Quantum Yields for the Photosensitized Formation of the Lowest Electronically Excited Singlet State of Molecular Oxygen in Solution

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Quenching of excited singlet and triplet states of many substances by ground state molecular oxygen produces singlet oxygen, the lowest electronically excited singlet state of molecular oxygen, $O_2(^1\Delta_g)$. The fractions of singlet and triplet states quenched which produce singlet oxygen and the quantum yields of formation of singlet oxygen in fluid solutions have been critically compiled. Methods for determining yield parameters have been reviewed. Data have been compiled from the literature through 1991. Photosensitizers such as aromatic hydrocarbons, aromatic ketones and thiones, quinones, coumarins, fluoresceins, transition metal complexes, and heterocyclics are included in Table 1. Porphyrins and phthalocyanines are included in Table 2. Other materials which have been investigated for singlet oxygen production, such as dyes and drugs, are collected in Table 3 along with heterogeneous systems such as polymer-bound photosensitizers.

Key words: data compilation; energy transfer; excited states; oxygen; photosensitization; quantum yields; quenching; singlet oxygen; singlet states; solution; triplet states.

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1. Introduction

Ground state molecular oxygen, O_2, is well known to be highly reactive and essential for animal respiration. Its properties have been actively studied for more than 200 years. However the properties of its lowest electronically excited state have only been actively investigated during the last three decades. This is illustrated in the book entitled *Singlet Molecular Oxygen*[1] where Paul Schaap collects 28 Benchmark papers covering the period 1924–1973 which tell the story of the 'discovery' of singlet oxygen and many of the key steps taken towards present day understanding. There is strong evidence for the involvement of singlet oxygen, a powerful oxidant, in photosensitized oxidations, in photodynamic inactivation of viruses and cells, in phototherapy for cancer, in photocarcinogenisis, in the photodegradation of dyes and polymers and in the dye sensitization of the photodegradation of polymers. Much current interest in the chemical reactions of singlet oxygen stems from its potential as a photochemo-therapeutic agent.

The ground electronic state of molecular oxygen, which has zero angular momentum about the internuclear axis and contains two unpaired p electrons, has the group theoretical symbol $^3\Sigma_g^-$. The two electronically excited singlet states which arise from this same electron configuration but with spin pairing of the two electrons are the $^1\Delta_g$ and the $^1\Sigma_g^+$ states which lie 94 and 157 kJ mol^{-1} respectively above the $^3\Sigma_g^-$ ground state (see potential energy curves shown in Fig. 1). The electronic transitions $^1\Delta_g \leftarrow {}^3\Sigma_g^-$ and $^1\Sigma_g^+ \leftarrow {}^3\Sigma_g^-$ although highly forbidden are readily observed in absorption and emission in the upper atmosphere with zero-zero transitions at 1,269 and 762 nm and estimated radiative lifetimes of 64 min and 10 s, respectively.[2,3] The measured lifetimes in the gas phase and in solution are very much shorter than this. In fact, in condensed media, the lifetime of $O_2^*(^1\Sigma_g^+)$ is so short that virtually nothing is known about its properties, and thus the term singlet oxygen is used throughout this review to refer to the $^1\Delta_g$ state.

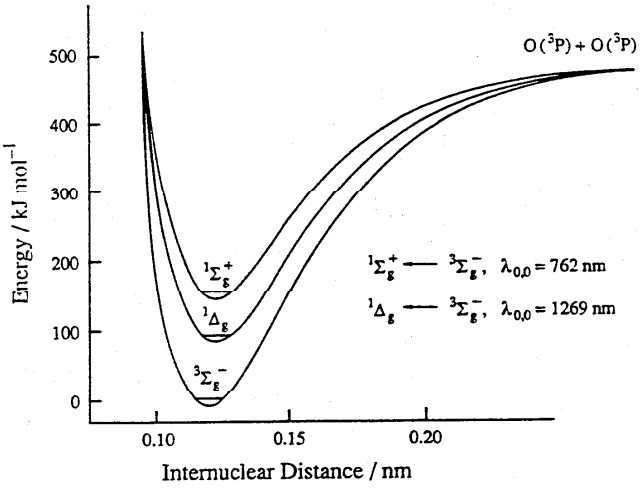

FIG. 1. Potential energy curves for molecular oxygen.

In 1963 Khan and Kasha[4] interpreted the red chemiluminescence of the hypochlorite-oxygen reactions as due to liberated singlet oxygen. Following the work of Ogryzlo *et al.*[5,6], Khan and Kasha[7] gave a full spectroscopic correlation of the absorption and emission spectra in terms of the simultaneous transitions between the states shown in Fig. 2. Obviously the long-lifetime of $^1\Delta_g$ even at one atmosphere pressure is such that two excited states collide

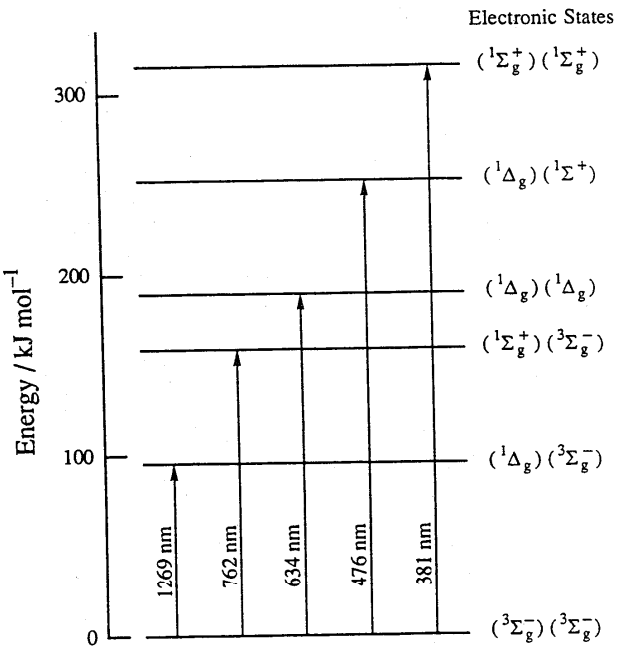

FIG. 2. Singlet state transitions and simultaneous pair-state transitions in molecular oxygen.

often enough for the simultaneous transition $^1\Delta_g$, $^1\Delta_g \rightarrow {}^3\Sigma_g$, $^3\Sigma_g + h\nu$ to be seen.

Although singlet oxygen had been proposed as a possible intermediate in dye-sensitized photo-oxygenations by Kautsky as early as 1931[8,9] this was only firmly established following publications by Foote and Wexler[10] and Corey and Taylor[11] in 1964. A few years later a method for measuring the lifetime of singlet oxygen in solution was developed by Adams and Wilkinson[12] which made direct time measurements of the reaction of singlet oxygen with a reactive substrate, diphenylisobenzofuran following nanosecond laser photolysis enabling rate constants to be obtained for reactions of singlet oxygen. In 1976 Krasnovsky[13] used a mechanical phosphoroscope to detect the weak luminescence from $O_2^*(^1\Delta_g)$ at 1270 nm, thereby obtaining kinetic information concerning the reactions of singlet oxygen on millisecond timescales. However the development in the eighties of sensitive germanium photodiodes means that direct kinetic and relative yield studies of the phosphorescence of singlet oxygen are now routinely possible on timescales down to 1 μs.

Numerous reviews[14–22] and several books[23–25] have recently been published on singlet oxygen and the field continues to grow dramatically. In 1981 we published a critical comprehensive compilation[26] on 'Rate Constants for the Decay and Reactions of the Lowest Electronically Excited State of Molecular Oxygen in Solution' which reported first order solvent deactivation rate constants for 50 different solvents and second order rate constants for the deactivation and chemical reaction of singlet oxygen for 690 different compounds, from available data up to the end of 1978, including a few papers for 1979. We are in the process of updating this published compilation which we shall refer to as Paper I.[26] A considerable number of studies on singlet oxygen properties have been published in the last decade yielding hundreds of rate constants for reaction, quenching and decay but also increasingly hundreds of reports of the quantum yields of singlet oxygen production, ϕ_Δ, for many sensitizer-solvent systems. Since we did not collect data on quantum yields in Paper I[26] we have concentrated in this compilation on ϕ_Δ values. We have endeavored to keep the treatment consistent with Paper I[26] by using identical equation numbers and symbols wherever possible. In order to avoid too much duplication much reference is made to Paper I[26] especially when discussing singlet oxygen kinetics and reactions.

It is important to stress that photo-oxidation can arise as a result of several different mechanisms. Two major classes of photosensitized oxygenations have been designated as Type I and Type II[27,28]. In the former, the sensitizer interacts directly with the substrate resulting, for example, in either H-atom or electron transfer. The radicals so produced from the sensitizer react in the presence of oxygen to regenerate the sensitizers, while radicals produced from the substrate, for example, initiate free radical chain reactions, as observed in auto-oxidations, etc. Type II reactions involve the direct interaction of the excited sensitizer with oxygen which can give upon energy transfer singlet oxygen, which reacts with various substrates yielding Type II photosensitized reactions.[28,29]

2. Photosensitized Production of Singlet Oxygen in Solution

The method most frequently used for producing singlet oxygen in the laboratory is photosensitization (see Scheme 1). Both continuous irradiation and pulsed excitation studies have made much use of this method of production which also frequently occurs in nature. In this mechanism (Scheme 1) the lowest excited singlet and triplet states of the sensitizers are represented as S_1, and T_1 respectively and the ground electronic state by S_0. Any substrate which deactivates singlet oxygen by physical or chemical quenching is represented by M in Scheme 1. However, when quenching is known to be mainly by chemical reaction we shall use A to represent a reactive substrate and when a second 'reference' reactive substrate is employed we shall use A′. When the molecule is known to be a physical quencher with negligible reaction Q will be used in place of M. The singlet oxygen sensitizer even if it quenches singlet oxygen will be represented by S in place of M. When measurements are made relative to a reference sensitizer we shall label this S′. Thus M is a general symbol in Scheme 1 which may be replaced by A, A′, Q, S or S′ or any combination of these.

Scheme 1 is easily modified for self-sensitization also called photo-autoxidation where a substrate sensitizes its

Scheme 1

		Rate Constants		Quantum Yields and Fractional Probabilities
1	$S_0 + h\nu \rightarrow S_1$	rate $= I_a$		
2	$S_1 \rightarrow S_0 + h\nu_F$	k_F	$k_{SD} = (\tau_S^0)^{-1}$	$\phi_F = \frac{k_F}{k_{SD}}$
3	$S_1 \rightarrow S_0$	k_{ic}		
4	$S_1 \rightarrow T_1$	k_{isc}		$\phi_T = \frac{k_{isc}}{k_{SD}}$
5	$S_1 + O_2 \rightarrow T_1 + {}^1O_2{}^*$	$k_{S\Delta}^{O_2}$	$k_{SQ}^{O_2}$	$f_\Delta^S = k_{S\Delta}^{O_2}/k_{SQ}^{O_2}$
6	$S_1 + O_2 \rightarrow T_1 + {}^3O_2$	$k_{isc}^{O_2}$		$f_T^{O_2} = (k_{S\Delta}^{O_2} + k_{isc}^{O_2})/k_{SQ}^{O_2}$
7	$S_1 + O_2 \rightarrow S_0 + {}^3O_2$	$k_{Sd}^{O_2}$		$P_S^{O_2} = k_{SQ}^{O_2}[O_2]/(k_{SD} + k_{SQ}^{O_2}[O_2])$
8	$S_1 + O_2 \rightarrow$ products	$k_{Sr}^{O_2}$		$1 - P_S^{O_2} = 1/(1 + k_{SQ}^{O_2}\tau_S^0[O_2])$
				$\phi_T^{O_2} = \phi_T(1 - P_S^{O_2}) + f_T^{O_2}P_S^{O_2}$
9	$T_1 \rightarrow S_0 + h\nu_P$	k_{Tp}	$k_{TD} = (\tau_T^0)^{-1}$	
10	$T_1 \rightarrow S_0$	k_{Td}		
11	$T_1 + O_2 \rightarrow S_0 + {}^1O_2{}^*$	$k_{T\Delta}^{O_2}$	$k_{TQ}^{O_2}$	$f_\Delta^T = k_{T\Delta}^{O_2}/k_{TQ}^{O_2}$
12	$T_1 + O_2 \rightarrow S_0 + {}^3O_2$	$k_{Td}^{O_2}$		
13	$T_1 + O_2 \rightarrow$ products	$k_{Tr}^{O_2}$		$P_T^{O_2} = k_{TQ}^{O_2}[O_2]/(k_{TD} + k_{TQ}^{O_2}[O_2])$
14	${}^1O_2{}^* \rightarrow {}^3O_2 + h\nu_P$	$k_{\Delta P}$	$k_\Delta = \tau_\Delta^{-1}$	$f_P^\Delta = k_{\Delta P}/(k_{\Delta P} + k_{\Delta d})$
15	${}^1O_2{}^* \rightarrow {}^3O_2$	$k_{\Delta d}$		
16	${}^1O_2{}^* + M \rightarrow$ products	k_r^M	k_M	$f_r^M = k_r^M/(k_r^M + k_q^M)$
17	${}^1O_2{}^* + M \rightarrow {}^1M + {}^3O_2$	k_q^M		

f_Δ^S = fraction of S_1 quenched by O_2 which gives ${}^1O_2{}^*$
$f_T^{O_2}$ = fraction of S_1 quenched by O_2 which gives T_1
f_Δ^T = fraction of T_1 quenched by O_2 which gives ${}^1O_2{}^*$
$P_S^{O_2}$ = proportion of S_1 quenched by O_2
$P_T^{O_2}$ = proportion of T_1 quenched by O_2

own photo-oxidation. However Scheme 1 does not include any of the possible reactions between the substrate M with the sensitizer singlet or triplet states S_1 or T_1 e.g.

$$18 \quad S_1 + M \xrightarrow{k_{Sd}^M} S_0 + M$$
$$19 \quad S_1 + M \xrightarrow{k_{isc}^M} T_1 + M$$
$$20 \quad S_1 + M \xrightarrow{k_{Sr}^M} \text{Products}$$
$$21 \quad T_1 + M \xrightarrow{k_{Td}^M} S_0 + M$$
$$22 \quad T_1 + M \xrightarrow{k_{Tr}^M} \text{Products}$$

These steps are not included in Scheme 1 since in most studies these reactions have been shown to be absent. In fact a major criterion for choosing a sensitizer is the absence of such complications. Other possible complications are the quenching or reaction of S_1, T_1 and ${}^1O_2{}^*$ by products and other bimolecular reactions for example between ${}^1O_2{}^*$ and T_1 etc. These possibilities should be borne in mind especially when experimental conditions are varied markedly by using different types of sensitizers or highly reactive substrates, high concentrations, high light intensities etc. Fig. 3 shows pictorially the reaction scheme including all the steps *1–22*.

The quantum yield of singlet oxygen production, via sensitization ϕ_Δ, is given by the sum of contributions due to oxygen quenching of S_1 and T_1 i.e.

$$\phi_\Delta = \phi_\Delta(S_1) + \phi_\Delta(T_1).$$

ϕ_Δ depends on the concentration of oxygen and in the presence of oxygen quenching of both S_1 and T_1, it follows from the steps shown in Scheme 1 (see Appendix 12.1.1 for derivation) that

$$\phi_\Delta = P_S^{O_2}f_\Delta^S + \phi_T^{O_2}P_T^{O_2}f_\Delta^T = P_S^{O_2}f_\Delta^S + P_S^{O_2}f_T^{O_2}P_T^{O_2}f_\Delta^T + \phi_T(1 - P_S^{O_2})P_T^{O_2}f_\Delta^T \quad (1)$$

which can be written as

$$\phi_\Delta = \phi_T P_T^{O_2}f_\Delta^T + P_S^{O_2}\{f_\Delta^S + P_T^{O_2}f_\Delta^T(f_T^{O_2} - \phi_T)\}.$$

When $E_{S_1} - E_{T_1} \ll E_\Delta$, $k_{S\Delta}^{O_2} \rightarrow 0$ and thus sensitization is just by the triplet state, Eq. (1) becomes

$$\phi_\Delta = \phi_T^{O_2}P_T^{O_2}f_\Delta^T = \phi_T(1 - P_S^{O_2})P_T^{O_2}f_\Delta^T + P_S^{O_2}f_T^{O_2}P_T^{O_2}f_\Delta^T.$$

When the lifetime of S_1 is such that $k_{SD} \gg k_{SQ}^{O_2}[O_2]$ a further simplification occurs and

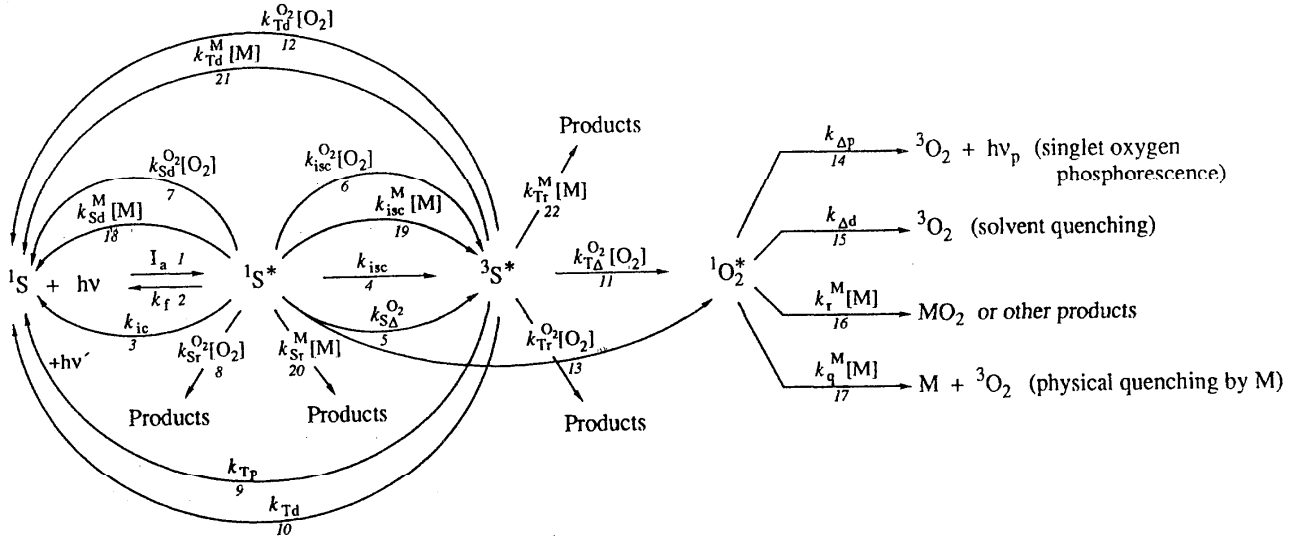

FIG. 3. Pictorial representation of full kinetic scheme [steps *1* to *22*, see text] for photosensitized oxidation involving singlet oxygen. S = Sensitizer, M = Substrate.

$$\phi_\Delta = \phi_T P_T^{O_2} f_\Delta^T .$$

For many molecules, triplet lifetimes are long and oxygen quenching is very efficient. Thus even air saturated solutions have $P_T^{O_2} = 1$. In this case, in the absence of singlet state quenching by oxygen,

$$\phi_\Delta = \phi_T f_\Delta^T .$$

Various methods are available for measuring the quantum yield of singlet oxygen production and these will be discussed in Section 4.

2.1. Sensitized Production by Pulsed Radiolysis

When a high energy electron beam is passed through liquid benzene and some other solvents a high yield of excited states can be formed. Since the lifetimes of singlet and triplet states of benzene are only a few nanoseconds in neat benzene, quenching by dissolved oxygen does not produce much singlet oxygen. However, in the presence of a high concentration of a triplet energy acceptor, energy transfer to and then from its triplet state to oxygen yields singlet oxygen. For example, on pulsed radiolysis of benzene containing 10^{-2} mol L^{-1} naphthalene, triplet benzene is intercepted by naphthalene to give triplet naphthalene which is quenched by oxygen and enough singlet oxygen is produced to enable its properties to be probed using the technique of pulsed radiolysis.[30]

3. Methods for Studying Kinetics of the Reactions of Singlet Oxygen.

3.1. Phosphorescence Decay

Although the phosphorescence from singlet oxygen is highly forbidden and it occurs in the infrared region of the spectrum which presents many difficulties for experimentalists, it is now possible to detect the decay of singlet oxygen luminescence from very dilute solutions of sensitizers.[31–37] These kinds of measurements have enabled much more direct determinations of the lifetime of singlet oxygen than the indirect methods reported earlier.[26] If the logarithm of the phosphorescence intensity is plotted as a function of time then the slope equals the decay constant, given by:

$$k_D = k_\Delta + \Sigma k_M[M] , \qquad (2)$$

where M represents any molecule including the sensitizer which quenches singlet oxygen (via a physical process or a chemical reaction). Several workers[38–39] have measured k_D as a function of sensitizer concentration which enables both k_Δ and the bimolecular rate constant for singlet oxygen quenching by the sensitizer k_S to be obtained. When a decay constant for singlet oxygen is measured in the presence of a sensitizer we shall use $k_d = k_\Delta + k_S[S]$ for the decay constants. It is often assumed or demonstrated that under many experimental conditions $k_d = k_\Delta$; how-

ever this is not always the case. Occasionally the value of k_Δ is obtained by measuring k_d as a function of [S] and extrapolating to [S] = 0.[38] This procedure is to be recommended.

3.2. Time Dependent Thermal Lensing due to Singlet Oxygen Decay

The absorption of even part of the energy in a laser pulse gives rise to local temperature changes in gases or liquids. This leads to changes in density and refractive index which causes the system to act as a diverging lens.[40] Time resolved thermal lensing (TL) due to release of energy by decaying excited states can be used to measure lifetimes of singlet oxygen in the range 0.1 to 100 μs. A continuous laser beam used as a probe source is dispersed by the thermal lens reducing the light reaching a photodiode through a pinhole. The photodiode signal gives the relative magnitudes of heat contributions (U) for fast and slow non-radiative processes relative to the acoustic transit time. The time dependence of the slow process gives rate information. The TL signal at time t is defined as

$$U(t) = \frac{V_0 - V(t)}{V_0} \tag{3}$$

where $V(t)$ is the time dependent voltage generated by the detector and V_0 is the value before excitation by the pump laser. Following the sensitized production of $^1O_2$*, $\Delta U = U_{total} - U_{fast}$ decays exponentially with the decay constant k_D given by Eq. (2) (See also Section 4.2.2).

3.3 Time Dependent Acceptor Disappearance

3.3.1. Following Pulsed Excitation of a Sensitizer

This method is discussed in detail in Paper I.[26] To summarize according to the mechanism given in Scheme 1, in this case with M = A, since we are discussing a reactive substrate, it follows that

$$-\frac{d[A]}{dt} = k_r^A[A][^1O_2^*].$$

Following pulsed excitation in aerated solutions most singlet and triplet states have decayed within 1 μs and then

$$-\frac{d[^1O_2^*]}{dt} = (k_d + k_A[A])[^1O_2^*]$$

and thus

$$-d[A] = k_r^A[A][^1O_2^*]_{t=0}[\exp-(k_d t + \int_0^t k_A[A]dt)]. \tag{4}$$

Equation (4) has been treated slightly differently by Adams and Wilkinson[12], by Young *et al.*[41] and by Merkel and Kearns[42] as explained in Paper I.[26] However for very small changes in [A] (i.e. less than 10%) all of these treatments effectively put [A] = $[A]_{av}$, the average value of [A], and integrate Eq. (4) taking $k_D = k_d + k_A[A]_{av}$ to give

$$[A]_t - [A]_\infty = \frac{k_r^A [^1O_2^*]_{t=0}[A]_{av}}{k_D} e^{-k_D t}. \tag{5}$$

Since the change in concentration of A is proportional to ΔA, the change in absorbance by the oxidizable acceptor at some convenient wavelength; i.e. $[A]_t - [A]_\infty = \Delta A/\epsilon l$, where ϵ is the extinction coefficient and l the analyzing path-length. It follows from Eq. (5) that

$$\ln \Delta A = -k_D t + \text{const} \tag{6}$$

and a plot of $-\ln \Delta A$ vs. t should have a slope equal to $k_D = k_d + k_A[A]_{av}$. Thus by varying $[A]_{av}$ values of k_d and k_A can be determined. If k_A is only partly due to chemical quenching and partly due to physical quenching, the value of k_A obtained will be the rate constant due to the combination of both processes; i.e. $k_A = k_r^A + k_q^A$. Thus when A acts both as a physical and as a chemical quencher, the value of k_A obtained is the total rate constant for quenching due to both processes. The acceptor used in most studies of this type is the original one chosen by Adams and Wilkinson,[12] namely 1,3-diphenylisobenzofuran, DPBF. In the presence of several possible singlet oxygen quenchers (i.e. Scheme 1 with M = A, S and Q), we have

$$k_D = k_\Delta + k_S[S] + k_Q[Q] + k_A[A]. \tag{9}$$

Measurement of k_D as a function of [Q] keeping [S] and [A] constant allows values of k_Q to be obtained. N.B. If k_Q is only partly due to physical quenching and a small part is due to reaction, the value of k_Q obtained will be the total rate constant for quenching due to both processes.

A variation on this method has been reported by Matheson, *et al.*[43,44] in which singlet oxygen is directly generated by absorption of the output at 1065 nm of a pulsed Nd-glass laser by oxygen dissolved under pressure (up to 130 atm) in 1,1,2-trichlorotrifluoroethane (Freon 113) and the disappearance of the singlet oxygen acceptor DPBF was monitored. Farmilo and Wilkinson[45] have developed a method for measuring singlet oxygen decay which monitors absorption by triplet β-carotene, $^3C^*$, formed by energy transfer from singlet oxygen in aerated solutions containing a sensitizer and a low concentration of β-carotene. Under appropriate conditions the decay of absorption at 520 nm due to $^3C^*$ mirrors the singlet oxygen decay yielding values of k_D. Paper I[26] describes these methods in detail (see Eqs. (7)–(12) given there).

3.3.2. Monitoring Sensitized Photo-oxidations by Consumption of Reactants or Appearance of Products Under Steady-State Conditions

Many photosensitized reactions of a single substrate A have been carried out under conditions such that no quenching by A of the sensitizer singlet or triplet states occurs, in which case the mechanism is as given in Scheme 1, with M = A. For continuous irradiation,

$$-\frac{d[A]}{dt} = -\frac{d[O_2]}{dt} = \frac{d[P]}{dt} = k_r^A[^1O_2^*]_{ss}[A] \qquad (13)$$

and the steady-state approximation can be applied to S_1, T_1 and $^1O_2^*$ (See Appendix 1, Sec. 12.1.1) to give

$$\phi_{ox} = \frac{r_{ox}}{I_a} = \frac{\phi_\Delta k_r^A[A]}{k_d + k_A[A]} = \phi_\Delta p_A \ , \qquad (14)$$

where p_A is the fraction of the $O_2^*(^1\Delta_g)$ formed which reacts with A. The rate of oxygenation may be followed by determining the rate of production of some product and/or the rate of disappearance of either the substrate A and/or of oxygen. All three have been used. N.B. It follows from Eq. (14) that when $k_d \gg k_A[A]$ or $k_A[A] \gg k_d$ the rate of oxygenation will be first or zero order respectively with respect to A. Equation (14) can be rearranged to give

$$r_{ox}^{-1} = (I_a \phi_\Delta f_r^A)^{-1}\left[1 + \frac{k_d}{k_A}\frac{1}{[A]}\right] \qquad (15)$$

where $f_r^A = k_r^A/k_A$ is the fraction of reactive quenching of singlet oxygen by A.

Most reactive substrates (A) react with singlet oxygen with unit stoichiometry as implied in Eqs. (13) to (15) which apply when each time a molecule of $^1O_2^*$ reacts it leads to the consumption of one molecule of A and one of O_2 and produces one molecule of the product P. If there are stoichiometry factors α different from unity, i.e. the overall reaction is given by the equation

$$\alpha_A A + \alpha_{O_2} O_2 \xrightarrow[h\nu]{S} \alpha_P P \ ,$$

then

$$r_{ox} = -\frac{1}{\alpha_A}\frac{d[A]}{dt} = -\frac{1}{\alpha_{O_2}}\frac{d[O_2]}{dt} = \frac{1}{\alpha_P}\frac{d[P]}{dt}$$

and Eqs. (14) and (15) still apply. If however the rate of the reaction is monitored by observing the rate of consumption of a reactive substrate such as thiourea where $\alpha = 2$ and this rate is not divided by $\alpha = 2$, then αf_r^A instead of f_r^A appears in Eqs. (14) and (15). This adjustment needs to be made whenever unit stoichiometry does not apply.

According to Eq. (15) linear plots of r_{ox}^{-1} or ϕ_{ox}^{-1} vs. $[A]^{-1}$ should give

$$\frac{\text{slope}}{\text{intercept}} = \frac{k_d}{k_A} = \beta_A \ ,$$

where $\beta_A = k_d/k_A$ represents the concentration at which the decay of singlet oxygen in the solvent sensitizer system equals the decay due to quenching by A by both physical and chemical paths (steps *16* and *17*); i.e. it is the *half-quenching concentration*. N.B. Eq. *(15) only predicts* a linear relationship if there is (i) constant light intensity, (ii) constant absorption by the sensitizer and with no absorption by A although this could be allowed for, and (iii) a constant oxygen concentration in the solution. For examples see Refs. 46–48 and Paper I[26] where hundreds of β values are given.

Several modifications on this theme are possible including the addition of quenchers which allow values of $\beta_Q = k_d/k_Q$ to be obtained. (For details see Paper I[26] and Eqs. (16) – (26) given there). If values of k_d are available β values can be converted into rate constants k_A and k_Q. Usually the rate constant obtained in this way is the sum of k_r and k_q contributions; however these can be separated as discussed below.

3.3.3. Separation of k_r and k_q

Methods which have been used to separate k_r and k_q values usually involve the direct measurement of the quantum yields of oxygenation, ϕ_{ox}. For example at high concentrations of A such that $k_A[A] \gg k_d$, it follows from Eq. (14) that

$$(\phi_{ox})_{[A]\to\infty} = \phi_\Delta f_r^A \ . \qquad (27)$$

Alternatively at low values of [A] when $k_d \gg k_A[A]$ Eq. (14) gives

$$\phi_{ox} = \frac{\phi_\Delta k_r^A[A]}{k_d} . \qquad (28)$$

Thus measurement of relative values of ϕ_{ox} or r_{ox}, under identical conditions at either of these limits allows the evaluation of relative values of k_r^A. It follows from Eqs. (27) and (28) that measurement of ϕ_{ox} together with a knowledge of ϕ_Δ, and k_d or β_A allows values of k_r^A or f_r^A to be determined. Often the limiting yield of oxygenation of a very reactive acceptor (e.g. α-terpinene or 2,5-dimethylfuran (2,5–DMF = A′)) for which $f_r^{A'}$ is close to unity (i.e. $k_r^{A'} \gg k_q^{A'}$) is used as a reference substrate to give values of ϕ_Δ and hence $k_r^{A'}$ for other additives.[49,50] Gollnick and Griesbeck[51] have for example measured the rates of oxygen consumption of various substrates relative to that of 2,5–DMF at concentrations greater than 4×10^{-5} mol L^{-1} in methanol. Since $k_r^{A'} \gg k_q^{A'}$, $f_r^{A'} = 1$ and the concentration is such that $k_A[A'] \gg k_d$ and thus $r_{ox}^{A'} = I_a\phi_\Delta$, and

$$\frac{r_{ox}^{A'}}{r_{ox}^{A}} = \frac{(k_r^A + k_q^A)[A] + k_S[S] + k_\Delta}{k_r^A[A]}$$

or

$$\frac{r_{ox}^{A'}}{r_{ox}^{A}} = \left[1 + \frac{k_q^A}{k_r^A}\right] + \left[\frac{k_\Delta}{k_r^A} + \frac{k_S[S]}{k_r^A}\right]\frac{1}{[A]} . \qquad (29)$$

Plots of $r_{ox}^{A'}/r_{ox}^{A}$ versus $[A]^{-1}$ are linear and values of k_q^A/k_r^A can be determined from the intercepts. Variations in the slope of such plots as a function of the sensitizer concentration allow values of k_S/k_r^A and k_Δ/k_r^A to be determined. If k_Δ is known then k_r^A, k_S and k_q^A can be determined; e.g. see Ref. 50 and also Paper I[26] and Eqs. (30)–(37) given there for various other methods.

4. Methods for Determining the Sensitized Yields of Singlet Oxygen Production

According to Scheme 1, as outlined in Sec. 2 and as derived in Appendix 1, Sec. 12.1.1, the quantum yield of singlet oxygen production from quenching of both singlet and triplet states of the sensitizer is given by Eq. (1); i.e.

$$\phi_\Delta = \phi_T P_T^{O_2} f_\Delta^T + P_S^{O_2}\{f_\Delta^S + P_T^{O_2} f_\Delta^T (f_T^{O_2} - \phi_T)\}. \quad (1)$$

It follows from Scheme 1 that there would be two molecules of $^1O_2$* produced for every photon absorbed if oxygen were to quench all the singlet states of a sensitizer to give $^1O_2$* and if in addition all triplet states were quenched by oxygen with 100% efficiency to give $^1O_2$*. This is apparent from Eq. (1) since $\phi_\Delta = 2$ when $P_S^{O_2} = P_T^{O_2} = f_\Delta^S = f_\Delta^T = f_T^{O_2} = 1$. This limit is approached for some systems (see some of the limiting values for Entry numbers 1.19 and 1.25 in Table 1) at high oxygen concentrations. At room temperatures air-saturated solutions of most organic solvents contain $(1-3) \times 10^{-3}$ mol L^{-1} of dissolved oxygen, while in water, ethylene glycol and glycerol, the values are much less: 2.9, 1.2 and 0.7×10^{-4} mol L^{-1}, respectively. Typically the rate constants for quenching of excited singlet states by oxygen in nonviscous solvents are in the range $(2-4) \times 10^{10}$ L mol^{-1} s^{-1}. Thus $k_{SQ}^{O_2}[O_2] = 6 \times 10^7\ s^{-1}$ and $3 \times 10^8\ s^{-1}$ in air- and oxygen-saturated solutions. It follows that singlet states with lifetimes of 16.7 ns and 3.3 ns for air and oxygen saturated solutions will have $P_S^{O_2} = 0.5$; i.e. half the excited singlet states would be quenched by oxygen. Compounds with singlet state lifetimes twenty times longer or shorter than these will have $P_S^{O_2} = 0.95$ and 0.05 respectively. In general therefore when excited singlet state lifetimes are less than 0.15 ns $P_S^{O_2} < 0.05$. This is often the case for example for aromatic ketones with lowest singlet states which are n,π* states. However the singlet states of aromatic hydrocarbons are often such that $P_S^{O_2}$ is critically dependent on oxygen solubility and thus on solvent, viscosity, temperature, etc, as are therefore ϕ_Δ values. As far as oxygen quenching of triplet states is concerned, $k_{TQ}^{O_2}$ values are usually one order of magnitude less than $k_{SQ}^{O_2}$, so when the triplet state lifetimes are >3.3 μs or >16.6 μs then $P_T^{O_2} > 0.95$ for oxygen and air saturated solutions respectively. When $P_T^{O_2} = 1$, Eq. (1) becomes

$$\phi_\Delta = \phi_T f_\Delta^T + P_S^{O_2}\{f_\Delta^S + f_\Delta^T (f_T^{O_2} - \phi_T)\} \quad (38)$$

or equally well in terms of $[O_2]$ and the Stern-Volmer constant for singlet quenching by O_2, K_{SV}

$$\phi_\Delta = \frac{\phi_T f_\Delta^T + K_{SV}[O_2](f_\Delta^S + f_\Delta^T f_T^{O_2})}{1 + K_{SV}[O_2]}. \quad (38)$$

Since

$$\frac{F^\circ}{F} = 1 + K_{SV}[O_2],$$

where F° and F represent the sensitizer fluorescence intensity in the absence and presence of oxygen another form of Eq. (38) is

$$\frac{F^\circ}{F}\phi_\Delta = \phi_T f_\Delta^T + (f_\Delta^S + f_\Delta^T f_T^{O_2})\left[\frac{F^\circ}{F} - 1\right]. \quad (38)$$

This form of Eq. (38) is often combined with Eq. (14) to give

$$\frac{F^\circ \phi_{ox}}{F p_A} = \phi_T f_\Delta^T + (f_\Delta^S + f_\Delta^T f_T^{O_2})\left[\frac{F^\circ}{F} - 1\right]. \quad (14,38)$$

Thus a plot of

$$\left(\frac{F^\circ \phi_{ox}}{F p_A}\right) \text{ versus } \left[\frac{F^\circ}{F} - 1\right]$$

or equally well

$$\phi_{ox}(1 + K_{SV}[O_2])/p_A \text{ versus } K_{SV}[O_2]$$

will give a straight line with an intercept equal to $\phi_T f_\Delta^T$ and a slope of $(f_\Delta^S + f_\Delta^T f_T^{O_2})$. In addition often $f_T^{O_2}$ is, perhaps too readily, assumed equal to one in order to allow the sum $f_\Delta^S + f_\Delta^T$ to be obtained.

Often the contribution to the singlet oxygen yield from singlet state quenching is negligible; this is certainly so when $E_{S_1} - E_{T_1} \ll E_\Delta$. In this case $f_\Delta^S = 0$ and Eq. (1) becomes:

$$\phi_\Delta = \phi_T^{O_2} P_T^{O_2} f_\Delta^T = \phi_T P_T^{O_2} f_\Delta^T + P_S^{O_2} P_T^{O_2} f_\Delta^T (f_T^{O_2} - \phi_T).$$

If in addition to $f_\Delta^S = 0$, $P_T^{O_2} = 1$ or if one divides ϕ_Δ by $P_T^{O_2}$ to correct for total triplet quenching, the triplet yield is still modified by O_2 and

$$\phi_\Delta = \phi_\Delta / P_T^{O_2} = \phi_T^{O_2} f_\Delta^T = \phi_T f_\Delta^T + P_S^{O_2} f_\Delta^T (f_T^{O_2} - \phi_T). \quad (39)$$

Although $f_T^{O_2}$ has been shown in some cases to be close to unity, in other cases this is not so and the assumption that $f_T^{O_2} = 1$ should be checked. However when $f_T^{O_2} = 1$ Eq. (1) becomes:

$$\phi_\Delta = \phi_T P_T^{O_2} f_\Delta^T + P_S^{O_2}\{f_\Delta^S + P_T^{O_2} f_\Delta^T (1 - \phi_T)\} \quad (40)$$

and when $f_T^{O_2} = P_T^{O_2} = 1$

$$\phi_\Delta = \phi_T f_\Delta^T + P_S^{O_2}\{f_\Delta^S + f_\Delta^T (1 - \phi_T)\}.$$

When there is negligible oxygen quenching of S_1 which occurs for short lived singlet states as explained above (i.e. when $P_S^{O_2} = 0$) Eq. (1) becomes

$$\phi_\Delta = \phi_T P_T^{O_2} f_\Delta^T \quad (41)$$

and Eq. (41) simplifies further if in addition $P_T^{O_2} = 1$ and the value of ϕ_Δ corrected for total triplet quenching is given by

$$\phi_\Delta^T = \phi_\Delta / P_T^{O_2} = \phi_T f_\Delta^T . \quad (42)$$

All the forms of Eq. (1) given above, i.e. Eqs. (38) – (42) have been used in the literature. N.B. When excitation is by pulse radiolysis, yields are measured as G values, where $G(^1O_2^*)$ for example is the number of singlet oxygen molecules produced per 100 eV of absorbed radiation. Gorman *et al.*[30] have shown that under the appropriate conditions (e.g. when $P_S^{O_2} = 0$, and $P_T^{O_2} = 1$), Eq. (42) can be used with $G(^1O_2^*)$ and $G(^3S^*)$ scavenged by O_2 replacing ϕ_Δ^T and $P_T^{O_2}\phi_T$ respectively.

It is useful to place sensitizers into one of three categories (as suggested in Ref. 52). We prefer not to use categories I, II and III as suggested in Ref. 52 in order to avoid confusion with type I and type II photo-oxidations. We use Type T for molecules where, in the range of concentration of oxygen normally employed, there is no singlet state quenching by O_2 (i.e. $P_S^{O_2} = 0$) and for which therefore Eqs. (41) and (42) hold. We use Type ST for sensitizers which have singlet and triplet states which may both be quenched by oxygen to give $^1O_2^*$, i.e. type ST sensitizers have $P_S^{O_2} \neq 0$ and $E_{S_1} - E_{T_1} \geq E_\Delta$. Equations (1), (38), (14,38) and (39) apply to type ST sensitizers and at the limit when $P_T^{O_2} = P_S^{O_2} = 1$, i.e. $[O_2] \rightarrow \infty$,

$$\phi_\Delta^{ST} = f_\Delta^S + f_\Delta^T f_T^{O_2}, \text{ for type ST sensitizers.}$$

We use Type TC for those sensitizers with singlet states which are quenched by O_2 but which have $E_{S_1} - E_{T_1} \ll E_\Delta$ and which therefore have $f_\Delta^S = 0$ and have triplet yields ($\phi_T^{O_2}$) and quantum yields of singlet oxygen production (ϕ_Δ) which depend on the amount of singlet quenching by oxygen. The triplet yield of the sensitizer changes according to the extent of singlet state quenching by oxygen and the extent of catalysed triplet states produced thereby. For type TC sensitizers Eq. (39) holds when $P_T^{O_2} = 1$ and when in addition $P_S^{O_2} = 1$ the limiting value for $[O_2] \rightarrow \infty$ is

$$\phi_\Delta^{ST} = f_\Delta^T f_T^{O_2}, \text{ for type TC sensitizers.}$$

For type TC sensitizers ϕ_Δ^{ST} can be greater or lower than ϕ_Δ^T depending on whether $f_T^{O_2}$ is greater or less then ϕ_T. For type T sensitizers where contributions due to oxygen quenching of S_1 are negligible (e.g., many aromatic ketones), it follows from Eq. (41) that

$$\frac{1}{\phi_\Delta} = \frac{1}{\phi_T f_\Delta^T}\left[1 + \frac{k_{TD}}{k_{TQ}^{O_2}[O_2]}\right]$$

and the intercept of linear plots of ϕ_Δ^{-1} vs. $[O_2]^{-1}$ gives $\phi_\Delta^T = \phi_T f_\Delta^T$ i.e. the value at the limit where $P_T^{O_2} \rightarrow 1$. N.B. In such cases one would have to make studies at much higher oxygen pressures to reach the limit where $P_S^{O_2}$ also equals unity. Several workers evaluate $P_T^{O_2}$ and/or $P_S^{O_2}$ and are thus able to calculate values of ϕ_Δ^T and ϕ_Δ^{ST} defined above. In the tables such values are labelled with superscripts (e.g. 0.5^T and 0.7^{ST}) although some of these limiting values have not been obtained in practice but only by extrapolation.

4.1. Photo-oxidation Studies

4.1.1. Steady-State Irradiation

Many authors have reported values for ϕ_Δ obtained by measuring quantum yields of photo-oxidation under steady-state conditions. Equation (14) derived from Scheme 1 with M = A can be written in several forms i.e.

$$\phi_{ox} = \frac{\phi_\Delta k_r^A[A]}{k_d + k_A[A]} = \frac{\phi_\Delta f_r^A[A]}{\beta_A + [A]} = \phi_\Delta p_A \quad (14)$$

where p_A is the proportion of $^1O_2^*$ formed which reacts. This equation has also been used to determine ϕ_Δ using pulsed laser excitation[53] and in pulsed radiolysis experiments only with G values in place of quantum yields.[30]

At high concentrations of [A] such that $k_d \ll k_A[A]$

$$(\phi_{ox})_{[A]\rightarrow\infty} = \phi_\Delta f_r^A . \quad (27)$$

Often it is assumed that $f_r^A = 1$ for very reactive substrates. Certainly if several substrates give the same limiting yield,[54] it is reasonable to assume $f_r^A = 1$. Unless otherwise stated in the Table 'Comments' f_r^A has been assumed to be unity for all A. The stoichiometry of the overall reaction also needs to be established (see Section 3.3.2). Equations (14) and (27) are often used to determine $\phi_\Delta(S)$ for one sensitizer relative to a 'known' value of $\phi_\Delta(S')$ for a reference sensitizer, S', since for measurements under identical conditions Eq. (14) gives

$$\frac{\phi_\Delta(S)}{\phi_\Delta(S')} = \frac{\phi_{ox}(S)}{\phi_{ox}(S')} . \quad (43)$$

Of course the ratio of any measurement directly proportional to ϕ_{ox} can be used in Eq. (43).

When low concentrations of acceptor are used such that $k_d \gg k_A[A]$ Eq. (14) yields

$$-\frac{d[A]}{dt} = \frac{I_{abs}\phi_\Delta k_r^A[A]}{k_d}$$

cf. Eq. (28) and a first order dependence of the disappearance of A with time is observed. The slopes of first order plots measured under identical conditions allow relative values of ϕ_Δ to be obtained since

$$\frac{\phi_\Delta(S)}{\phi_\Delta(S')} = \frac{\{-d(\ln A)/dt\}_S}{\{-d(\ln A)/dt\}_{S'}} . \quad (44)$$

A variation on this theme involves using a reference sensitizer (S'), to act as a triplet energy donor to transfer energy to another sensitizer viz.,

23 $$^3S'^* + {}^1S \rightarrow {}^3S^* + {}^1S'$$

in the presence of oxygen and an oxidizable substrate. In the absence of absorption by S, of singlet state reaction by

S or S′ and of singlet state sensitization and if reaction *23* is 100% efficient, then $f_\Delta^T(S)$ can be obtained relative to $f_\Delta^T(S')$ since

$$f_\Delta^T(S) = \frac{f_\Delta^T(S')P_T^{O_2}(S')\phi_{ox}(S' + S)}{P_T^{O_2}(S)\phi_{ox}(S')} \quad (45)$$

where $\phi_{ox}(S' + S)$ is the quantum yield of oxidation of the substrate sensitized by the mixture of S′ and S. Obviously here again any observable directly proportional to ϕ_{ox} can also be used in Eq. (45).

Stevens *et al.*[55] have evolved a method for evaluating relative values of ϕ_Δ by the simultaneous excitation of two sensitizers one of which (S) does not react with or quench singlet oxygen whereas the other (S′) does. If the absorbance at the exciting wavelength by S′ and S are $A_{S'}$ and $A_S = A - A_{S'}$, then the quantum yield of oxidation in terms of light absorbed by both S′ and S is

$$\phi_{ox}(S + S') = p_A\left[\frac{\phi_\Delta(S)A_S}{A} + \frac{\phi_\Delta(S')A_{S'}}{A}\right],$$

where $\phi_\Delta(S)$ and $\phi_\Delta(S')$ are the quantum yields of singlet oxygen production for S and S′ respectively. The quantum yield of oxidation by S′ alone at the same concentration of S′ in the absence of sensitizer $\phi_{ox}(S') = p_A\phi_\Delta(S')$. N.B. S′ = A, an oxidizable substrate which undergoes self-sensitization and substitution into the equation above gives upon rearrangement

$$\frac{\phi_{ox}(S + S')A}{\phi_{ox}(S')A_{S'}} - 1 = \frac{\phi_\Delta(S)}{\phi_\Delta(S')}\left[\frac{A}{A_{S'}} - 1\right] \quad (46)$$

and thus the relative values of ϕ_Δ have been obtained from plots of $\phi_{ox}(S + S')\dfrac{A}{\phi_{ox}(S')A_{S'}} - 1$ versus $\dfrac{A}{A_{S'}} - 1$. Equation (46) needs to be modified if energy transfer between S and S′ occurs.[55]

Carre *et al.*[56] have compared the rate of disappearance of DPBF as a reference substrate A′ when sensitized with Methylene Blue as a reference sensitizer in the presence and absence of several dyes A which both quench and react with $^1O_2$*. When absorption is only by S′ in the presence of A and A′ Eq. (14) becomes

$$-\frac{d[A']}{dt} = \frac{I_a\phi_\Delta(S')k_{A'}[A']}{k_d + k_{A'}[A'] + (k_q^A + k_r^A)[A]}$$

since $k_r^{A'} = k_{A'}$ for DPBF. When both S′ and the dye absorbs at the exciting wavelength i.e. A = S, Eq. (14) gives

$$-\frac{d[A']}{dt} = \frac{\{I_a(S')\phi_\Delta(S') + I_a(S)\phi_\Delta(S)\}k_{A'}[A']}{k_d + k_{A'}[A'] + (k_q^S + k_r^S)[S]}. \quad (47)$$

Carre *et al.*[56] used integrated forms of Eq. (47) to give $\phi_\Delta(S)$ relative to $\phi_\Delta(S')$ and by assuming $\phi_\Delta = \phi_T$ (i.e. that Eq. (42) holds with $f_\Delta^T = 1$) they report ϕ_Δ as values for ϕ_T.

4.1.2. Pulsed Studies of Acceptor Disappearance

When a sensitizer S is excited by a laser pulse in the presence of oxygen and a reactive substrate A (such as DPBF), the amount of DPBF consumed is proportional to $\phi_\Delta(S)$. Thus if the change (reduction) in absorbance ΔA_A caused by the laser pulse is measured for excitation of optically matched solutions of S and S′, then it follows that since $\phi_{ox}(S)$ is proportional to $\Delta A_A(S)$ substitution in Eq. (43) gives another form of that equation; i.e.,

$$\frac{\phi_\Delta(S)}{\phi_\Delta(S')} = \frac{\Delta A_A(S)}{\Delta A_A(S')}. \quad (43)$$

The decrease in absorbance of a reactive substrate following excitation by a laser pulse measured at an analyzing wavelength where only A absorbs is given by

$$\Delta A_A = [^1O_2{}^*]^\circ p_A\epsilon_A l$$

where $[^1O_2{}^*]^\circ$ represents the concentration of singlet oxygen generated by the laser pulse, ϵ_A is the extinction coefficient of A and l the path length. The amount of triplet state of the sensitizer produced by an identical pulse $[^3S^*]^\circ$ can be measured by detecting the change in absorption due to triplet state absorption ΔA_T. Thus

$$\Delta A_T = [^3S^*]^\circ\epsilon_T l$$

where ϵ_T is the triplet state extinction coefficient at an analyzing wavelength where the ground state of the sensitizer does not absorb. The number of singlet oxygen molecules found per triplet state formed n_Δ is given by

$$n_\Delta = \frac{\phi_\Delta}{\phi_T^{O_2}} = \frac{\phi_T^{O_2}P_T^{O_2}f_\Delta^T + P_S^{O_2}f_\Delta^S}{\phi_T^{O_2}} = \frac{[^1O_2{}^*]^\circ}{[^3S^*]^\circ} = \frac{\Delta A_A\epsilon_T}{\Delta A_T p_A\epsilon_A}. \quad (48)$$

When analysis is made at a wavelength where both the ground state and triplet state absorb, ϵ_T in Eqs. (48) and (49) should be replaced by $\Delta\epsilon_T = \epsilon_T - \epsilon_G$. Equation (48) has various limits e.g.

$$n_\Delta = n_\Delta^T = f_\Delta^T$$

when $P_T^{O_2} = 1$ from type T and type TC sensitizers,

$$n_\Delta = n_\Delta^{ST} = f_\Delta^T + \frac{f_\Delta^S}{f_T^{O_2}}$$

when $P_T^{O_2} = 1$ and $P_S^{O_2} = 1$, for type ST sensitizers, and

$$n_\Delta = n_\Delta^{ST} = f_\Delta^T + f_\Delta^S$$

when $P_T^{O_2} = 1$, $P_S^{O_2} = 1$ and $f_T^{O_2} = 1$. The maximum value of n_Δ^{ST} is 2 when $f_T^{O_2} = P_S^{O_2} = f_T^{O_2} = f_\Delta^T = f_\Delta^S = 1$ (see Ref. 57).

Chattopadhyay *et al.*[58] have reported an analogous method for measuring ϕ_Δ where two solutions are flashed under identical conditions with equal absorption by the

sensitizer in the presence of DPBF and oxygen on the one hand and by a triplet actinometer, AC, in the absence of oxygen and DPBF on the other. In the first case the change in absorbance of DPBF following excitation ΔA_A is measured and in the second case the absorbance by the triplet state of the sensitizer A_T^{AC} is measured. Since I_a and the path length etc. are identical in the two experiments it follows that

$$\frac{\Delta A_A}{A_T^{AC}} = \frac{\epsilon_A \phi_\Delta p_A}{\phi_T^{AC} \epsilon_T^{AC}}$$

which rearranges to give

$$\phi_\Delta = \frac{\Delta A_A \phi_T^{AC} \epsilon_T^{AC}}{A_T^{AC} \epsilon_A p_A} . \quad (49)$$

Usually it is assumed that DPBF does not physically quench singlet oxygen and thus $p_A \rightarrow 1$ as $[A] \rightarrow \infty$. It is also necessary that DPBF does not quench the sensitizer. The method needs to be treated with care. Thus Scaiano *et al.*[59] extrapolated their data to 'zero laser dose' to eliminate nonlinear effects due to the triplet state of benzophenone, the actinometer they used, absorbing at the laser wavelength. Due allowance also has to be made for any auto-oxidation due to DPBF absorbing the laser pulse and for the possibility of the excited sensitizer reacting with singlet oxygen.

In addition relative values of f_Δ^T have been obtained by subjecting optically matched cells at the laser excitation wavelength of one solution containing a sensitizer S and another containing a reference sensitizer S', to laser photolysis. In one case this procedure was applied in the presence of oxygen and DPBF and in the other in deaerated solution containing the addition of a high concentration of a triplet acceptor TA (e.g. 0.1 mol L^{-1} 1-methylnaphthalene (1-MeNp) used to quench > 99% of sensitizer triplet states by energy transfer to give triplet 1-methylnaphthalene[60]). If $A_T^{TA}(S)$ and $A_T^{TA}(S')$ represent the absorbance observed for the triplet acceptor formed by energy transfer from ^3S and $^3S'$ respectively and $\Delta A_A(S)$ and $\Delta A_A(S')$ the measured change in absorbance by the reactive substrate A, then

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{\Delta A_A(S) A_T^{TA}(S') P_T^{O_2}(S')}{\Delta A_A(S') A_T^{TA}(S) P_T^{O_2}(S)} . \quad (50)$$

4.2. Photothermal Methods

A useful review of and general introduction to these methods is given by Braslavsky and Heihoff.[61]

4.2.1. Steady-State Photocalorimetric Methods

Photocalorimetric studies have been used to measure triplet quantum yields of sensitizers and overall reaction quantum yields involving singlet oxygen. It can be shown that heating rates of nonfluorescent sensitizer solutions in the presence and absence of a singlet oxygen acceptor, if measured over short equal time intervals, are proportional to ΔT and ΔT_A, the temperature rises without and with the additive respectively. It is shown that

$$\frac{\Delta T - \Delta T_A}{\Delta T} = \frac{\phi_{ox} \Delta H_{ox}}{N h \nu} \quad (51)$$

where ϕ_{ox} is the quantum yield of the reaction with enthalpy change ΔH_{ox}, N and h are Avogadros's and Planck's constants, and ν is the frequency of the absorbed light. Olmsted[62] used this technique to show that ϕ_{ox} for TPP (tetraphenylporphine) sensitized photo-oxidation of DMF, DPBF and TME (2,3-dimethyl-2-butene) in CCl_4, at concentrations where ϕ_{ox} is independent of concentration, are identical and equal to 0.88 ± 0.02. This implies $\phi_T p_A$ for TPP in CCl_4 is > 0.88 and that ϕ_Δ for all three acceptors is the same and most probably therefore equal to unity. In fact, Olmsted obtained ϕ_{ox} for DPBF and TME in Freon equal to 1.00 ± 0.03 implying that ϕ_T, ϕ_Δ and p_A all equal unity in this solvent.

4.2.2. Time Dependent Thermal Lensing

The fraction of heat dissipated slowly as $^1O_2^*$ decays as measured in thermal lensing experiments (see also Section 3.2) is

$$\frac{\Delta U}{U_{tot}} = \frac{\phi_\Delta < \nu_\Delta >}{(\nu_l - \phi_F < \nu_F >)} \quad (52)$$

where $< \nu_\Delta >$ is the average frequency of emission of singlet oxygen, ν_l is the frequency of the laser and ϕ_F is the yield and $< \nu_F >$ is the integrated average frequency of the sensitizer fluorescence in the aerated solution. Equation (52) has been used to determine absolute values of ϕ_Δ from time dependent thermal lensing experiments.[63,64]

4.2.3. Laser Induced Photoacoustics

It is well known that when a solid or a liquid is irradiated with a modulated beam of light, the fraction of the light absorbed by the sample, converted into heat, causes a pressure wave at the surface. This photoacoustic wave can be detected (e.g. by a microphone) and used to obtain absorption spectra as in a photoacoustic spectrometer. When a laser excites an absorbing solution the first photoacoustic peak has an amplitude H given by

$$H = K \alpha I_a ,$$

where I_a is the intensity of the light absorbed and K is a constant depending on the thermoelastic properties of the media as well as on instrumental parameters, geometry, etc. and α is the fraction of the energy dissipated as heat within the time resolution of the experiment τ_a. Energy balance requires[65]

$$\alpha = 1 - \frac{\phi_F^{O_2} < \nu_F >}{\nu_l} - \frac{\phi_\Delta < \nu_\Delta >}{\nu_l} \exp(-k_D \tau_a) \quad (53)$$

where k_D is the decay constant of the slowly decaying transient, ($^1O_2$*) in this case. Experimental measurements can be calibrated since dissipation of all of the energy in a time $\tau \ll \tau_a$ gives $\alpha = 1$. For example, solutions of benzophenone containing a high concentration of potassium iodide can be used to give $\alpha = 1$.[66] In this way Eq. (53) has been used to measure ϕ_Δ.[65]

4.3. Luminescence Intensity Measurements

The quantum yield of phosphorescence of $^1O_2$* is related to ϕ_Δ as follows

$$\phi_P^\Delta = \phi_\Delta f_P^\Delta = \frac{\phi_\Delta \tau_\Delta}{\tau_P^\Delta}, \tag{54}$$

where f_P^Δ is the fraction of $^1O_2$* formed which emits. For a discussion of the problems associated with the determination of absolute quantum yields of phosphorescence and radiative lifetimes of singlet oxygen see Ref. 68. In most solvents it is particularly difficult to measure ϕ_P^Δ because the values are very small (e.g. they are $\sim 10^{-6}$ and $\sim 10^{-4}$ in water and benzene, respectively). However for solvents in which there are no high energy vibrations (e.g. CS_2, CCl_4 and $ClCF_2CCl_2F$), much higher yields are observed[69] (viz. 0.06, 0.09 and 0.15, respectively). The singlet oxygen lifetimes in these solvents are several milliseconds. If τ_P^Δ, the radiative lifetime were independent of solvent, relative measurements of phosphorescence intensities combined with known singlet oxygen lifetimes would give relative values for ϕ_P^Δ. However since the radiative process $^1\Delta_g \leftarrow {}^3\Sigma_g^-$ for the symmetrical molecule O_2 is highly forbidden, τ_P^Δ is highly solvent-dependent and estimates of ϕ_P^Δ and τ_P^Δ in the literature are often widely different. However relative measurements in the same solvent are directly proportional to ϕ_Δ and much use has been made of this as a probe for singlet oxygen.

For compounds where $f_\Delta^S = 0$, relative values of f_Δ^T can be obtained from matched solutions by measurement of relative luminescence intensities at 1270 nm using the same solvent for S and S′ extrapolated back to time $t = 0$ ($L_\Delta(S)_{t=0}$) and of the absorbance of the triplet state generated from identical laser pulses ($A_T(S)$). The relationship used is:

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{L_\Delta(S)_{t=0} A_T(S') \epsilon_T(S) P_T^{O_2}(S')}{L_\Delta(S')_{t=0} A_T(S) \epsilon_T(S') P_T^{O_2}(S)}. \tag{55}$$

Relative measurements of singlet oxygen luminescence decay curves following pulse laser excitation of sensitizers can also be used to obtain relative ϕ_Δ values. Usually the luminescence intensities measured under identical conditions are extrapolated to time $t = 0$ when

$$\frac{\phi_\Delta(S)}{\phi_\Delta(S')} = \frac{L_\Delta(S)_{t=0}}{L_\Delta(S')_{t=0}}. \tag{56}$$

Sometimes this ratio is extrapolated to zero laser intensity thus eliminating any possible nonlinear effects.[37,58] Often $L_\Delta(S)_{t=0}$ is measured as a function of laser energy and the ratio of the slopes of linear plots of $L_\Delta(S)_{t=0}$ versus I_L are used with Eq. (56) to give relative ϕ_Δ values. A comparison of values obtained by luminescence intensity measurement and time dependent thermal lensing is given in Ref. 67. Alternatively the ratio of the intensity of phosphorescence of singlet oxygen $L_\Delta(S)$ observed from a sensitizer S relative to that observed from a suitable reference sensitizer S′ (L_Δ (S′)) excited and observed under identical continuous irradiation conditions is used in Eq. (56). Thus Eq. (56) applies to steady-state measurements provided neither S nor S′ quenches singlet oxygen. It is a good practice to extrapolate such values to infinite dilution.[58]

If luminescence intensities are compared from different solvents the measured intensity L_Δ must be corrected for differences in radiative probabilities by multiplying by τ_P^Δ and for differences in luminescence collection efficiencies which often depend on n^2 (where n is the refractive index). Thus, corrected values L_Δ^c have to be used in Eq. (56) where $L_\Delta^c = L_\Delta n^2 \tau_P^\Delta$.

4.4. Triplet Energy Transfer and Singlet Oxygen Yields

4.4.1. Using Triplet β-Carotene as a Probe

As mentioned earlier the sensitized production and decay of β-carotene arising from the process

$$^1O_2* + C \rightarrow {}^3C* + {}^3O_2$$

can be used for measuring singlet oxygen lifetimes[45] (see Paper I[26]). This reaction is very efficient and has a rate constant of 1.2×10^{10} L mol^{-1} s^{-1} in benzene solution, producing ^3C* which has a strong absorption band at ~520 nm. The process of triplet energy transfer from a donor (TD) to an acceptor (TA) is also very efficient; i.e.,

$$^3TD* + {}^1TA \rightarrow {}^3TA* + {}^1TD$$

and ^{3}TA* can act as a singlet oxygen sensitizer. Garner and Wilkinson[70] were the first to employ this process using a series of different energy acceptors to determine relative singlet oxygen yields by observing the different amounts of triplet β-carotene produced extrapolated to zero time. Matched solutions containing concentrations of reagents selected so that the following sequence of reactions could be observed were flashed,

$$S + h\nu \rightarrow {}^1S* \rightarrow {}^3S*(+O_2) \rightarrow {}^1O_2*(+C) \rightarrow {}^3C*$$

and compared with

$$S + h\nu \rightarrow {}^1S*(+TA) \rightarrow {}^3TA*(+O_2) \rightarrow {}^1O_2*(+C) \rightarrow {}^3C*.$$

A full kinetic analysis is given in Ref. 70. It is sufficient to observe here that when S was xanthone dissolved

in benzene without addition of naphthalene as a triplet acceptor, the amount of absorbance by $^3C^*$ at 520 nm extrapolated to zero time $A_T^C(S)$ was only 30% of that observed when the extra step of energy transfer to naphthalene occurred $A_T^C(TA)$. After correcting for the fractions of $^3S^*$ and $^3TA^*$ intercepted by oxygen the ratio f_Δ^T(xanthone)/f_Δ^T(naphthalene) was shown to be ≤ 0.55. The equality sign applies if the efficiency for energy transfer from triplet xanthone to give triplet naphthalene is 100%. When energy transfer is 100%

$$\frac{f_\Delta^T(TA)}{\phi_\Delta(S)} = \frac{A_T^C(TA)P_T^{O_2}(S)}{A_T^C(S)P_T^{O_2}(TA)}. \quad (57)$$

Comparison of $A_T^C(S)$ values for matched solutions of S and S′ containing equal concentration of β-carotene gives a form of Eq. (43) viz

$$\frac{\phi_\Delta(S)}{\phi_\Delta(S')} = \frac{A_T^C(S)}{A_T^C(S')}. \quad (43)$$

In this technique when different triplet energy acceptors S and S′ are used with the same triplet donor, provided the efficiency of energy transfer is 100% in each case, then

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{P_T^{O_2}(S')A_T^C(S)}{P_T^{O_2}(S)A_T^C(S')} \quad (58)$$

where $A_T^C(S)$ and $A_T^C(S')$ are the observed amount of absorbance by $^3C^*$ when TA = S and S′ respectively. A similar technique using β-carotene as a probe was used in pulse radiolysis experiments to measure f_Δ^T for substrates relative to that for benzophenone.[71] In Ref. 71 the relative amounts of triplet states formed in the absence of O_2 and β-carotene were calculated by measuring the absorbance by the sensitizer triplets $A_T(S)$ and $A_T(S')$ and using known extinction coefficients (ϵ_T) to give

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{A_T^C(S)\epsilon_T(S)P_T^{O_2}(S')A_T(S')}{A_T^C(S')\epsilon_T(S')P_T^{O_2}(S)A_T(S)}, \quad (59)$$

where A_T^C is the absorption by $^3C^*$ observed at 540 nm due to energy transfer from singlet oxygen, extrapolated to zero time.

4.4.2. Using Luminescence Measurements

With the development of singlet oxygen luminescence decay measurements a simpler technique is to measure the decay of singlet oxygen luminescence and the intensity extrapolated to time $t = 0$ ($L_\Delta(S)_{t=0}$) following laser excitation of matched solutions in which 100% efficient energy transfer takes place. Using aromatic ketones, for which $P_S^{O_2} = 0$ due to their short singlet state lifetimes as triplet donors (TD) relative values of f_Δ^T can be obtained from L_Δ values measured under identical conditions. The reaction sequence is as follows

$$^1TD + h\nu \rightarrow {}^1TD^* \rightarrow {}^3TD^*(+S) \rightarrow {}^3S^*(+O_2) \rightarrow {}^1O_2^* \rightarrow h\nu_P$$

compared with

$$^1TD + h\nu \rightarrow {}^1TD^* \rightarrow {}^3TD^*(+S') \rightarrow {}^3S'^*(+O_2) \rightarrow {}^1O_2^* \rightarrow h\nu_P .$$

In the absence of absorption of exciting light by S and S′ and when the efficiencies of energy transfer to the sensitizers are both unity, then relative values of f_Δ^T are given by

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{L_\Delta(S)_{t=0}P_T^{O_2}(S')}{L_\Delta(S')_{t=0}P_T^{O_2}(S)}. \quad (60)$$

If the transfer efficiences (i.e. the fractional quenching of the triplet state of the $^3TD^*$ by S and S′) are known to be less than unity, due allowance can be made. Gorman *et al.*[37] introduced this technique and suggest using naphthalene as the standard of choice in a variety of situations. See also Section 4.1.2.

4.4.3. Using Pulsed Studies of Acceptor Disappearance

An analogous method for measuring relative f_Δ^T values makes use of a reactive reactant such as DPBF as a probe for singlet oxygen production. The reactive sequence is similar:

$$^1TD + h\nu \rightarrow {}^1TD^* \rightarrow {}^3TD^*(+S) \rightarrow {}^3S^*(+O_2) \rightarrow {}^1O_2^*(+A) \rightarrow AO_2$$

$$^1TD + h\nu \rightarrow {}^1TD^* \rightarrow {}^3TD^*(+S') \rightarrow {}^3S'^*(+O_2) \rightarrow {}^1O_2^*(+A) \rightarrow AO_2.$$

In the absence of absorption of the exciting light by A, S or S′ and when the efficiency of energy transfer is unity then under identical matched conditions

$$\frac{f_\Delta^T(S)}{f_\Delta^T(S')} = \frac{\Delta A_A(S)P_T^{O_2}(S')}{\Delta A_A(S')P_T^{O_2}(S)}, \quad (61)$$

where ΔA_A is the decrease in the absorbance of A due to reaction with singlet oxygen. See also Section 4.1.1.

A variation on this theme uses a ketone with $P_S^{O_2} = 0$ as both triplet donor and as an actinometer by measuring the change in absorbance due to the triplet donor absorption at time $t = 0$, in which case

$$f_\Delta^T(S) = \frac{\Delta A_A(TD + S)p_A\epsilon_T(TD)}{\Delta A_T(TD)\epsilon_A P_T^{O_2}(S)}. \quad (62)$$

Again it is necessary for the energy transfer from the triplet donor to be 100% efficient.

5. Quantum Yields of Singlet Oxygen Production – Comments on the Tables

5.1. Contents of Tables 1–3

Quantitative data for photosensitized singlet oxygen production are given in three tables containing 1,600 separate entries for 750 chemical species. Tables 1–3 follow Sec. 8. The main table (Table 1) contains data for 316 compounds which convert molecular oxygen into singlet oxygen via their excited triplet and/or singlet states with varying efficiencies. Porphyrins and related species have been collected into Table 2. An additional table (Table 3) has been provided for dyes, polymers and some other species which, although they are ill-defined, are of interest for various biomedical, environmental, and industrial applications. The arrangement of the tables is alphabetic by the chemical names of the photosensitizers. Common names have been used for a few compounds; otherwise, systematic names have been entered. Inverted names have been used in most cases so that substituted acetophenones, anthracenes, fluoresceins, etc. are grouped. An index of chemical names and synonyms and a formula index follow the tables (Secs. 10 and 11) and refer to the entry numbers in Tables 1–3.

Oxygen concentrations are given when they have been reported or else the column headed [O_2] contains 'air' or 'O_2' to indicate that the solution was air- or oxygen-saturated. The *Solvent* column gives the solvent or mixture of solvents with the proportions (volume:volume) and the pH or pD, if reported. Heterogeneous systems are identified, (e.g. as micellar (mic)), and the surfactant present is given in the Comments. Data for each photosensitizer are grouped by solvent and listed in reverse chronological order.

Values in the quantum yield column may be tagged with a superscript T to denote quantum yields representing 100% quenching of T_1, or ST representing 100% quenching of both S_1 and T_1. Most of the quantum yields tagged T are for type T sensitizers which have $P_S^{O_2} = 0$. However limiting yields of singlet oxygen production from T_1 have been obtained in other cases by adjusting oxygen concentrations or by correcting for oxygen quenching of the sensitizer singlet states. Evaluation of $P_S^{O_2}$ and $P_T^{O_2}$ has enabled the determination of ϕ_Δ^T and ϕ_Δ^{ST} (see Sec. 4). When $P_T^{O_2}$ has been measured for type T sensitizers, f_Δ^T is known through $\phi_T(S)$ and Eqs. (41) and (42). If values of $\phi_T(S)$ have been used to calculate f_Δ^T from ϕ_Δ (or the reverse) they are given in the comments. Data for the f_Δ^S column, and the column labeled Σf ($f_\Delta^T + f_\Delta^S$) or n_Δ (the number of singlet oxygen molecules produced per triplet state formed) are sparse; see Sec. 4.1.2 for limits on n_Δ for type T, type TC and type ST sensitizers.

Codes in the *Method* column combine symbols (see Sec. 6) representing the excitation technique, the measurement technique, and the numbers of the equations given above which have been used for analyzing the data. If two measurement techniques or equations were used the symbols are combined. For example, PL/LI–56,42 represents the pulsed-laser luminescence-intensity technique and refers to both Eqs. (56) and (42) to obtain values for ϕ_Δ and f_Δ^T.

Some details of the determination are given in the *Comments* column. Abbreviations and symbols are listed in Sec. 6 for chemical species which have been used as reference sensitizer (S'), triplet donor (TD), triplet acceptor (TA), actinometer (AC), and acceptor of singlet oxygen (A). Values for ϕ_Δ and f_Δ^T of the reference sensitizer which have been used to obtain the tabulated data are given. Quantum yields and extinction coefficients for the triplet states have been included when their values have been used for obtaining the singlet oxygen yields. Temperature is included in the *Comment* if it has been reported to be outside the range of about 20 – 25° C.

Codes in the *Reference* column are from the Radiation Chemistry Data Center Bibliographic Database. The first two characters of the reference code identify the year of publication. The complete references to the tables are listed in Sec. 9 which follows the tables.

5.2. Relative Measurements and Standard Values

Often f_Δ^T or ϕ_Δ have been determined relative to the known value for another sensitizer so that the values depend on the standard values chosen for the reference sensitizer. It would be desirable to obtain the best possible values for f_Δ^T and ϕ_Δ for the reference sensitizers based on the measured values which have been reported. Unfortunately f_Δ^T for each sensitizer depends on the solvent (on pH etc.) and so it is necessary to treat the values for each solvent separately. For sensitizers other than type T, values of ϕ_Δ depend on the concentration of oxygen even when $P_T^{O_2} = 1$. For those classes of sensitizer (e.g. type ST and TC) we must therefore treat separately the values for each solvent saturated with air and oxygen, respectively.

Values reported as ratios with respect to the value for a reference sensitizer (e.g. $f_\Delta^T(S)/f_\Delta^T(S') = R_f(S,S')$ or $\phi_\Delta(S)/\phi_\Delta(S') = R_\phi(S,S')$) are often of greater accuracy than values obtained by methods used to measure f_Δ^T and ϕ_Δ which do not give a ratio but may depend on other photophysical parameters (e.g. ϕ_T, ϵ_T or $\Delta\epsilon_T$) or relative or absolute values of ΔA. Although the time-dependent thermal lensing and photo-acoustic methods, in principle, only depend on the standard used as a 100% heat producer to give ϕ_Δ, values of ϕ_T are needed, as in other methods, to convert ϕ_Δ to f_Δ^T in the case of type T sensitizers. It has to be recognised that no accurate set of ϕ_T values, however, is available. For example, the ϕ_T in benzene for the important reference sensitizer acridine (Ac) is given in the literature as 0.73[72] and 1.0[73]. We have chosen to use the average value of 0.86 for ϕ_T of Ac in benzene in Table 1.

Thus we have the situation where many values of ϕ_Δ and f_Δ^T may be connected through ratios and errors of at least 10% are expected; inspection of the tables shows that agreement is often much worse than this. We have

therefore carried out an iterative averaging process to obtain a limited self-consistent set of average values. Similar procedures used to examine rate constants for reactions of singlet oxygen[74] and extinction coefficients for triplet-triplet absorption[75] have been described. Full details of the exact procedure used here are given in Appendix 2. The procedure gives self-consistent averages for f_Δ^T and a mutually self-consistent set of average values for ϕ_Δ, where ϕ_Δ^T is related to f_Δ^T through ϕ_T. These values are given in Table A.2.1 (see Appendix 2).

Figure 4 shows the interconnections for the relative values of f_Δ^T in benzene, the solvent with the most interdependencies. Figure 4 demonstrates that the crucial compounds, the values for which are critical, are benzophenone (BP), acridine (Ac) and naphthalene (Np). In the case of BP, where $\phi_T = 1$ and $f_\Delta^T = \phi_\Delta$, the ratio R_f (Np,BP) has been indicated to be 1.9 in several careful studies.[37,70,71,76,77] The global averages obtained for f_Δ^T of Np and BP in benzene (Table A.2.1) are 0.618 and 0.346, respectively, in the ratio 1.8. The values of 0.29 for BP and 0.55 for Np in benzene have been most often used in the literature as standards. However the mathematical procedure has directed us to the higher value for BP and consequently, a higher value for Np. The value of 0.35 has been selected as the standard value for ϕ_Δ and f_Δ^T of BP in benzene (see the following table). The global averages for f_Δ^T(Ac) = 0.99 and ϕ_Δ(Ac) = 0.83 are in good agreement with recent papers[67,78,79] which have preferred ϕ_Δ = 0.84 as the standard reference value for acridine.

Selected reference values for ϕ_Δ and f_Δ^T.

No.[a]	S	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T
1.1	2-ACN	C_6H_6		0.71	0.81
1.7	Ac	C_6H_6		0.83	0.99
1.88	BP	C_6H_6		0.35	0.35
1.169	RB	MeOH		0.80	
1.169	RB	H_2O		0.76	
1.220	Np	C_6H_6			0.62
1.239	Pz	C_6H_6		0.88	1.00
2.136	TPP	CCl_4	air	0.62	

[a]Entry numbers in Tables 1 and 2.

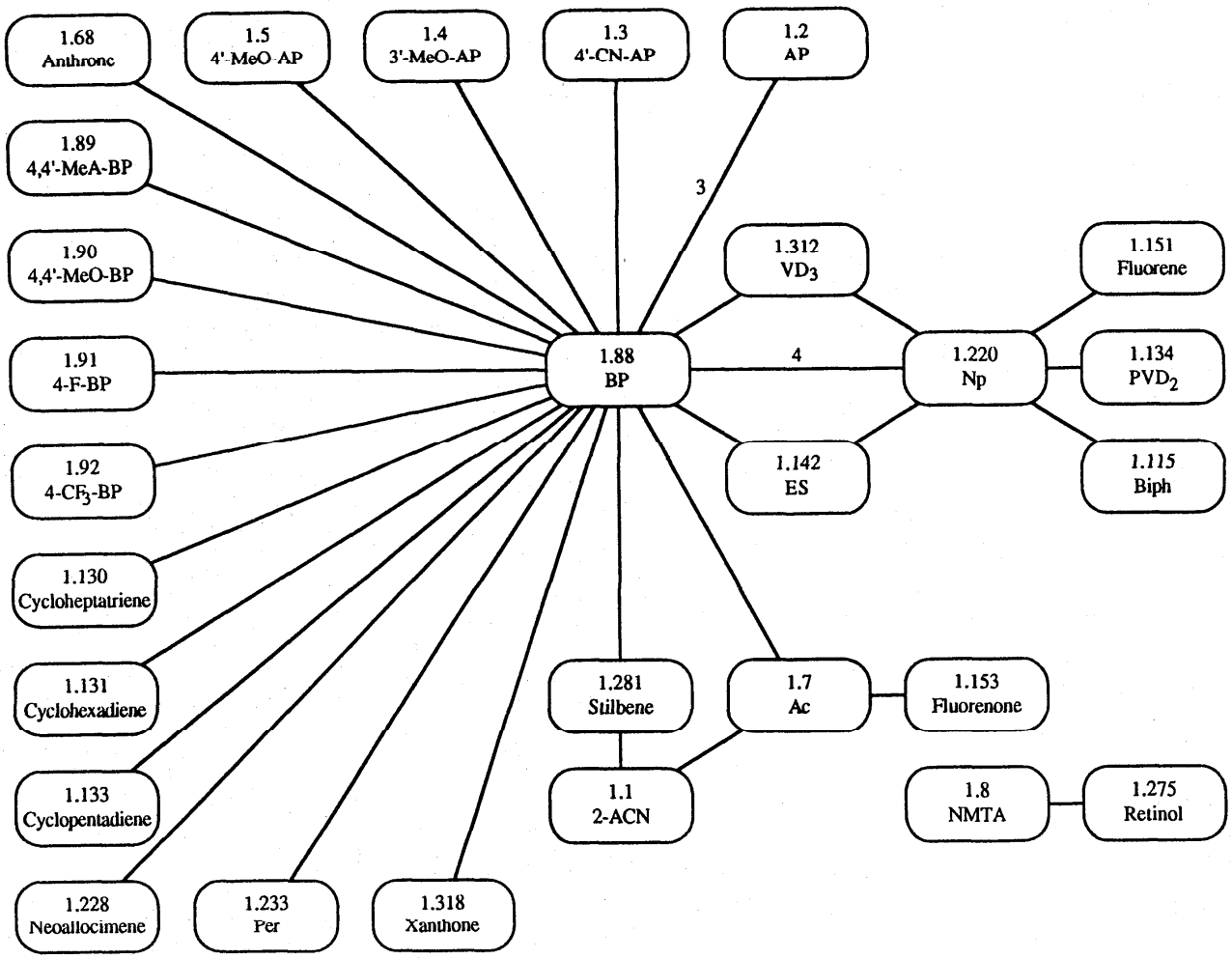

FIG. 4. Diagram showing connections between relative f_Δ^T measurements for photosensitizers in benzene. Entry numbers in Table 1 are given. Three ratios for acetophenone-benzophenone (AP–BP) and four for benzophenone-naphthalene (BP–Np) have been measured.

Whenever the average values given in Table A.2.1 differ by more than 10% from the reference values of S′ used to calculate either f_Δ^T or ϕ_Δ from R_f(S,S′) or R_ϕ(S,S′) we have recalculated those values. The table on p. 127 lists reference values derived from the global averaging process which have been used for recalculations. The recalculated values have been marked with an asterisk and listed in Tables 1–3 along with the reported data. We have also recalculated some values of ϕ_Δ relative to S′ = hematoporpyrin (HP) in CH_3OD (e.g. see entry 1.245) where a recent paper identified in the entry has provided a value for ϕ_Δ(HP) in CH_3OD.

In some cases only ratios of ϕ_Δ have been reported. We have converted reported ratios into absolute values by using the averages from Table A.2.1 when available, or using apparently accepted standards from the literature, or using a standard value inferred from other reported data. Footnote b in the tables identifies reference values used in this work to calculate absolute values from reported ratios. Many authors have used ϕ_Δ = 0.76 or 0.75 for Rose Bengal (RB) as the reference value in a variety of solvents. The values obtained for water and methanol in the averaging procedure (Appendix 2) are 0.76 and 0.80, respectively. We have used ϕ_Δ(RB) = 0.76 to calculate values for the ϕ_Δ column for data which have been quoted only as ratios in water, and ϕ_Δ(RB) = 0.80 for data in ethanol, methanol, acetonitrile, acetone, and methylene chloride.

Other values used in this work to convert ratios to absolute values of ϕ_Δ(S) are 0.50 for methylene blue (MB^+) in ethanol, 0.77 for mesoporphyrin dimethyl ester (MPDME) in chloroform, 0.4 for HP in water, 0.6 for HP in dimethylformamide or dioxane, and 0.3, 0.4, and 0.5 for riboflavine (RF) in D_2O, methanol and H_2O/EtOH (1:1), respectively.

The use of ϕ_Δ = 1 for PdMPDME as a reference sensitizer has been justified (see entry 2.183). The same result has been obtained by the use of ϕ_Δ = 1 for both PdMPDME and PdOEP (palladium octaethylporphine) for calculating absolute values for octaethylporphine (OEP) and ZnOEP (entries 2.73 and 2.83), therefore ϕ_Δ = 1 has also been used for PdOEP to convert ratios to absolute values. No similar relationship was found for values relative to GaTPP (gallium tetraphenylporphine) in carbon tetrachloride so data involving that sensitizer are only available as ratios. In those cases the ratios are given in the *Comments* column. Ratios also remain for a group of platinum and palladium complexes (see entry 3.34 and subsequent entries in Table 3). Likewise, there are a number of metallated dyes (cf. entry 3.85 and following entries) for which there is no value in the ϕ_Δ column since only relative yields have been reported.

6. List of Abbreviations and Symbols

Excitation Methods

CL	continuous laser photolysis
CP	continuous photolysis
MP	modulated photolysis
PL	pulsed laser photolysis
PR	pulsed radiolysis

Measurement Methods

Ac	substrate consumption under steady-state conditions
ACt	actinometer triplet absorbance at end-of-pulse
Ad	time resolved substrate disappearance
βCb	triplet beta-carotene buildup as a probe for singlet oxygen production
Hp	heat produced from singlet oxygen
LI	luminescence intensity at end-of-pulse or under steady-state conditions
Oc	oxygen consumption under steady-state conditions
Pa	product appearance under steady-state conditions
St	sensitizer triplet absorbance at end-of-pulse
TAt	triplet acceptor absorbance at end-of-pulse
TDt	triplet donor absorbance at end-of-pulse
Tr	temperature rise

Other Symbols

ΔA_A	change in absorption due to acceptor A
ΔA_T	change in absorption due to triplet state
A	substrate (singlet oxygen acceptor)
A′	reference substrate
AC	triplet actinometer
β_A	k_d/k_A
E_Δ	energy of O_2 ($^1\Delta_g$) above the ground state
$\Delta\epsilon_T$	difference of extinction coefficients of triplet and ground state absorption
ϵ_T	extinction coefficient of triplet state absorption
F	fluorescence intensity of sensitizer
F^o	fluorescence intensity of sensitizer in presence of oxygen
f_Δ^S	fraction of S_1 quenched by O_2 which gives singlet oxygen
f_Δ^T	fraction of T_1 quenched by O_2 which gives singlet oxygen
Σf	$f_\Delta^S + f_\Delta^T$
f_F^A	fraction of singlet oxygen which emits
f_r^A	fraction of $^1O_2$* quenched by A which reacts
$f_T^{O_2}$	fraction of S_1 quenched by O_2 which gives T_1
G	radiation yield, molecules per 100 eV
k_d	first-order decay rate of singlet oxygen in solvent
k_Δ	first-order decay rate of singlet oxygen for [S]→0
$k_{\Delta P}$	first-order radiative decay rate of singlet oxygen
$k_{\Delta d}$	first-order radiationless decay rate of singlet oxygen

k_A	rate constant for reaction of singlet oxygen with substrate
k_q^A	rate constant for physical quenching of A
k_r^A	rate constant for chemical reaction of A
k_S	rate constant for reaction of singlet oxygen with sensitizer
K_{SV}	Stern-Volmer constant for singlet quenching by O_2
L_Δ	luminescence intensity due to singlet oxygen
λ_{exc}	wavelength of excitation
n_Δ	number of singlet oxygen molecules found per triplet state formed
$^1O_2$*	the first excited singlet state of molecular oxygen
P	product from substrate
p_A	fraction of substrate which reacts
$P_S^{O_2}$	proportion of S_1 quenched by O_2
$P_T^{O_2}$	proportion of T_1 quenched by O_2
ϕ_Δ	quantum yield of singlet oxygen formation
ϕ_{et}	quantum yield for energy transfer
ϕ_{ox}	quantum yield of oxidation of substrate
ϕ_F	quantum yield of fluorescence
$\phi_F^{O_2}$	quantum yield of fluorescence in the presence of O_2
ϕ_P^Δ	quantum yield of phosphorescence of singlet oxygen
ϕ_T	quantum yield of triplet formation (intersystem crossing yield)
$\phi_T^{O_2}$	quantum yield of triplet formation in the presence of O_2
S	sensitizer
^{3}S*	sensitizer triplet
S′	reference sensitizer
TA	triplet acceptor
TD	triplet donor
τ_r	radiative lifetime
τ_Δ	lifetime of singlet oxygen
τ_P^Δ	radiative lifetime of singlet oxygen
$<\nu_F>$	integrated average frequency of sensitizer fluorescence in presence of oxygen
$<\nu_\Delta>$	integrated average frequency of emission of singlet oxygen

Reference Sensitizers, Acceptors, Triplet acceptors, Triplet actinometers

Ac	Acridine
2-ACN	2-Acetonaphthone
ADC	Anthra[1,9-*bc*:4,10-*b′c′*]dichromene
ADPA	9,10-Anthracenedipropionate ion
AlPCS	Aluminum(III) sulfophthalocyanine
An	Anthracene
Ang	Angelicin
AnS	Anthracenesulfonate ion
AP	Acetophenone
AQ	9,10-Anthraquinone
ATU	Allylthiourea
BChl a	Bacteriochlorophyll a
BDX	Benzo[1,2,3-*kl*:4,5,6*k′l′*]dixanthene
Biph	Biphenyl
BP	Benzophenone
BRH_2	Bilirubin
BR^{2-}	Bilirubin dianion
BXP	Benoxaprofen
Car	β-Carotene (also β-C)
Cd(II) Dye I	Cadmium(II) 1-(2-hydroxyphenylazo)-2-naphtholate
Chl a	Chlorophyll a
CQ	Camphoroquinone
CZ	Chlorpromazine
DCA	9,10-Dicyanoanthracene
DMA	9,10-Dimethylanthracene
4,7-DMAPs	4,7-Dimethylallopsoralen
DMBA	9,10-Dimethylbenz[a]anthracene
DMDPA	1,4-Dimethoxy-9,10-diphenylanthracene
2,5-DMF	2,5-Dimethylfuran
DMTBP	4,4′-Dimethoxythiobenzophenone
DNT	1,8-Dinaphthalene thiophene (Diacenaphtho[1,2-*b*:1′,2′-*d*]thiophene)
DOPA	3-(3,4-Dihydroxyphenyl)alanine
DPA	9,10-Diphenylanthracene
DPB	1,4-Diphenyl-1,3-butadiene
DPBF	1,3-Diphenylisobenzofuran
DPF	2,5-Diphenylfuran
DPH	1,6-Diphenyl-1,3,5-hexatriene
DPO	1,8-Diphenyl-1,3,5,7-octatetraene
DTBF	2,5-Di-*tert*-butylfuran
Eos	Eosin (Tetrabromofluorescein)
Ery	Erythrosin (Tetraiodofluorescein)
ES	Ergosterol
FFA	Furfuryl alcohol
Fl	Fluorescein
HCD	Heterocoerdianthrone
His	Histidine
HP	Hematoporphyrin
HYP	Hypericin
Im	Imidazole
p-MAP	4′-Methoxyacetophenone
MB	Methylene Blue
MDBH	Mesodiphenylbenzhelianthrene
MDH	Mesodiphenylhelianthrene
1-MeNp	1-Methylnaphthalene
MOP	Methoxypsoralen
2M2P	2-Methyl-2-pentene
MPDEE	Mesoporphyrin diethyl ester
MPDME	Mesoporphyrin dimethyl ester
NMTA	10-Methyl-9-acridinethione
Np	Naphthalene
PdTPP	Palladium(II) tetraphenylporphyrin
$PdTPPS^{4-}$	Palladium(II) tetrakis(4-sulfonatophenyl) porphyrin
Per	Perylene
Ph a	Pheophytin a
PP	Protoporphyrin
PPDME	Protoporphyrin dimethyl ester
PrPor	2,7,12,17-Tetrapropylporphycene
$Pt(bpy)(N_3)_2$	Platinum(II) diazido(2,2′-bipyridine)

Pt(phen) (BCAT)	Platinum(II) (1,10-phenanthroline)(*tert*-butylcatechol)
Pt(phen) (dhn)	Platinum(II) (1,10-phenanthroline)(2,3-naphthalenediol)
Py	Pyrene
Pz	Phenazine
RB	Rose Bengal (Tetrachlorotetraiodofluorescein)
RBEE	Rose Bengal ethyl ester
Ret	(*all-E*)-Retinal
RF	Riboflavine
RNO	*N*,*N*-Dimethyl-4-nitrosoaniline
Rub	Rubrene (5,6,11,12-Tetraphenylnaphthacene)
TEMP-4-OH	2,2,6,6-Tetramethylpiperidin-4-ol
Tetr	Tetracene
T(m-HOP)P	Tetra(3-hydroxyphenyl)porphyrin
T(p-HOP)P	Tetra(4-hydroxyphenyl)porphyrin
TME	2,3-Dimethyl-2-butene (Tetramethylethylene)
H_2TMpyP^{4+}	Tetra(4-*N*-methylpyridyl)porphyrin
TPBC	Tetraphenylbacteriochlorin
TPCP	Tetraphenylcyclopentadienone
TPP	Tetraphenylporphyrin
H_2TPPS^{4-}	Tetra(4-sulfonatophenyl)porphyrin
TrpH	Tryptophan
UP	Uroporphyrin I
ZnTPP	Zinc(II) tetraphenylporphyrin
Zn(II) Dye II	Zinc(II) 2-(4,5-diphenylimidazol-2-yl)azo-5-methylbenzoate
Zn(II) Dye III	Zinc(II) 2-(4,5-diphenylimidazol-2-yl)azo-4-nitrophenolate

Medium components

AOT	Di(2-ethylhexyl) sulfosuccinate
Brij 35	Polyoxyethylene(23) dodecyl ether
BSA	Bovine serum albumin
tert-BuOH	*tert*-Butyl alcohol
CPC	Hexadecylpyridinium chloride
CTAB	Hexadecyltrimethylammonium bromide
CTAC	Hexadecyltrimethylammonium chloride
DAP	Dodecylammonium propionate
DDAB	Didodecyldimethylammonium bromide
diox	Dioxane
dis	dispersion
DMAA	*N*,*N*-Dimethylacetamide
DMF	*N*,*N*-Dimethylformamide
DODAC	Dioctadecyldimethylammonium chloride
DPPC	Dipalmitoyl phosphatidylcholine
DTAC	Dodecyltrimethylammonium chloride
EtOH	Ethanol
HSA	Human serum albumin
MeOH	Methanol
mic	micelles
i-octane	2,2,4-Trimethylpentane
1-PrOH	1-Propanol
2-PrOH	2-Propanol
PS	Polystyrene
py	Pyridine
SDS	Sodium dodecylsulfate
THF	Tetrahydrofuran
Triton X-100	Polyoxyethylene(10) 4-(1,1,3,3-tetramethylbutyl)phenyl ether
ves	vesicles

7. Acknowledgements

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Table 1, Quantum yields of photosensitized production of singlet oxygen.

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.1	**2′-Acetonaphthone (2-ACN)**								
	C_6H_6	air or O_2	0.71	0.81				See Table 4.	
	C_6H_6	air[a]	0.73^T	0.87			CP/LI-56,42	S′ = 9-Fluorenone; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.84$. $P_T^{O_2} = 1$; measured ratio of I_a at $\lambda_{exc}(S) = 336$ and $\lambda_{exc}(S') = 367$ nm.	91F023
	C_6H_6	air	0.59^T	0.70			PL/LI,St-55,42	S′ = Ac; rel. to $f_\Delta^T(S') = 1.0$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.84$[e]. $\varepsilon_T(S) = 10{,}500$ L mol^{-1} cm^{-1} at 430 nm, $\varepsilon_T(S') = 24{,}300$ L mol^{-1} cm^{-1} at 440 nm, $P_T^{O_2}$ (S and S′) = 1.	84E373
	C_6H_6	O_2	0.73^T	0.87			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.84$. Measured $\phi_\Delta = 0.73$, $P_T^{O_2} = 1$ and ϕ_F.	88E449
	C_6H_6	O_2	0.71^T	0.85			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.84$. Measured $P_T^{O_2} = 1$.	88E449
	C_6H_6	O_2	0.4^T	0.5			PR/Ad,St-49,42	A = DPBF; used $\phi_T(S) = 0.84$, $\varepsilon_T(S) = 10{,}500$ L mol^{-1} cm^{-1} at 430 nm. Measured $G(^3S^*)$.	78E263
	CD_3OD	air[a]	0.79^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.76$. $P_T^{O_2} = 1$; meas. ratio of I_a at $\lambda_{exc}(S) = 336$ and $\lambda_{exc}(S') = 547$ nm.	91F023
	MeOH	O_2	0.75^T				CP/Ac-15	A = 2,5-DMF; $\lambda_{exc} = 313$ nm. $P_T^{O_2} = 1$.	767071
1.2	**Acetophenone (AP)**								
	C_6H_6	air	0.29^T	0.35* 0.29			PL/LI,St-55,42	S′ = BP; rel. to $f_\Delta^T(S') = 0.29$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$[c].	86A230
	C_6H_6	air[a]	0.41^T	0.41			PL/βCb-43,42	S′ = BP; TD = S; rel. to $f_\Delta^T(S') = 0.35$; used $\phi_T(S) = 1$. Measured $\phi_\Delta(S)/\phi_\Delta(S') = 1.2$.	76F904
	C_6H_6	O_2	0.33^T	0.33			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Measured $\phi_\Delta = 0.31$, $P_T^{O_2} = 0.94$ and ϕ_F.	88E449
	C_6H_6	O_2	0.36^T	0.36			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 1$. Measured $P_T^{O_2} = 0.94$.	88E449
	C_6H_6	O_2	0.35^T	0.31* 0.35			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.39$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.52^T	0.52			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.37$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	MeOH	O_2	<0.58				CP/Oc-14	A = 2,5-DMF; $\lambda_{exc} = 283$-373 nm. Some free radical reaction occurs.	70F735
1.3	**Acetophenone, 4′-cyano-**								
	C_6H_6	O_2	0.49^T	0.44* 0.49			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.39$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.76^T	0.76			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.37$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
1.4	**Acetophenone, 3′-methoxy-**								
	C_6H_6	air		0.33* 0.27			PL/LI,St-55	S′ = BP; rel. to $f_\Delta^T(S') = 0.29$; $\lambda_{exc} = 355$ nm.	86A230
1.5	**Acetophenone, 4′-methoxy-**								
	C_6H_6	O_2	0.27^T	0.24* 0.27			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.39$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.42^T	0.42			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.37$; meas. $\phi_T(S) = 1$[c]; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.6	**Acetophenone, 2′-methyl-, biradical**								
	CH_3CN	air[a]	0.23^T	0.38			PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 337$ nm. f_Δ^T based on quantum yield of biradical formation = 0.60 in soln. contg. 0.012 mol L^{-1} 2-methylacetophenone.	89A241
1.7	**Acridine (Ac)**								
	C_6H_6	air or O_2	0.83	0.99				See Table 4.	
	C_6H_6	O_2	0.84^T	1			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.86^g$. Measured $\phi_\Delta = 0.84$, $P_T^{O_2} = 1$ and ϕ_F.	88E449
	C_6H_6	O_2	0.84^T	1			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.86^g$. Measured $P_T^{O_2} = 1$.	88E449
	C_6H_6	O_2	0.6^T	0.7			PR/Ad,St-49,42	A = DPBF; used $\phi_T(S) = 0.86^g$, $\varepsilon_T(S) = 24{,}300$ L mol^{-1} cm^{-1} at 440 nm. Measured $G(^3S^*)$.	78E263
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.95^T				PL/Ad,ACt-49	A = DPBF; AC = BP; $\lambda_{exc} = 337$ nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7640$ L mol^{-1} cm^{-1} at 525 nm. $P_T^{O_2} = 1$; $p_A = 1$.	87E410
	CH_3CN	O_2	0.82^T				PL/Hp-52	$\lambda_{exc} = 354$ nm.	88Z155
1.8	**9-Acridinethione, 10-methyl- (NMTA)**								
	c-C_6H_{12}	O_2		1			PL/Ad,St-49,39	A = DPBF; AC = S; meas. $\phi_T(S) = 0.79$; $\lambda_{exc} = 485$ nm; used $k_d = 5.0 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(S) = 8800$ L mol^{-1} cm^{-1} at 520 nm. Measured $P_T^{O_2}$.	84E342
	C_6H_6	O_2		0.92			PL/Ad,St-49,39	A = DPBF; AC = S; meas. $\phi_T(S) = 0.85$; $\lambda_{exc} = 485$ nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(S) = 9300$ L mol^{-1} cm^{-1} at 520 nm. Measured $P_T^{O_2}$.	84E342
	CH_3CN	O_2		0.85			PL/Ad,St-49,39	A = DPBF; AC = S; meas. $\phi_T(S) = 0.76$; $\lambda_{exc} = 485$ nm; used $k_d = 2.5 \times 10^4$ s^{-1}, $k_A = 1.0 \times 10^9$ L mol^{-1} s^{-1}, $\varepsilon_T(S) = 9000$ L mol^{-1} cm^{-1} at 520 nm. Measured $P_T^{O_2}$.	84E342
	MeOH	O_2		1.0			PL/Ad,St-49,39	A = DPBF; AC = S; meas. $\phi_T(S) = 0.75$; $\lambda_{exc} = 485$ nm; used $k_d = 1.0 \times 10^5$ s^{-1}, $k_A = 8.1 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(S) = 8500$ L mol^{-1} cm^{-1} at 520 nm. Measured $P_T^{O_2}$.	84E342
1.9	**Acridinium, 3,6-diamino- (Proflavine)**								
	H_2O	air[a]	0.12	0.25			CP/Ac-43,42	S′ = MB^+; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.52$; used $\phi_T(S) = 0.47$. Assumed $P_T^{O_2} = 1$.	737339
1.10	**Acridinium, 3,6-diamino-10-methyl- (Acriflavine)**								
	CH_3COCH_3	air[a]	0.1				MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. Rel. to S′ in CCl_4.	82Z317
1.11	**Allopsoralen (Furo[2,3-*f*]benzopyran-7-one)**								
	C_6H_6	O_2	0.08* 0.07^T	0.41			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.17$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
1.12	**Angelicin (Furo[2,3-*h*]benzopyran-2-one, Ang)**								
	C_6H_6	O_2	0.01^T	0.33			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.03$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
	CCl_4	air	0.002* 0.0026^T				MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 652$ nm.	83E813
	D_2O	air	0.02^T				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.3$; $\lambda_{exc} = 337$ nm.	86E959 86F144
	MeOH	air	0.03^T	1			PL/LI-56,42	S′ = RF; rel. to $\phi_\Delta(S') = 0.4$; $\lambda_{exc} = 337$ nm; used $\phi_T(S) = 0.31^d$.	86E959 86F144

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.13	**Anthracene (An)**								
	iso-BuOH	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.32$	87E668
	1-BuOH	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.26$	87E668
	$(C_2H_5)_2O$	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.35$	87E668
	i-$C_5H_{11}OH$	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.38$	87E668
	n-C_6H_{14}	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.68$	87E668
	$C_6H_5CH_3$	0.2 atm O_2	0.83				PL/LI-38,56	used $\phi_T(S) = 0.72$. Assumed $f_T^{O_2} = 1$; used $f_\Delta^T = 1.0$ and $f_\Delta^S = 0.46$.	87E668
	$C_6H_5CH_3$	O_2	1.0				PL/LI-38,56	used $\phi_T(S) = 0.72$. Assumed $f_T^{O_2} = 1$; used $f_\Delta^T = 1.0$ and $f_\Delta^S = 0.46$.	87E668
	$C_6H_5CH_3$	1.2×10^{-3}				1.0	PL/Ad,St-48	A = Rub; $\lambda_{exc} = 347$ nm; used $\phi_1(S) = 0.72$, $\varepsilon_T(S) = 42{,}000$ L mol^{-1} cm^{-1} at 428.5 nm. $P_T^{O_2} = 1$; $n_\Delta = 1$.	83F075
	C_6H_5CN	1.2×10^{-3}				0.57	PL/Ad,St-48	A = Rub; $\lambda_{exc} = 347$ nm; used $\phi_T(S) = 0.72$. $P_T^{O_2} = 1$; used $\varepsilon_T(S) = 24{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.57$.	83F075
	C_6H_5Cl	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.95$	87E668
	C_6H_6	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.85$	87E668
	C_6H_6	1.3×10^{-4}	0.58^T	0.77			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.75$. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
	C_6H_6	air	~0.74				PL/Hp-52,42	$\lambda_{exc} = 337$ nm. Measured ϕ_T; assumed $P_T^{O_2} = 1$, $[S] > 5 \times 10^{-4}$ mol L^{-1}, used $\phi_F = 0.22$; $\phi_\Delta = 0.50$ extrapolating $[S] \rightarrow 0$; authors used meas. ϕ_T to give $f_\Delta^T = 0.95$ but $P_S^{O_2} \neq 0$.	91F198
	C_6H_6	air	0.61				PL/Hp-52	$\lambda_{exc} = 355$ nm. Assumed $f_\Delta^S = 0$; $\phi_T^{O_2} = 0.78$ gives $f_\Delta^T = 0.78$.	85E591
	C_6H_6	air[a]	0.63				PL/βCb-43	S′ = BP; rel. to $\phi_\Delta(S') = 0.35$. Measured $\phi_\Delta(S)/\phi_\Delta(S') = 1.8$; since $P_S^{O_2} \neq 0$, only ϕ_Δ is obtainable.	76F904
	C_6H_6	1.9×10^{-3}	0.88				CP/Ac-46	S′ = A = DMA; rel. to $\phi_\Delta(S') = 0.52$; $\lambda_{exc} =$ 365 nm. Assumed $f_T^{O_2} = 1$.	81F364
	C_6H_6	O_2	0.68				PL/Hp-52	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.78$. Measured $\phi_\Delta = 0.68$, $P_T^{O_2} = 1$ and $\phi_T^{O_2} = \phi_T(S)$ and ϕ_F. Authors assume $f_\Delta^S = 0$ and $f_\Delta^T = 0.87$ but $P_S^{O_2} = 0.52$ so values of f_Δ^S and f_Δ^T are indeterminable.	88E449
	C_6H_6	O_2	0.63				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$. Measured $P_T^{O_2} = 1$ and $\phi_T^{O_2} \approx \phi_T(S)$. Authors assume $f_\Delta^S = 0$ and $f_\Delta^T = 0.87$ but $P_S^{O_2} = 0.52$ so values of f_Δ^S and f_Δ^T are indeterminable.	88E449
	C_6H_6	O_2		0.7			PR/Ad,St-49	A = DPBF; used $\phi_T(S) = 0.75$, $\varepsilon_T(S) = 45{,}500$ L mol^{-1} cm^{-1} at 432 nm. Measured $G(^3S^*)$.	78E263
	C_6H_6	9.0×10^{-3}	1.1	1.0	0.46		CP/Ac-46,38	S′ = A = DMA; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 365$ nm; used $\phi_T(S) = 0.74$. Assumed $f_T^{O_2} = 1$; $\phi_\Delta(S') = 1$ through coronene using ϕ_Δ(ave.) = 0.88.	81F364
	n-C_7H_{16}	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.63$	87E668
	CCl_4	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.075$	87E668
	CCl_4	air	0.13* 0.15				MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	86E959
	CCl_4	O_2	0.75				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	CH_2Cl_2	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.37$	87E668
	CH_3CN	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.27$	87E668
	CH_3COCH_3	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.45$	87E668

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.13	**Anthracene (An)**—Continued								
	$CHCl_3$	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.62$	87E668
	$CHCl_3$	O_2	0.69				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	CS_2	O_2	0.70				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	DMF	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.36$	87E668
	EtOH	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.26$	87E668
	$HCONH_2$	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.20$	87E668
	MeOH	air	0.7				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.4$.	86E959
	1-PrOH	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.3$	87E668
	2-PrOH	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.32$	87E668
	c-C_4H_8O	0.2 atm O_2					PL/LI-56	$\phi_\Delta(\tau_r(\text{toluene})/\tau_r) = 0.44$	87E668
1.14	**Anthracene, 1-chloro-**								
	CCl_4	O_2	0.45				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	$CHCl_3$	O_2	0.66				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	CS_2	O_2	0.64				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
1.15	**Anthracene, 9-chloro-**								
	CCl_4	O_2	0.63				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	$CHCl_3$	O_2	0.56				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	CS_2	O_2	0.57				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
1.16	**Anthracene, 9-cyano-**								
	C_6H_6 and CH_3CN	air and O_2	$\sim 2^{ST}$	~1	~1		CP/Pa-14	λ_{exc} = 365 nm. A = TME, 2M2B, or cyclohexene, P = alkene hydroperoxides, solvent = C_6H_6 and CH_3CN.	85F160
1.17	**Anthracene, 9,10-dibromo-**								
	C_6H_6	air	~0.85	~0.96			PL/Hp-52,42	λ_{exc} = 337, 400 nm. Measured ϕ_T; [S] > 5 × 10^{-4} mol L^{-1}, assumed $P_T^{O_2} = 1$, used ϕ_F = 0.11; $\phi_\Delta = 0.44, f_\Delta^T = 0.49$ extrapolating [S] → 0.	91F198
1.18	**Anthracene, 9,10-dichloro-**								
	CCl_4	O_2	0.89				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	$CHCl_3$	O_2	1.6				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
	CS_2	O_2	2.0				CP/Oc-14	A = S; λ_{exc} = 365 nm.	537004
1.19	**Anthracene, 9,10-dicyano- (DCA)**								
	c-C_6H_{12}	→ ∞	1.9^{ST}				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S') = 0.81$; λ_{exc} = 355 nm.	91E297
	C_6H_6	air	0.19				CP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.67$.	89E223 88E609
	C_6H_6	air	0.48				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	C_6H_6	1.45×10^{-3}	0.28				CP/Ac-14,38	A = 2M2P. Used $P_T^{O_2} = 1$, assumed $\phi_T = 0$.	83F172
	C_6H_6	6.8×10^{-3}	0.82			1.7	CP/Ac-14,38	A = 2M2P; λ_{exc} = 334, 366 nm. Used $P_T^{O_2} = 1$, assumed $\phi_T = 0$.	83F172
	C_6H_6	→ ∞	1.6^{ST}	0.70	0.86		PL/LI-56,38	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; λ_{exc} = 355 nm. Used $f_T^{O_2} = 1$; f_Δ^T was measured using 2,5-dimethyliodobenzene enhanced intersystem crossing producing $^3S^*$ with 50% efficiency.	92F013
	C_6D_6	1.45×10^{-3}	0.46				PL/LI-38,56	S′ = DNT; rel. to $\phi_\Delta(S') = 0.98$; λ_{exc} = 355 nm. Used $P_T^{O_2} = 1$, assumed $\phi_T = 0$, $f_T^{O_2} = 1$.	83F172
	C_6D_6	6.8×10^{-3}	1.1			1.6	PL/LI-38,56	S′ = DNT; rel. to $\phi_\Delta(S') = 0.98$; λ_{exc} = 355 nm. Used $P_T^{O_2} = 1$, assumed $\phi_T = 0$, $f_T^{O_2} = 1$.	83F172

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.19	**Anthracene, 9,10-dicyano- (DCA)**—Continued								
	C_6H_6 and CH_3CN	air and O_2	$\sim 2^{ST}$	~1	~1		CP/Pa-14	λ_{exc} = 365 nm. A = TME, 2M2B, or cyclohexene, P = alkene hydroperoxides, solvent = C_6H_6 and CH_3CN.	85F160
	CCl_4	air	0.15* 0.13				CP/LI-56	S′ = TPP; A = MDH; rel. to ϕ_Δ(S′) = 0.54.	89E223
	CCl_4	air	0.16				CP/Ac-14	A = MDH. f_r^A = 0.30.	89E223
	CCl_4	O_2	2^{ST}				CP/Pa-14	A = DPB. $P_T^{O_2}$ = 1.	90F292
	CH_3CN	air	0.23				CP/LI-56	S′ = TPP; A = MDH; rel. to ϕ_Δ(S′) = 0.50.	89E223
	CH_3CN	air	0.76				CP/Ac-14	A = MDH. f_r^A = 0.30.	89E223
	CH_3CN	1.7×10^{-3}	0.06				CP/Ac-14,38	A = 2M2P; λ_{exc} = 334, 366 nm. Used $P_T^{O_2}$ = 1, assumed ϕ_T = 0.	83F172
	CH_3CN	8.1×10^{-3}	0.25			2.0	CP/Ac-14,38	A = 2M2P; λ_{exc} = 334, 366 nm. Used $P_T^{O_2}$ = 1, assumed ϕ_T = 0.	83F172
	CH_3CN	$\rightarrow \infty$	1.5^{ST}		0.76		PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.84; λ_{exc} = 355 nm. Assumed f_Δ^T = 0.7, $f_T^{O_2}$ = 1.	92F013
	CD_3CN	1.7×10^{-3}	0.90				PL/LI-38,56	S′ = DNT; rel. to ϕ_Δ(S′) = 0.62; λ_{exc} = 355 nm. Used $P_T^{O_2}$ = 1, assumed ϕ_T = 0, $f_T^{O_2}$ = 1.	83F172
	CD_3CN	8.1×10^{-3}	1.6			2.0	PL/LI-38,56	S′ = DNT; rel. to ϕ_Δ(S′) = 0.62; λ_{exc} = 355 nm. Used $P_T^{O_2}$ = 1, assumed ϕ_T = 0, $f_T^{O_2}$ = 1.	83F172
	$CHCl_3$	air	0.16				CP/Ac-14	A = MDH. f_r^A = 0.30.	89E223
	$CHCl_3$	air	0.09				CP/LI-56	S′ = TPP; A = MDH; rel. to ϕ_Δ(S′) = 0.50.	89E223
	CS_2	air	0.09				CP/LI-56	S′ = TPP; A = MDH; rel. to ϕ_Δ(S′) = 0.51.	89E223
	CS_2	air	0.17				CP/Ac-14	A = MDH. f_r^A = 0.30.	89E223
	$ClCF_2CCl_2F$	air	0.14				CP/Ac-14	A = MDH. f_r^A = 0.30.	89E223
	$ClCF_2CCl_2F$	air	0.09				CP/LI-56	S′ = TPP; A = MDH; rel. to ϕ_Δ(S′) = 0.41.	89E223
1.20	**Anthracene, 1,4-dimethoxy-9,10-diphenyl-**								
	$(C_2H_5)_2O$	$(2\text{-}9) \times 10^{-3}$				0.69	CP/Ac-14,38	A = S. Assumed $f_T^{O_2}$ = 1, $\phi_T f_\Delta^T \approx 0$.	84F197
	$CH_3CO_2C_2H_5$	$(2\text{-}9) \times 10^{-3}$				0.69	CP/Ac-14,38	A = S. Assumed $f_T^{O_2}$ = 1, $\phi_T f_\Delta^T$ = 0.08.	84F197
1.21	**Anthracene, 9,10-dimethyl- (DMA)**								
	C_5H_5N	O_2	0.19				CP/Oc-14	A = H_2NCSNH_2; λ_{exc} = 405 nm. Assumed f_r^A = 2.	737347 74E522
	n-C_6H_{14}	O_2	1.1	≥0.42	≥0.41		CP/Ac-27	A = 2,5-DMF; λ_{exc} = 313 nm. $P_T^{O_2}$ = 1; assumed $f_T^{O_2}$ = 1; used p_A = 1.	79E643
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$				2.0	CP/Ac-14,38	A = S. Assumed $f_T^{O_2}$ = 1, $\phi_T f_\Delta^T$ = 0.05.	84F197
	C_6H_6	air[a]	0.08^T	1	1	2.0	CP/Ac-14,40	A = S. Assumed $f_T^{O_2}$ = 1; $f_\Delta^T + f_\Delta^S$ from ϕ_Δ when $P_S^{O_2}$ = 1; $\phi_T f_\Delta^T = \phi_\Delta$ when $P_S^{O_2}$ = 0.	767422
	C_6H_6	air[a]			≥0.62	≥1.6	CP/Ac-14,38	A = S. Assumed f_Δ^T = 1 and $f_T^{O_2}$ = 1.	76F905
	C_6H_6	O_2 var.					CP/Ac-14,38	A = S; λ_{exc} = 365 nm. $\phi_T f_\Delta^T / (f_\Delta^T + f_\Delta^S)$ = 0.02 ± 0.05.	68F286
	C_6H_6	1.9×10^{-3}	0.52				CP/Ac-14	A = S; λ_{exc} = 365 nm. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 0.56, 0.59 and 0.91 for S′ = Cor, An and BP, resp.	81F364
	C_6H_6	9.0×10^{-3}	1.0			1.4	CP/Ac-14	A = S; λ_{exc} = 365 nm; used $\phi_T(S) = -0.02$. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 1.1, 0.91 and 1.1 for S′ = Cor, An and BP, resp.	81F364
1.22	**Anthracene, 2-(3,3-dimethyl-1-butenyl)-, (*E*)-**								
	C_6H_6	1.3×10^{-4}	0.46* 0.38^T	0.76			PL/LI-56,42	S′ = BP; rel. to ϕ_Δ(S′) = 0.29; meas. $\phi_T(S)$ = 0.46; λ_{exc} = 355 nm. $P_S^{O_2}$ <0.02 and $P_T^{O_2}$ >0.99.	88E452

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.23	**Anthracene, 2-(3,3-dimethyl-1-butenyl)-, (Z)-**								
	C_6H_6	1.3×10^{-4}	0.63* 0.52^T	0.88			PL/LI-56,42	S′ – BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.59$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.24	**Anthracene, 9-(1,1-dimethylethyl)-**								
	H_2O (mic) pH = 7	air[a]					CP/Pa-43	S′ = An; A = Im; P = Imidazole endoperoxide; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.06$. soln. cont. 1% CTAB, RNO as monitor of P.	83N082
1.25	**Anthracene, 9,10-diphenyl-**								
	n-C_6H_{14}	O_2	1.1	≥0.49	≥0.48		CP/Ac-27	A = 2,5-DMF; $\lambda_{exc} = 313$ nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$				0.8	CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.08$.	84F197
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$	2^{ST}	1	1	2	PL/Ad,St-48	A = Rub; AC = S; $\lambda_{exc} = 347$ nm; used $k_d = 3.2 \times 10^4\ s^{-1}$, $k_A = 2.5 \times 10^7\ L\ mol^{-1}\ s^{-1}$, $\varepsilon_T(AC) = 12{,}000\ L\ mol^{-1}\ cm^{-1}$ at 450 nm. $P_T^{O_2} = 1$; measured $n_\Delta = 2$, thus $f_T^{O_2} = 1$.	82E451
	C_6H_6	air	0.13^T	1			CP/Ac-14,40	A = S; $\lambda_{exc} = 436$ nm. $P_S^{O_2} = 0$; measured $\phi_T f_\Delta^T = 0.13$.	727196
	C_6H_6	air[a]	1^{ST}				CP/Pa-14,38	A = S; $\lambda_{exc} = 436$ nm. $P_S^{O_2} = 1$, measured $f_\Delta^T + f_\Delta^S f_T^{O_2} = 1$.	727196
	CCl_4	O_2	0.75				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	$CHCl_3$	O_2	0.69				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	CS_2	O_2	1.8				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
1.26	**Anthracene, 9-methyl-**								
	n-C_6H_{14}	O_2	0.97	≥0.32	≥0.19		CP/Ac-27	A = 2,5-DMF; $\lambda_{exc} = 313$ nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	CCl_4	O_2	1.3				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	$CHCl_3$	O_2	1.2				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
1.27	**Anthracene, 2-[2-(2-naphthyl)ethenyl]-, (E)-**								
	C_6H_6	1.3×10^{-4}	0.13* 0.11^T	0.92			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.12$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.28	**Anthracene, 2-[2-(2-naphthyl)ethenyl]-, (Z)-**								
	C_6H_6	1.3×10^{-4}	0.12* 0.10^T	0.45			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.22$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.29	**Anthracene, 9-phenyl-**								
	n-C_6H_{14}	O_2	1.1	≥0.50	≥0.42		CP/Ac-27	A = 2,5-DMF; $\lambda_{exc} = 313$ nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	CCl_4	O_2	0.85				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	$CHCl_3$	O_2	0.94				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
	CS_2	O_2	0.91				CP/Oc-14	A = S; $\lambda_{exc} = 365$ nm.	537004
1.30	**Anthracene, 2-(2-phenylethenyl)-, (Z)-**								
	C_6H_6	1.3×10^{-4}	0.10* 0.08^T	0.47			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.17$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.31	**Anthracene, 2-(2-phenylethenyl)-, (E)-**								
	C_6H_6	1.3×10^{-4}	0.12* 0.10^T	0.91			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.11$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.32	**Anthracene, 2-(1-propenyl)-, (*E*)-**								
	C_6H_6	1.3×10^{-4}	0.50* 0.41^T	0.89			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.46$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.33	**Anthracene, 2,6,9,10-tetracyano-**								
	C_6H_6 and CH_3CN	air and O_2	$\sim 2^{ST}$	~1	~1		CP/Pa-14	$\lambda_{exc} = 365$ nm. A = TME, 2M2B, or cyclohexene, P = alkene hydroperoxides, solvent = C_6H_6 and CH_3CN.	85F160
1.34	**Anthracene, 2-vinyl-**								
	C_6H_6	1.3×10^{-4}	0.43* 0.36^T	0.73			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.49$; $\lambda_{exc} = 355$ nm. $P_S^{O_2} < 0.02$ and $P_T^{O_2} > 0.99$.	88E452
1.35	**1-Anthracenesulfonate ion**								
	H_2O	3×10^{-3}	0.70	~1			CP/Ac-14	A = S. Assumed $P_T^{O_2} = 1$ and $f_\Delta^S = 0$; ϕ_T(calc.) = 0.82, $T = 30$°C.	78A275
1.36	**2-Anthracenesulfonate ion**								
	H_2O	3×10^{-3}	0.70	~1			CP/Ac-14	A = S. Assumed $P_T^{O_2} = 1$ and $f_\Delta^S = 0$; ϕ_T(calc.) = 0.81, $T = 30$°C.	78A275
1.37	**Anthra[1,9-*bc*:4,10-*b′c′*]dichromene (ADC)**								
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$				0.8	CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.01$.	84F197
1.38	**Anthra[2,1,0-*def*:6,5,10-*d′e′f′*]diisoquinoline, *N,N′*-dimethyl-**								
	D_2O	O_2	0.08				PL/LI-56	S′ = ZnTMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.88$; meas. $\phi_T(S) = 0.12$; $\lambda_{exc} = 355$ nm.	91R201
1.39	**9,10-Anthraquinone**								
	C_6H_6	O_2	0.15^T	0.17			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.90$. Measured $P_T^{O_2} = 0.65$.	88E449
	C_6H_6	O_2	0.26^T	0.29			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.90$. Measured $\phi_\Delta = 0.17$, $P_T^{O_2} = 0.65$ and ϕ_F.	88E449
	$CHCl_3$	air[a]	0.01^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
1.40	**9,10-Anthraquinone, 1-amino-**								
	$CHCl_3$	air[a]	0.2^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	2-PrOH/H_2O (5:1)	air	0.19^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S') = 0.80$; $\lambda_{exc} = 434$ nm.	88F582
1.41	**9,10-Anthraquinone, 2-amino-**								
	$CHCl_3$	air[a]	0.02^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	2-PrOH/H_2O (5:1)	air	0.02^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S') = 0.80$; $\lambda_{exc} = 434$ nm.	88F582
1.42	**9,10-Anthraquinone, 1-amino-2-hydroxy-**								
	$CHCl_3$	air[a]	0.02^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
1.43	**9,10-Anthraquinone, 1-amino-4-hydroxy-**								
	$CHCl_3$	air[a]	0.02^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	MeOH	O_2	0.004^T				CP/Ac-43	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$; $\lambda_{exc} = 546$ nm. Measured $P_T^{O_2} = 1$.	80F304
	2-PrOH/H_2O (5:1)	air	0.02^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S') = 0.80$; $\lambda_{exc} = 545$ nm.	88F582
1.44	**9,10-Anthraquinone, 1-amino-4-hydroxy-2-phenoxy-**								
	$CHCl_3$	air[a]	0.05^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.44	**9,10-Anthraquinone, 1-amino-4-hydroxy-2-phenoxy**—Continued								
	$CHCl_3$	air[a]	0.05^T				PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631
	EtOH	air[a]	0.05^T				CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S')$ = 0.77. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
1.45	**9,10-Anthraquinone, 1-amino-4-hydroxy-2-[4-(phenylaminosulfonyl)phenoxy]-**								
	$CHCl_3$	air[a]	0.04^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air[a]	0.04^T				PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631
	EtOH	air[a]	0.05^T				CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S')$ = 0.77. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
1.46	**9,10-Anthraquinone, 1-amino-2-methyl-**								
	CCl_4	air	0.12^T				MP/LI-56	S′ = TPBC; rel. to $\phi_\Delta(S') = 0.45$.	82A384
	$CHCl_3$	air[a]	0.12^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
1.47	**9,10-Anthraquinone, 1-chloro-**								
	$CHCl_3$	air[a]	0				PL/LI-56	S′ = MPDME. $P_T^{O_2} = 1$.	86E640
1.48	**9,10-Anthraquinone, 2-chloro-**								
	$CHCl_3$	air[a]	0				PL/LI-56	S′ = MPDME. $P_T^{O_2} = 1$.	86E640
1.49	**9,10-Anthraquinone, 1,2-diamino-**								
	$CHCl_3$	air[a]	0.03^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air	<0.05				CP/Pa-14	A = DMA; P = 9,10-Dimethylanthracene endoperoxide; λ_{exc} = 435 nm. $P_T^{O_2} = 1$.	80E446
	2-PrOH/ H_2O (5:1)	air	0.04^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 545 nm.	88F582
1.50	**9,10-Anthraquinone, 1,4-diamino-**								
	CCl_4	air	0.04^T				MP/LI-56	S′ = TPBC; rel. to $\phi_\Delta(S') = 0.45$.	82A384
	$CHCl_3$	air[a]	0.01^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air	<0.05				CP/Pa-14	A = DMA; P = 9,10-Dimethylanthracene endoperoxide; λ_{exc} = 435 nm. $P_T^{O_2} = 1$.	80E446
	2-PrOH/ H_2O (5:1)	air	0.03^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 545 nm.	88F582
1.51	**9,10-Anthraquinone, 1,5-diamino-**								
	$CHCl_3$	air[a]	0.46^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air	0.67^T				CP/Pa-14	A = DMA; P = 9,10-Dimethylanthracene endoperoxide; λ_{exc} = 435 nm. $P_T^{O_2} = 1$.	80E446
	2-PrOH/ H_2O (5:1)	air	0.80^T				CP/Ac-14	A = DPBF; λ_{exc} = 434 nm.	88F582
1.52	**9,10-Anthraquinone, 1,8-diamino-**								
	$CHCl_3$	air[a]	0.35^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air	0.77^T				CP/Pa-14	A = DMA; P = 9,10-Dimethylanthracene endoperoxide; λ_{exc} = 435 nm. $P_T^{O_2} = 1$.	80E446
	2-PrOH/ H_2O (5:1)	air	0.58^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 545 nm.	88F582
1.53	**9,10-Anthraquinone, 2,6-diamino-**								
	2-PrOH/ H_2O (5:1)	air	0.05^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 434 nm.	88F582
1.54	**9,10-Anthraquinone, 1,5-diamino-2-bromo-4,8-dihydroxy-**								
	$CHCl_3$	air[a]	0.35^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77$[b]. $P_T^{O_2} = 1$.	86E640
	$CHCl_3$	air[a]	0.15^T				PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.54	**9,10-Anthraquinone, 1,5-diamino-2-bromo-4,8-dihydroxy—Continued**								
	CCl_4	air	0.20^T				MP/LI-56	S′ = TPBC; rel. to $\phi_\Delta(S') = 0.45$.	82A384
	EtOH	air[a]	0.16^T				CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S')$ = 0.77. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
1.55	**9,10-Anthraquinone, 1,5-diamino-4,8-dihydroxy-**								
	$CHCl_3$	air[a]	0.38^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
1.56	**9,10-Anthraquinone, 1,8-diamino-4,5-dihydroxy-**								
	$CHCl_3$	air[a]	0.58^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
	EtOH	air	0.28^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
	MeOH	air	0.18^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
1.57	**9,10-Anthraquinone, 2,5-diamino-1,8-dihydroxy-**								
	EtOH	air	0.12^T				CP/LI-56	S′ = RB: rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
	MeOH	air	0.08^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
1.58	**9,10-Anthraquinone, 2,7-diamino-1,8-dihydroxy-**								
	EtOH	air	0.08^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
	MeOH	air	0.07^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	91F197
1.59	**9,10-Anthraquinone, 1,4-diamino-2-methoxy-**								
	$CHCl_3$	air[a]	0.01^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$	86E640
	2-PrOH/ H_2O (5:1)	air	0.05^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 545 nm.	88F582
1.60	**9,10-Anthraquinone, 1,4-diamino-2-[4-(phenylaminosulfonyl)phenoxy]-**								
	$CHCl_3$	air[a]	0.01^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
1.61	**9,10-Anthraquinone, 1,2-dihydroxy-**								
	$CHCl_3$	air[a]	0.01^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
1.62	**9,10-Anthraquinone, 1,8-dihydroxy-**								
	C_5H_5N	O_2 var.	0.84^T				CP/Oc-14	A = α-Terpinene.	587004
	CH_3CN	air	0.70^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	90D185
	DMSO	air	0				CP/LI-56	S′ = RB. No detectable phosphorescence.	90D185
	EtOH	air	0.43^T				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80^b$.	90D185
1.63	**9,10-Anthraquinone, 1-hydroxy-**								
	$CHCl_3$	air[a]	0.2^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
1.64	**9,10-Anthraquinone, 2-hydroxy-**								
	$CHCl_3$	air[a]	0.03^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.77^b$. $P_T^{O_2} = 1$.	86E640
1.65	**9,10-Anthraquinone, 1,4,5,8-tetraamino-**								
	2-PrOH/ H_2O (5:1)	air	0.10^T				CP/Ac-43	S′ = 1,5-AQ$(NH_2)_2$; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.80; λ_{exc} = 545 nm.	88F582
1.66	**9,10-Anthraquinone, 1,4,5,8-tetrahydroxy-**								
	$CHCl_3$	air[a]	0.92^T				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.80^b$. $P_T^{O_2} = 1$.	86E640
1.67	**Anthrone**								
	C_6H_6	O_2	0.25^T	0.25			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 1$. Measured $P_T^{O_2} = 1$.	88E449
	C_6H_6	O_2	0.25^T	0.25			PL/Hp-52,42	λ_{exc} = 355 nm; used $\phi_T(S) = 1$. Measured ϕ_Δ = 0.25, $P_T^{O_2} = 1$ and ϕ_F.	88E449

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.68	**Anthrone, 1,8-dihydroxy- (Anthralin)**								
	C_6H_6	air	<0.01				PL/LI-56	S′ = Np; rel. to $\phi_\Delta(S') = 0.55$; λ_{exc} = 355 nm. $P_T^{O_2}$ >0.94; no detectable luminescence.	89E158
	C_6H_6	air		0.77* 0.64			PR/βCb-59	S′ = BP; TA = Car; rel. to $f_\Delta^T(S') = 0.29$; used $\varepsilon_T(S) = 4770$ L mol^{-1} cm^{-1} at 560 nm, $\varepsilon_T(S') = 7630$ L mol^{-1} cm^{-1} at 532.5 nm. $P_T^{O_2}$ >0.94.	89E158
	DMSO	air	0				CP/LI-56	S′ = RB. No detectable phosphorescence.	90D185
	EtOH	air	0				CP/LI-56	S′ = RB. No detectable phosphorescence.	90D185
	CH_3CN	air	0				CP/LI-56	S′ = RB. HCl added; no detectable phosphorescence.	90D185
1.69	**Anthrone, 1,8-dihydroxy-, conjugate base**								
	CH_3CN	air	≥0.11				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.80$[b]. 15% quenching of singlet oxygen by S.	90D185
1.70	**Azulene**								
	C_6H_6	air[a]		0	0		CP/Ac-14,38	λ_{exc} = 546.1 nm. A = DMA and DMBA.	69F388
1.71	**Benzaldehyde**								
	MeOH	O_2	0.61				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	<0.58				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm. Some free radical reaction occurs.	70F735
1.72	**Benz[*a*]anthracene**								
	$C_6H_5CH_3$	1.2×10^{-3}				0.95	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.85$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$; used $\varepsilon_T(S) = 15{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.95$.	83F075
	$C_6H_5CH_3$	1.2×10^{-3}	1.4				PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	82E010
	C_6H_5CN	1.2×10^{-3}				0.21	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.75$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$; used $\varepsilon_T(S) = 12{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.21$.	83F075
1.73	**Benz[*a*]anthracene, 9,10-dimethyl-**								
	C_6H_6	air[a]	0.69[T]	1.0		1.0	CP/Ac-14,40	A = S. Assumed $f_T^{O_2} = 1$; $f_\Delta^T + f_\Delta^S$ from ϕ_Δ when $P_S^{O_2} = 1$; $\phi_T f_\Delta^T = \phi_\Delta$ when $P_S^{O_2} = 0$.	767422
	C_6H_6	air[a]			≤0.34	≤1.3	CP/Ac-14,38	A = S. Assumed $f_\Delta^T = 1$ and $f_T^{O_2} = 1$.	76F905
	C_6H_6	O_2 var.					CP/Ac-14,38	A = S; λ_{exc} = 365 nm. $\phi_T f_\Delta^T / (f_\Delta^T + f_\Delta^S) = 0.66$.	68F286
1.74	**Benzene, 5-chloro-1,3-dimethoxy-**								
	D_2O	air	0.0092				PL/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.78$; λ_{exc} = 308 nm.	91A341
1.75	**Benzene, 1,3,5-triphenyl-**								
	n-C_6H_{14}	air	0.4[T]				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 264 nm. $P_T^{O_2} = 1$.	82E258
1.76	**Benzenebutanoic acid, α-amino-2-(formylamino)-γ-oxo- (*N*-Formylkynurenine)**								
	H_2O pH = 7.4	air	0.17				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 332 nm. RNO as monitor of P.	91R141
	H_2O pH = 7.5	0.15×10^{-3}	0.15	0.75			CP/Ac-14,42	A = TrpH; meas. $\phi_T(S) = 0.20$[f]; λ_{exc} = >320 nm. $P_S^{O_2} = 0$; with $k_d = k_\Delta + k_S[S]$.	78A358
	H_2O pH = 7.5	2×10^{-3}	0.17	0.85			CP/Ac-14,42	A = TrpH; meas. $\phi_T(S) = 0.20$[f]; λ_{exc} = >320 nm. $P_S^{O_2} = 0$; in presence of Type I photooxidation; with $k_d = k_\Delta + k_S[S]$.	78A358
1.77	**Benzenebutanoic acid, α,2-diamino-3-hydroxy-γ-oxo- (3-Hydroxykynurenine)**								
	D_2O pD = 7	air	0.003				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.30$; λ_{exc} = 337 nm.	87F290

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.77	**Benzenebutanoic acid, α,2-diamino-3-hydroxy-γ-oxo- (3-Hydroxykynurenine)**—Continued								
	H_2O pH = 7.4	air	0				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 360 nm. RNO as monitor of P.	91R141
1.78	**Benzenebutanoic acid, α,2-diamino-γ-oxo- (Kynurenine)**								
	D_2O pD = 7	air	0.006				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.30$.	87F290
	H_2O pH = 7.4	air	0				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 360 nm. RNO as monitor of P.	91R141
1.79	**1,3-Benzenediol (Resorcinol)**								
	diox	air	0.12				PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.73$; λ_{exc} = 308 nm.	91A341
1.80	**1,3-Benzenediol, 4-chloro-**								
	diox	O_2	0.05				PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.73$; λ_{exc} = 308 nm.	91A341
1.81	**1,4-Benzenediol (Hydroquinone)**								
	diox	air	0.21				PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.73$; λ_{exc} = 308 nm. May be from quinone contaminents.	91A341
1.82	**1,4-Benzenediol, chloro-**								
	diox	O_2	0.04				PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.73$; λ_{exc} = 308 nm. May be from quinone contaminents.	91A341
1.83	**Benzil**								
	C_6H_6	O_2	0.57	0.62			CP/Pa-14,42	A = 1,2-Dimethylcyclohexene: λ_{exc} = 366 nm; used $\phi_T(S) = 0.92$[d]. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.84	**Benzil, 4,4′-dichloro-**								
	C_6H_6	O_2	0.23				CP/Pa-14	A = 1,2-Dimethylcyclohexene; λ_{exc} = 366 nm. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.85	**Benzil, 4,4′-dimethoxy-**								
	C_6H_6	O_2	0.27				CP/Pa-14	A = 1,2-Dimethylcyclohexene; λ_{exc} = 366 nm. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.86	**Benzil, 2,2′,4,4′,6,6′-hexamethyl-**								
	C_6H_6	O_2	0.06				CP/Pa-14	A = 1,2-Dimethylcyclohexene; λ_{exc} = 366 nm. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.87	**Benzo[1,2,3-*kl*:4,5,6-*k′l′*]dixanthene (BDX)**								
	$C_6H_5CH_3$	air				1.9	CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.08$.	84F197
1.88	**Benzophenone (BP)**								
	C_6D_6	air	0.29^T	0.29			PL/LI-56,42	λ_{exc} = 355 nm; used $\phi_T(S) = 1$. S′ = BP in benzene, used $\phi_\Delta(S')$ in benzene = 0.29.	88E657
	C_6H_6	air or O_2	0.35	0.35				See Table 4.	

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.88	**Benzophenone (BP)**—Continued								
	C_6H_6	air	0.36^T	~0.37			PL/Hp-52,42	λ_{exc} = 337 nm. Measured ϕ_T, assumed $P_T^{O_2}$ = 1.	91F198
	C_6H_6	air	0.31^T	0.31			PL/LI-57,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.83; used ϕ_T(S) = 1.0. $P_T^{O_2}$ = 1.	90A328
	C_6H_6	air	0.29^T	0.33* 0.29			PL/LI-60,42	S′ = Np; TD = p-MAP; rel. to f_Δ^T(S′) = 0.55; λ_{exc} = 355 nm; used ϕ_T(S) = 1[c].	87E234
	C_6H_6	air	0.29^T	0.29			PL/LI,St-55,42	S′ = Ac; rel. to f_Δ^T(S′) = 1.0; λ_{exc} = 355 nm; used ϕ_T(S) = 1[e], ε_T(S) = 7630 L mol^{-1} cm^{-1} at 532 nm. Used ε_T(S′) = 24,300 L mol^{-1} cm^{-1} at 440 nm, $P_T^{O_2}$ (S) = 0.96, $P_T^{O_2}$ (S′) = 1.	84E373
	C_6H_6	1.9×10^{-3}	0.54				CP/Ac-46	A = DMA; λ_{exc} = 365 nm. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 1.1, 1.6 and 1.8 for S′ = DMA, Rub and DPBF, resp.; solvent may contain impurities.	81F364
	C_6H_6	O_2	0.35^T	0.35			PL/Hp-52,42	λ_{exc} = 355 nm; used ϕ_T(S) = 1. Measured ϕ_Δ = 0.35, $P_T^{O_2}$ = 1 and ϕ_F.	88E449
	C_6H_6	O_2	0.35^T	0.35			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.83; used ϕ_T(S) = 1. Measured $P_T^{O_2}$ = 1.	88E449
	C_6H_6	O_2	0.39^T	0.39			PL/Ad-49,42	A = DPBF; AC = S; λ_{exc} = 337 nm; used k_d = 4.0×10^4 s^{-1}, k_A = 8.0×10^8 L mol^{-1} s^{-1}, ϕ_T(AC) = 1, ε_T(AC) = 7600 L mol^{-1} cm^{-1} at 532 nm.	84F005
	C_6H_6	9.0×10^{-3}	0.90	1	0		CP/Ac-46	A = DMA; λ_{exc} = 365 nm; used ϕ_T(S) = 1.0. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 0.90, 1.0 and 1.13 for S′ = DMA, Rub and DPBF, resp.; solvent may contain impurities.	81F364
	C_6H_6	O_2	0.4^T	0.4			PR/Ad,St-49,42	A = DPBF; used ϕ_T(S) = 1.0, ε_T(S) = 7630 L mol^{-1} cm^{-1} at 532 nm. Measured $G(^3S^*)$.	78E263
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.55^T	0.55			PL/Ad,St-49,42	A = DPBF; AC = S; λ_{exc} = 337 nm; used ϕ_T(S) = 1[f], ε_T(S) = 7640 L mol^{-1} cm^{-1} at 525 nm. p_A = 1.	87E410
	CH_3CN	O_2	0.37^T	0.37			PL/Ad,St-49,42	A = DPBF; AC = S; λ_{exc} = 337 nm; used k_d = 2.5×10^4 s^{-1}, k_A = 1.0×10^9 L mol^{-1} s^{-1}, ϕ_T(S) = 1[d], ε_T(AC) = 6500 L mol^{-1} cm^{-1} at 520 nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	MeOH	O_2	<0.50				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm. Some free radical reaction occurs.	70F735
1.89	**Benzophenone, 4,4′-bis(dimethylamino)-**								
	C_6H_6	O_2	0.41^T	0.37* 0.41			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to f_Δ^T(S′) = 0.39; meas. ϕ_T(S) = 1[e]; λ_{exc} = 337 nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.16^T	0.35			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to f_Δ^T(S′) = 0.37; meas. ϕ_T(S) = 0.47[e]; λ_{exc} = 337 nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
1.90	**Benzophenone, 4,4′-dimethoxy-**								
	C_6H_6	O_2	0.34^T	0.30* 0.34			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to f_Δ^T(S′) = 0.39; meas. ϕ_T(S) = 1[e]; λ_{exc} = 337 nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.40^T	0.40			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to f_Δ^T(S′) = 0.37; meas. ϕ_T(S) = 1[e]; λ_{exc} = 337 nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.91	**Benzophenone, 4-fluoro-**								
	C_6H_6	O_2	0.43^T	0.39* 0.43			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.39$; meas. $\phi_T(S) = 1^e$; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.44^T	0.44			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.37$; meas. $\phi_T(S) = 1^e$; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
1.92	**Benzophenone, 4-(trifluoromethyl)-**								
	C_6H_6	O_2	0.42^T	0.38* 0.42			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.39$; meas. $\phi_T(S) = 1^e$; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
	CH_3CN	O_2	0.54^T	0.54			PL/Ad,TAt-50,42	S′ = BP; A = DPBF; TA = 1-MeNp; rel. to $f_\Delta^T(S') = 0.37$; meas. $\phi_T(S) = 1^e$; $\lambda_{exc} = 337$ nm. Showed $P_T^{O_2}$ (S and S′) >0.95.	85A268
1.93	**Benzo[*a*]phenothiazine**								
	CH_3CN	O_2	~0.2				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.94	**Benzo[*b*]phenothiazine**								
	CH_3CN	O_2	0.19				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.95	**Benzo[*c*]phenothiazine**								
	CH_3CN	O_2	0.17				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.96	**1-Benzopyran-4-one, 2,3-diphenyl- (3-Phenylflavone)**								
	C_6H_6	$(0.6\text{-}5.5) \times 10^{-3}$	0.4^T	0.8			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S') = 0.4$; meas. $\phi_T(S) = 0.5^f$; $\lambda_{exc} = 337$ nm.	86E567
1.97	**1-Benzopyran-4-one, 3-hydroxy-2-phenyl- (3-Hydroxyflavone)**								
	n-C_7H_{16}	2.3×10^{-3}	0.18				PL/LI-56	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$, $\phi_{et} = 1$.	89E365
1.98	**1-Benzopyran-4-one, 2-phenyl- (Flavone)**								
	C_6H_6	$(0.6\text{-}5.5) \times 10^{-3}$	0.5* 0.6^T	0.7			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S') = 0.4$; meas. $\phi_T(S) = 0.9^f$; $\lambda_{exc} = 337$ nm.	86E567
1.99	**[1]Benzopyrano[6,7,8-*ij*]quinolizin-11-one, 2,3,6,7-tetrahydro-9-methyl-**								
	C_6H_6	air	0.08				CP/Pa-14	A = Rub; $\lambda_{exc} = 365$ nm.	87F569
1.100	**1,4-Benzoquinone, 2,6-diphenyl-**								
	$C_6H_5CH_3$	O_2	1.1				PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.82$; $\lambda_{exc} = 530$ nm.	88E124
1.101	**1,4-Benzoquinone, 2,6-diphenyl-, complex with Triphenylamine**								
	$C_6H_5CH_3$	O_2	0.14				PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.82$; $\lambda_{exc} = 530$ nm. Triplet ion-radical pair.	88E124
1.102	**1,4-Benzoquinone, tetrachloro- (Chloranil)**								
	C_6H_6	$\rightarrow\infty$	0.73^T	0.85* 0.73			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$.	91E444
	$CHCl_3$	$\rightarrow\infty$	0.75^T	0.75			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. rel. to S′ in benzene, cor. for solvent k_r.	91E444
	$C_6H_5CH_3$	$\rightarrow\infty$	0.35^T	0.35			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. rel. to S′ in benzene, cor. for solvent k_r.	91E444
1.103	**1,4-Benzoquinone, tetrachloro-, complex with Anisole**								
	C_6H_6	$\rightarrow\infty$	0.05^T	0.06* 0.05			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Triplet ion-radical pair.	91E444

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.104	**1,4-Benzoquinone, tetrachloro-, complex with Durene**								
	C_6H_6	$\rightarrow\infty$	0.22* 0.19^T	 0.19			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Triplet ion-radical pair.	91E444
1.105	**1,4-Benzoquinone, tetrachloro-, complex with Hexamethylbenzene**								
	C_6H_6	$\rightarrow\infty$	0.23* 0.20^T	 0.20			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Triplet ion-radical pair.	91E444
1.106	**1,4-Benzoquinone, tetrachloro-, complex with 1,2,3-Trimethoxybenzene**								
	C_6H_6	$\rightarrow\infty$	0.09* 0.08^T	 0.08			PL/LI-56,42	S′ = BP; rel. to $\phi_\Delta(S') = 0.30$; $\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Triplet ion-radical pair.	91E444
1.107	**1,4-Benzoquinone, tetramethyl- (Duroquinone)**								
	$C_6H_5CH_3$	1.2×10^{-3}				1.0	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 347$ nm; used $\varepsilon_T(S) = 7600$ L mol^{-1} cm^{-1} at 490 nm. $n_\Delta = 1.0$.	83F075
1.108	**Biacetyl**								
	C_6H_6	O_2	0.57^T	0.57			CP/Pa-14,42	A = 1,2-Dimethylcyclohexene; $\lambda_{exc} = 366$ nm; used $\phi_T(S) = 1$[d]. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.109	**Bicyclo[2.2.1]heptane-2,3-dione, 1,7,7-trimethyl- (Camphoroquinone, CQ)**								
	C_6H_6	O_2	0.84				CP/Pa-14	A = 1,2-Dimethylcyclohexene; $\lambda_{exc} = 366$ nm. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.110	**Bicyclo[2.2.1]heptane-2-thione (Thionorcamphor)**								
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1$. [S] $\rightarrow$ 0, ϕ_Δ = 0.56 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.111	**Bicyclo[2.2.1]heptane-2-thione, 3,3-dimethyl- (Thiocamphenilone)**								
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1.0$. [S] $\rightarrow$ 0, ϕ_Δ = 0.59 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.112	**Bicyclo[2.2.1]heptane-2-thione, 1,3,3,7,7-pentamethyl- (3,3-Dimethylthiocamphor)**								
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1.0$. [S] $\rightarrow$ 0, ϕ_Δ = 0.91 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.113	**Bicyclo[2.2.1]heptane-2-thione, 1,3,3-trimethyl- (Thiofenchone)**								
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1.0$. [S] $\rightarrow$ 0, ϕ_Δ = 0.83 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.114	**Bicyclo[2.2.1]heptane-2-thione, 1,7,7-trimethyl- (Thiocamphor)**								
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1.0$. [S] $\rightarrow$ 0, ϕ_Δ = 0.87 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.115	**Biphenyl**								
	c-C_6H_{12}	$\rightarrow\infty$	0.73^{ST}				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S') = 0.81$; $\lambda_{exc} = 355$ nm.	91E297
	c-C_6H_{12}	air		1.0			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 1.0$; $\lambda_{exc} = 355$ nm.	87E234
	C_6H_6	air		0.51* 0.45			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 0.55$; $\lambda_{exc} = 355$ nm.	87E234
	C_6H_6	O_2		0.6			PR/Ad,St-49	A = DPBF; used $\psi_T(S) = 0.81$, $\varepsilon_T(S) = 27{,}100$ L mol^{-1} cm^{-1} at 367 nm. Measured $G(^3S^*)$.	78E263
	CH_3CN	$\rightarrow\infty$	0.27^{ST}				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S') = 2.0$; $\lambda_{exc} = 355$ nm.	91E297

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.115	**Biphenyl**—Continued								
	CH_3CN	air		1.0			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm.	87E234
	H_2O (mic)	O_2		1.0			PL/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm.	87E234
1.116	**Bis(2,2′-bipyridine)bis(cyano)ruthenium(II)**								
	MeOH	O_2	0.79^T				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.117	**Bis(1,10-phenanthroline)-4,7-di(sulfonatophenyl)-1,10-phenanthrolineosmium(II)**								
	MeOH	O_2	0.74^T				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.118	**Bis(1,10-phenanthroline)-4,7-di(sulfonatophenyl)-1,10-phenanthrolineruthenium(II)**								
	MeOH	O_2	0.82^T				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.119	**5-Bromo-1,10-phenanthrolinebis(1,10-phenanthroline)ruthenium(II) ion**								
	MeOH	O_2	0.80^T				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.120	**Carbon sixty-atom molecule (Buckminsterfullerene)**								
	$C_6H_5CH_3$	air	1.0^T	1.0			PL/Hp-53,42	λ_{exc} = 510 nm; used $\psi_T(S) = 1$.	91E368
	C_6H_6	air	0.92^T				PL/Hp-52	λ_{exc} = 530 nm.	91E534
	C_6H_6	air	0.98^T				PL/Hp-52	λ_{exc} = 340 nm.	91E534
	C_6H_6	air	0.96^T				PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.62$; λ_{exc} = 532 nm. $P_T^{O_2} = 1$.	91E003
	C_6H_6	air	0.76^T				PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.62$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	91E003
	C_6H_6	air	0.76^T				PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	91E003
1.121	**Carbon seventy-atom molecule**								
	C_6H_6	air	0.81^T	~1			PL/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.62$; meas. $\phi_T(S)$ = 0.9; λ_{exc} = 355, 532 nm.	91E594
1.122	**β-*apo*-14′-Carotenal (*all-trans*-C_{22} aldehyde)**								
	c-C_6H_{12}	air					PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 5 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, ε_T(AC) = 121000 L mol^{-1} cm^{-1} at 470 nm. $f_\Delta^T P_T^{O_2} + P_S^{O_2} f_\Delta^S / \phi_T^{O_2} = 1.4$.	85F041
	c-C_6H_{12}	O_2	0.48^T	~1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 5.0 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.54^f$, ϕ_T(AC) = 1, ε_T(AC) = 7600 L mol^{-1} cm^{-1} at 532 nm.	84F005
1.123	**5-Chloro-1,10-phenanthrolinebis(1,10-phenanthroline)ruthenium(II) ion**								
	MeOH	O_2	0.81^T				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.124	**Chrysene**								
	c-C_6H_{12}	$\rightarrow \infty$	0.65^{ST}				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S') = 0.81$; λ_{exc} = 355 nm.	91E297
	n-C_6H_{14}	air	0.3				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 264 nm. $P_T^{O_2} = 1$.	82E258
	$C_6H_5CH_3$	1.2×10^{-3}	1.2				PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	82E010
	C_6H_6	O_2	0.66				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$. Measured $P_T^{O_2}$ = 0.99 and $\phi_T^{O_2} = \phi_T(S)$. Authors assume $f_\Delta^S = 0$ and $\phi_T(S) = 0.81$ to give $f_\Delta^T = 0.81$ but $P_S^{O_2}$ is estimated to be >0.8 so values of f_Δ^S and f_Δ^T are indeterminable.	88E449

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.124	**Chrysene**—Continued								
	C_6H_6	O_2	0.69				PL/Hp-52	λ_{exc} = 355 nm. Measured ϕ_Δ = 0.68, $P_T^{O_2}$ = 0.99 and $\phi_T^{O_2} = \phi_T(S)$ and ϕ_F. Authors assume $f_\Delta^S = 0$ and $\phi_T(S)$ = 0.81 to give f_Δ^T = 0.85 but $P_S^{O_2}$ is estimated to be >0.8 so values of f_Δ^S and f_Δ^T are indeterminable.	88E449
	CCl_4	air	0.2				MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S')$ = 0.7; λ_{exc} = 652 nm.	83E813
	CH_3CN	$\rightarrow \infty$	0.30^{ST}				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S')$ = 2.0; λ_{exc} = 355 nm.	91E297
	EtOH	O_2	0.90				CP/Ac-43	S′ = MB^+; A = Bu_2S; rel. to $\phi_\Delta(S')$ = 0.50[b]; λ_{exc} = 313 nm. $P_T^{O_2}$ = 1.	74F648
1.125	**Chrysene, 2-bromo-**								
	EtOH	O_2	1				CP/Ac-43	S′ = MB^+; A = Bu_2S; rel. to $\phi_\Delta(S')$ = 0.50[b]; λ_{exc} = 313 nm. $P_T^{O_2}$ = 1.	74F648
1.126	**Chrysene, 2-chloro-**								
	EtOH	O_2	1				CP/Ac-43	S′ = MB^+; A = Bu_2S; rel. to $\phi_\Delta(S')$ = 0.50[b]; λ_{exc} = 313 nm. $P_T^{O_2}$ = 1.	74F648
1.127	**Coronene**								
	$C_6H_5CH_3$	1.2×10^{-3}	0.90				PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S')$ = 1.0; λ_{exc} = 347 nm.	82E010
	C_6H_6	1.9×10^{-3}	0.94				CP/Ac-46	λ_{exc} = 365 nm. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 1.80 and 3.3 for S′ = A = DMA and DPBF, resp.	81F364
	C_6H_6	9.0×10^{-3}	0.97	≥0.95	0		CP/Ac-46	λ_{exc} = 365 nm; used $\phi_T(S)$ = 0.56. Assumed $f_T^{O_2}$ = 1; measured $\phi_\Delta(S)/\phi_\Delta(S')$ = 0.95 and 1.25 for S′ = A = DMA and DPBF, resp.	81F364
1.128	**Coumarin**								
	D_2O	air[a]	0.01				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S')$ = 0.3; λ_{exc} = 337 nm.	86F144
	MeOH	air[a]	0.03				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S')$ = 0.4; λ_{exc} = 337 nm.	86F144
1.129	**Coumarin, 7-(diethylamino)-4-methyl-**								
	C_6H_6	air	0.08				CP/Pa-14	A = Rub; λ_{exc} = 365 nm.	87F569
1.130	**Cycloheptatriene**								
	C_6H_6	2×10^{-3}		0.80* 0.66			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.29; λ_{exc} = 355 nm. Measured $P_T^{O_2}$.	89A235
1.131	**1,3-Cyclohexadiene**								
	C_6H_6	8.7×10^{-4}		0.48* 0.40			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.29; λ_{exc} = 355 nm. Measured $P_T^{O_2}$.	89A235
1.132	**2-Cyclohexenethione, 3,5,5-trimethyl-**								
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.9^T	0.9			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S')$ = 1; meas. $\phi_T(S)$ = 1; λ_{exc} = 532 nm. Used $P_S^{O_2}$ = 0, $P_T^{O_2}$ = 1.	86A240
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.5* 0.6^T	0.6			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.4; meas. $\phi_T(S)$ = 1; λ_{exc} = 337 nm. Used $P_S^{O_2}$ = 0, $P_T^{O_2}$ = 1	86A240
1.133	**Cyclopentadiene**								
	C_6H_6	8.7×10^{-4}		0.90* 0.75			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.29; λ_{exc} = 355 nm. Measured $P_T^{O_2}$.	89A235
1.134	**7-Dehydrocholesterol**								
	C_6H_6	air		0.96* 0.85			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S')$ = 0.55; λ_{exc} = 355 nm.	88E575

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.135	**Diacenaphtho[1,2-*b*:2′,1′-*d*]thiophene (DNT)**								
	C_6H_6	air[a]	0.46				PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$. Supersedes 0.98 quoted in [83F172].	92F013
	CH_3CN	air[a]	0.39				PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$. Supersedes 0.62 quoted in [83F172].	92F013
1.136	**2,7-Diazapyrene, 2,7-dimethyl-**								
	D_2O	O_2	0.14				PL/LI-56	S′ = ZnTMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.88$; meas. $\phi_T(S) = 0.17$; $\lambda_{exc} = 355$ nm.	91R201
1.137	**Dibenz[*a*,*h*]anthracene**								
	$C_6H_5CH_3$	1.2×10^{-3}				1.0	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.9$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; used $\epsilon_T(S) = 13{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 1.0$.	83F075
	C_6H_5CN	1.2×10^{-3}				0.23	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.9$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; used $\epsilon_T(S) = 10{,}500$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.23$.	83F075
1.138	**Dibenzo[*def*,*mno*]chrysene (Anthanthrene)**								
	C_6H_6	O_2 var.		1			CP/Ac-14,38	$\lambda_{exc} = 435.8$ nm. A = DMA and DMBA; results consistent with $f_\Delta^S << f_\Delta^T$; assumed $f_T^{O_2} = 1$; measured $\phi_T f_\Delta^T/(f_\Delta^T + f_\Delta^S) = 0.22$.	69F388
1.139	**Dibenzo[*a*,*o*]perylene, 7,16-diphenyl- (Mesodiphenylhelianthrene. MDH)**								
	c-C_6H_{12}	air	0.33				CP/Ac-14	A = S; $\lambda_{exc} = 578$ nm. Recalculated using $f_r^A = 0.30$.	83F406
	n-C_5H_{12}	air	0.28				CP/Ac-A.18	A = S; $\lambda_{exc} = 546$ nm. $f_r^A = 0.30$	87F480
	$C_6H_5CH_3$	air	0.67				CP/Ac-14,38	A = S; meas. $\phi_T(S) = 0.52$; $\lambda_{exc} = 578$ nm. $f_T^{O_2} = 1$, $f_r^A = 0.30$, $[O_2]$ varied, $(f_\Delta^S + f_\Delta^T f_T^{O_2}) = 1.2$.	87F479
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$				0.35	CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.16$.	84F197
	CCl_4	air	0.50				CP/Ac-14	A = S. $f_T^{O_2} = 1$, $f_r^A = 0.30$, $[O_2]$ varied.	87F479
	CH_3COCH_3	air	0.67				CP/Ac-A.18	A = S; $\lambda_{exc} = 546$ nm. $f_r^A = 0.30$	87F480
	$CHCl_3$	air	0.43				CP/Ac-14	A = S; $\lambda_{exc} = 578$ nm. Recalculated using $f_r^A = 0.30$.	83F406
	CS_2	air	0.33				CP/Ac-14	A = S; $\lambda_{exc} = 578$ nm. Recalculated using $f_r^A = 0.30$.	83F406
	MeOH /$C_6H_5CH_3$ (97:3)	air	0.50				CP/Ac-A.18	A = S; $\lambda_{exc} = 546$ nm. $f_r^A = 0.30$	87F480
	$C_6H_5CH_2OH$	air	0.43				CP/Ac-A.18	A = S; $\lambda_{exc} = 546$ nm. $f_r^A = 0.30$	87F480
	m-Cresol	air	0.42				CP/Ac-A.18	A = S; $\lambda_{exc} = 546$ nm. $f_r^A = 0.30$	87F480
1.140	**Dicyanobis(1,10-phenanthroline)ruthenium(II)**								
	MeOH	O_2	0.68^T				CL/Oc-14	A = TME; $\lambda_{exc} = 488$ nm.	777221
1.141	**(4,7-Diphenyl-1,10-phenanthroline)bis(1,10-phenanthroline)osmium(II) ion**								
	MeOH	O_2	0.78^T				CL/Oc-14	A = TME; $\lambda_{exc} = 488$ nm.	777221
1.142	**Ergosterol**								
	C_6H_6	5.5×10^{-4}		0.96* 0.85			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 0.55$; $\lambda_{exc} = 355$ nm.	87E055
	C_6H_6	8.7×10^{-4}		1.0* 0.83			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S') = 0.29$; $\lambda_{exc} = 355$ nm. Measured $P_T^{O_2}$.	89A235

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.143	**9,10-Ethenoanthracene, 9-acetyloxy-11,12-dibenzoyl-9,10-dihydro-**								
	C_6H_6	air[a]	0.62^T	0.9			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.7$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.144	**9,10-Ethenoanthracene, 11,12-dibenzoyl-9,10-dihydro-9,10-dimethoxy-**								
	C_6H_6	air[a]	0.17^T	0.9			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.2$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.145	**9,10-Ethenoanthracene, 11,12-dibenzoyl-9,10-dihydro-9-hydroxy-**								
	C_6H_6	air[a]	0.66^T	0.9			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.7$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.146	**9,10-Ethenoanthracene, 11,12-dibenzoyl-9,10-dihydro-9-methoxy-**								
	C_6H_6	air[a]	0.57^T	0.9			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.6$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.147	**9,10-Ethenoanthracene, 11,12-dibenzoyl-9-ethyl-9,10-dihydro-**								
	C_6H_6	air[a]	0.57^T	0.9			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.6$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.148	**9,10-Ethenoanthracene-9-carbonitrile, 11,12-dibenzoyl-9,10-dihydro-**								
	C_6H_6	air[a]	0.44^T	0.6			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.7$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.149	**9,10-Ethenoanthracene-9-carboxaldehyde, 11,12-dibenzoyl-9,10-dihydro-**								
	C_6H_6	air[a]	0.41^T	0.7			PL/Ad-49,42	A = DPBF; AC = BP; meas. $\phi_T(S) = 0.6$[f]; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	85B073
1.150	**Fluoranthene**								
	n-C_6H_{14}	air	0.5				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 264 nm. $P_i^{O_2} = 1$.	82E258
1.151	**Fluorene**								
	c-C_6H_{12}	air		1.0			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm.	87E234
	C_6H_6	air		0.74* 0.66			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 0.55$; λ_{exc} = 355 nm.	87E234
	CH_3CN	air		1.0			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm.	87E234
	D_2O (mic)	O_2		1.0			PL/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm. [SDS] = 0.2-0.5 mol L^{-1}.	87E234
	MeOH	O_2	0.09				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.10				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
	diox	air		1.0			PL/LI-60	S′ = Np; TD = p-MAP; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm.	87E234

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.152	**Fluorene, 9-(phenylsulfonyl)-**								
	tert-BuOH	O_2	0.035				CP/Pa-14	A = S; P = 9-Fluorenone; λ_{exc} = 360 nm.	707250
1.153	**9-Fluorenone**								
	C_6H_6	O_2	0.82^T	0.88			PL/Hp-52,42	λ_{exc} = 355 nm; used $\phi_T(S) = 0.93$. Measured $\phi_\Delta = 0.82$, $P_T^{O_2} = 1$ and ϕ_F.	88E449
	C_6H_6	O_2	0.83^T	0.89			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.93$. Measured $P_T^{O_2} = 1$.	88E449
	C_6H_6	air	0.7^T	0.8			PL/LI,St-55,42	S′ = Ac; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 355 nm; used $\phi_T(S) = 0.93$[c].	84E287
	CD_3OD	air[a]	0.02				CP/LI-56	S′ = RB; rel. to $\phi_\Delta(S') = 0.76$. $P_T^{O_2} = 1$; measured ratio of I_a at $\lambda_{exc}(S)$ = 367 and $\lambda_{exc}(S')$ = 547 nm.	91F023
	MeOH	O_2	0.07				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.03				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
1.154	**Fluorescein dianion**								
	c-C_6H_{12} (mic)	air	0.15				CP/Ac-14	A = DPBF. Reverse micelles [DAP] = 8×10^{-2} mol L^{-1}; ϕ_Δ decreased with added H_2O.	80N092
	EtOH	air	0.03				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	EtOH	air[a]	0.13				CP/Ac-14	A = DPBF; λ_{exc} = 488 nm. Assumed $f_r^A = 2$.	76R193
	H_2O pH = 7	air	0.03				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
	H_2O	air[a]	0.06				CP/Ac-43,42	S′ = MB^+; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.52$; used $\phi_T(S) = 0.05$. Assumed $P_T^{O_2} = 1$.	737339
1.155	**Fluorescein, dibromo-, dianion**								
	EtOH	air	0.29				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.42				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
1.156	**Fluorescein, 4′,5′-dibromo-2′,7′-dinitro-, dianion (Eosin B)**								
	EtOH	air	0.37				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.52				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
1.157	**Fluorescein, 2′,7′-dibromo-4′-(hydroxymercuri)-, dianion (Mercurochrome)**								
	EtOH	air	0.14	1.0			PL/LI-56,42	S′ = RB; rel. to $\phi_\Delta(S') = 0.76$; meas. $\phi_T(S)$ = 0.14.	92E001
	MeOH	O_2	~0.1				CP/Oc-43	S′ = Eos; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.4$.	90F289
1.158	**Fluorescein, 2′,7′-dichloro-, dianion**								
	EtOH	air	0.04				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.07				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
	H_2O (mic)	air	0.06				CP/Ac-44	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$[b]. [SDS] = 0.1 mol L^{-1}.	86N209
	H_2O (mic)	air	0.03				CP/Ac-44	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$[b]. [CTAB] = 0.1 mol L^{-1}.	86N209
1.159	**Fluorescein, 4′,5′-dichloro-, dianion**								
	EtOH	air	0.04				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.07				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
1.160	**Fluorescein, diiodo-, dianion**								
	EtOH	air	0.33				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.160	**Fluorescein, diiodo-, dianion**—Continued								
	H_2O pH = 7	air	0.48				CP/Ac-44	S′ = Eos; rel. to ϕ_Δ(S′) = 0.57. A = RNO and ADPA.	83E113
1.161	**Fluorescein, 2′,4′,5′,7′-tetrabromo-, dianion (Eosin Y)**								
	CH_3CN	air	0.57[T]				CP/Pa-14	A = DPF; P = 2,5-Diphenylfuran endoperoxide. Method adapted to allow for chain reaction.	87F440
	CH_3COCH_3	air[a]	0.12[T]				MP/LI-56	S′ = Ph a; rel. to ϕ_Δ(S′) = 0.8. Reference value in CCl_4.	82Z317
	EtOH	air	0.60[T]	0.92			PL/LI-56,42	S′ = RB; rel. to ϕ_Δ(S′) = 0.76; meas. ϕ_T(S) = 0.65.	92E001
	EtOH	9.9×10^{-3}	0.42[T]	0.64			CP/Oc-43,42	S′ = MB^+; A = TME; rel. to ϕ_Δ(S′) = 0.50; used ϕ_T(S) = 0.65[d]. Used $P_T^{O_2} = 1$.	84F191
	D_2O pD = 8.2	air	0.58[T]				PL/LI-56	rel. to Eos in EtOH, unclear what reference value was used	91N118
	D_2O (mic) pD = 8.2	air	0.24[T]				PL/LI-56	rel. to Eos in EtOH, unclear what reference value was used; CPC micelles.	91N118
	H_2O	air[a]	0.57[T]	0.89			CP/Ac-43,42	S′ = MB^+; A = 2,5-DMF; rel. to ϕ_Δ(S′) = 0.52; used ϕ_T(S) = 0.64. Assumed $P_T^{O_2} = 1$.	737339
	H_2O (mic)	air	0.54[T]				CP/Ac-44	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76[b]. [SDS] = 0.1 mol L^{-1}.	86N209
	H_2O (mic)	air	0.14[T]				CP/Ac-44	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76[b]. [CTAB] = 0.1 mol L^{-1}.	86N209
	MeOH	air[a]	0.26[T]				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	90F251
	MeOH	air[a]	0.30[T]				CP/Ac-43	A = DPBF. Rel. to ϕ_Δ = 0.32 for eosin disodium salt in ethanol.	90F251
	MeOH	1.06×10^{-2}	0.42[T]	0.64			CP/Oc-43,39	S′ = MB^+; A = TME; rel. to ϕ_Δ(S′) = 0.50; used ϕ_T(S) = 0.66[f]. Used $P_T^{O_2} = 1$.	84F191
1.162	**Fluorescein, 2′,4′,5′,7′-tetrabromo-, benzyl ester, monoanion**								
	MeOH	air[a]	0.36				CP/Ac-43	S′ = Eos; A = DPBF; rel. to ϕ_Δ(S′) = 0.32. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.32				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	90F251
1.163	**Fluorescein, 2′,4′,5′,7′-tetrabromo-, *p*-isopropylbenzyl ester, monoanion**								
	MeOH	air[a]	0.32				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	90F251
	MeOH	air[a]	0.36				CP/Ac-43	S′ = Eos; A = DPBF; rel. to ϕ_Δ(S′) = 0.32. Rel. to S′in ethanol.	90F251
1.164	**Fluorescein, 2′,4′,5′,7′-tetrabromo-, methyl ester, protonated**								
	diox	air[a]	0.26				CP/Ac-43	S′ = *O*-Methyl Rose Bengal methyl ester; A = TPCP; rel. to ϕ_Δ(S′) = 0.70. Soln. contg. 10^{-3} mol L^{-1} HCl.	90F251
	diox	air[a]	0.30				CP/Ac-43	S′ = Eos; A = TPCP; rel. to ϕ_Δ(S′) = 0.32. Soln. contg. 10^{-3} mol L^{-1} HCl. rel. to S′ in ethanol.	90F251
1.165	**Fluorescein, 2′,4′,5′,7′-tetrabromo-, methyl ester, monoanion**								
	MeOH	air[a]	0.32				CP/Ac-43	S′ = Eos; A = DPBF; rel. to ϕ_Δ(S′) = 0.32. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.28				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	90F251
1.166	**Fluorescein, 2′,4′,5′,7′-tetrabromo-3,4,5,6-tetrachloro-, dianion (Phloxin B)**								
	EtOH	air	0.40				CP/Ac-44	S′ = Eos; A = DPBF; rel. to ϕ_Δ(S′) = 0.32.	83E113
	H_2O pH = 7	air	0.65				CP/Ac-44	S′ = Eos; rel. to ϕ_Δ(S′) = 0.57. A = RNO and ADPA.	83E113

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.166	**Fluorescein, 2′,4′,5′,7′-tetrabromo-3,4,5,6-tetrachloro-, dianion (Phloxin B)**—Continued								
	H_2O (mic)	air	0.35				CP/Ac-44	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$[b]. [CTAB] = 0.1 mol L^{-1}.	86N209
	H_2O (mic)	air	0.39				CP/Ac-44	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$[b]. [SDS] = 0.1 mol L^{-1}.	86N209
1.167	**Fluorescein, 2′,4′,5′,7′-tetrachloro-, dianion**								
	EtOH	air	0.05				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.05				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
1.168	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo- (Rose Bengal lactone)**								
	$C_6H_5CH_3$/ MeOH (99:1)	air	0.65^T				CP/Ac-14	A = DPBF; λ_{exc} = 546 nm. $[O_2]$ varied.	87F479
	CCl_4/MeOH (97:3)	air	0.71^T				CP/Ac-14	A = DPBF; λ_{exc} = 546 nm. $[O_2]$ varied.	87F479
	DMF	air	0.4^T				CP/Ac-14,A18	A = DPBF.	79F412
1.169	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, dianion (Rose Bengal dianion, RB)**								
	tert-BuOH	O_2	0.80^T				CP/Pa-14	A = 9-(Phenylsulfonyl)fluorene anion; P = 9-Fluorenone; λ_{exc} = 546 nm.	707250
	$C_6H_5CH_2OH$	air	0.95^T				CP/Ac-14	A = DPBF; λ_{exc} = 546 nm. $[O_2]$ varied.	87F479
	CH_3CN	air	0.54^T				CP/Ac-14	A = DPBF.	90E215
	CH_3CN	air[a]	0.83^T				CP/Pa-14	A = DPF; P = 2,5-Diphenylfuran endoperoxide. Method adapted to allow for chain reaction.	87F440
	EtOH	air[a]	0.68^T	0.8			CP/Pa-43,42	A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 555 nm; used $\phi_T(S) = 0.90$[d]. Rel. to RB in methanol.	86F462
	EtOH	air	0.86^T	1			CP/Ac-44,42	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$; used $\phi_T(S) = 0.90$[d].	83E113
	D_2O pH = 7.4	air	0.62^T				PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.62$. independent of λ = 308 and 532 nm.	91R177
	D_2O pD = 8.2	air	0.75^T				PL/LI-56	rel. to $\phi_\Delta(S') = 0.75$. rel. to RB in EtOH, cor. for solvent k_r.	91N118
	D_2O (mic) pD = 8.2	air	0.75^T				PL/LI-56	rel. to $\phi_\Delta(S') = 0.75$. rel. to RB in EtOH, cor. for solvent k_r; CPC micelles.	91N118
	H_2O	air or O_2	0.76					See Table 4.	
	H_2O pH = 7	air	0.75^T				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
	H_2O pH = 7.0	O_2		0.76			PL/Ad,St-48	A = ADPA; λ_{exc} = 532 nm. used $\Delta\varepsilon_T(S)$ = 4900 L mol^{-1} cm^{-1} at 600 nm; assumed $P_S^{O_2}$ = 0 and measured $P_T^{O_2}$ = 1.	87A043
	H_2O pH = 7.4	O_2	0.75^T				CP/Ac-14	A = TrpH; λ_{exc} = 540 nm. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	0.74^T				CP/Oc-14	A = Im; λ_{exc} = 540 nm. 1.6% NaCl in phosphate buffer.	88N170
	i-octane/ H_2O (96:4) (mic)	O_2	0.81^T	1			PL/Hp-53,42	meas. $\phi_T(S) = 0.78$; λ_{exc} = 355 nm. Soln. cont. 0.1 mol L^{-1} AOT; meas. $\phi_F = 0.057$.	91N191
	i-octane/ H_2O (96:4) (mic)	O_2	0.80^T	1			PL/Hp-52,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.80$; meas. $\phi_T(S)$ = 0.78; λ_{exc} = 355 nm. Soln. cont. 0.1 mol L^{-1} AOT.	91N191

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.169	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, dianion (Rose Bengal dianion, RB)**—Continued								
	H_2O/MeOH (1:1) pH = 7	O_2	0.75[T]				CP/Pa-14	A = TrpH; λ_{exc} = 555 nm.	87F104
	MeOH	air or O_2	0.80					See Table 4.	
	MeOH	air	0.81[T]				CP/Ac-14	A = DPBF.	90E215
	MeOH	air	0.77[T]				CP/Ac-14	A = DPBF.	90F157
	MeOH	air[a]	0.82[T]				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.32. Rel. to S′ in ethanol; ϕ_Δ = 0.93 for 'pure' RB rel. to Eos; ϕ_Δ = 0.87 for 'commercial' RB rel. to Eos; ϕ_Δ = 0.81 for 'pure' RB rel. to ϕ_Δ = 0.76 for commercial RB.	90F251
	MeOH	1.06×10^{-2}	0.79[T]	~1			CP/Oc-43,39	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S')$ = 0.50; used $\phi_T(S)$ = 0.80[f]. Used $P_T^{O_2}$ = 1.	84F191
	MeOH	O_2	0.80[T]				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
	MeOH	O_2	0.80[T]				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.82[T]				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
	MeOH/ $C_6H_5CH_3$ (97:3)	air	0.91[T]				CP/Ac-14	A = DPBF. $[O_2]$ varied.	87F479
	2-PrOH	air	0.76[T]				CP/Ac-14	A = DPBF.	90E215
1.170	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, 6-*O*-acetyl-, ethyl ester**								
	CH_2Cl_2	O_2	0.61				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 561 nm.	84F297 85F152
1.171	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester**								
	CH_2Cl_2/ MeOH (8:2)	O_2	0.37				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 566 nm.	85F171
1.172	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, monoanion**								
	MeOH	air[a]	0.94				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.32. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.82				CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.76.	90F251
	MeOH	O_2	0.72				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 566 nm.	85F171
1.173	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, benzyltriphenylphosphonium salt**								
	MeOH	O_2	0.76				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 561 nm.	88F161
1.174	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, diphenyliodonium salt**								
	MeOH	O_2	0.74				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 561 nm.	88F161
1.175	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, diphenylmethylsulfonium salt**								
	MeOH	O_2	0.73				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 561 nm.	88F161
1.176	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, triethylammonium salt**								
	CH_2Cl_2	O_2	0.67				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S')$ = 0.76; λ_{exc} = 561 nm.	84F297 85F152

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.176	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, triethylammonium salt**—Continued								
	MeOH	O_2	0.74				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
1.177	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, benzyl ester, 2,4,6-triphenylpyrylium salt**								
	MeOH	O_2	0.70				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	88F161
1.178	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, bis(benzyltriphenylphosphonium) salt**								
	MeOH	O_2	0.74				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2 Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	88F161
1.179	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, bis(diphenyliodonium) salt**								
	MeOH	O_2	0.66				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	88F161
1.180	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, bis(triethylammonium) salt**								
	CH_2Cl_2	O_2	0.48				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
	MeOH	O_2	0.72				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
1.181	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, complexed with dicyclohexyl-18-crown-8**								
	CH_2Cl_2	air[a]	0.76				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 559 nm. Rel. to S′ in methanol.	86F462
	CH_3COCH_3	air[a]	0.70				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 557 nm. Rel. to S′ in methanol.	86F462
	$CHCl_3$	air[a]	0.76				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 559 nm. Rel. to S′ in methanol.	86F462
	$CHCl_3$	air[a]	0.36				CP/Ac-14	A = DPBF; λ_{exc} = 560 nm.	79F104
	MeOH	air[a]	0.63				CP/Ac-14	A = DPBF; λ_{exc} = 560 nm.	79F104
1.182	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, ethyl ester**								
	CH_2Cl_2	O_2	0.61				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
	MeOH	O_2	0.73				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
1.183	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, ethyl ester, triethylammonium salt**								
	CH_2Cl_2	O_2	0.71				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152
	MeOH	O_2	0.74				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 561 nm.	84F297 85F152

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.184	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, *p*-isopropylbenzyl ester, protonated**								
	diox	air[a]	0.80				CP/Ac-43	S′ = Eos; A = TPCP; rel. to $\phi_\Delta(S') = 0.32$. Soln. contg. 10^{-3} mol L^{-1} HCl; rel. to S′ in ethanol.	90F251
1.185	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, *p*-isopropylbenzyl ester, monoanion**								
	MeOH	air[a]	0.90				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.79				CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	90F251
1.186	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, *O*-methyl-, methyl ester**								
	diox	air[a]	0.80				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.70				CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	90F251
	MeOH	air[a]	0.80				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$. Rel. to S′ in ethanol.	90F251
1.187	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, methyl ester, protonated**								
	diox	air[a]	0.75				CP/Ac-43	S′ = *O*-Methyl Rose Bengal methyl ester; A = TPCP; rel. to $\phi_\Delta(S') = 0.70$. Soln. contg. 10^{-3} mol L^{-1} HCl; rel. to S′ in methanol.	90F251
	diox	air[a]	0.86				CP/Ac-43	S′ = Eos; A = TPCP; rel. to $\phi_\Delta(S') = 0.32$. Soln. contg. 10^{-3} mol L^{-1} HCl; rel. to S′ in ethanol.	90F251
1.188	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, methyl ester, monoanion**								
	MeOH	air[a]	0.80				CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	90F251
	MeOH	air[a]	0.91				CP/Ac-43	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$. Rel. to S′ in ethanol.	90F251
1.189	**Fluorescein, 3,4,5,6-tetrachloro-2′,4′,5′,7′-tetraiodo-, octyl ester, tributylammonium salt**								
	$C_6H_5CH_3$	O_2	0.40				CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 561$ nm.	84F297 85F152
1.190	**Fluorescein, 2′,4′,5′,7′-tetraiodo-, dianion (Erythrosin)**								
	CH_3CN	air	0.68^T				CP/Pa-14	A = DPF; P = 2,5-Diphenylfuran endoperoxide. Method adapted to allow for chain reaction.	87F440
	DMF	air[a]	0.54^T				CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	88F618
	EtOH	air	0.69^T				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.63^T				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
	H_2O	air[a]	0.68^T	0.68			CP/Ac-43,42	S′ = MB^+; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.52$; used $\phi_T(S) = 1.0$. Assumed $P_T^{O_2} = 1$.	737339
	MeOD	$\sim 10^{-3}$	0.60^T	0.57			PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 1.1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; rel. to S′ in EtOH. Recalcd. value = 0.70 using $\phi_\Delta(S') = 0.64$ [88Z155].	88A165
1.191	**Fluorescein, tribromo-, dianion**								
	EtOH	air	0.32				CP/Ac-44	S′ = Eos; A = DPBF; rel. to $\phi_\Delta(S') = 0.32$.	83E113
	H_2O pH = 7	air	0.44				CP/Ac-44	S′ = Eos; rel. to $\phi_\Delta(S') = 0.57$. A = RNO and ADPA.	83E113
1.192	**Furan, 2,5-di(2-thienyl)-**								
	EtOH	O_2	~0.1	~1			PL/Ac-14,42	A = DPBF; meas. $\phi_T(S) = 0.10^f$; $\lambda_{exc} = 353$ nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.193	**Furo[2,3-*f*][1]benzopyran-7-one, 8-acetyl- (3-Acetoallopsoralen)**								
	C_6H_6	O_2	0.63* 0.55^T	 0.81			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.68$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
1.194	**Furo[2,3-*f*][1]benzopyran-7-one, 4,9-dimethyl- (4,7-Dimethylallopsoralen, 4,7-DMAPs)**								
	C_6H_6	1.91×10^{-3}	0.073* 0.064	 0.49			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.13$; $\lambda_{exc} = 355$ nm.	87E497
1.195	**Furo[2,3-*f*][1]benzopyran-7-one, 2,4,9-trimethyl- (4,7,5′-Trimethylallopsoralen)**								
	C_6H_6	1.91×10^{-3}	0.14* 0.12	 0.68			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.18$; $\lambda_{exc} = 355$ nm.	87E497
	H_2O pH = 7.3	2.65×10^{-4}					CP/Pa-43	S′ = 4,7-DMAPs; A = Im; P = Imidazole endoperoxide; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.84$; $\lambda_{exc} = 365$ nm. RNO as monitor of P.	87E497
1.196	**Furo[2,3-*f*][1]benzopyran-7-one, 3,4,9-trimethyl- (4,7,4′-Trimethylallopsoralen)**								
	C_6H_6	1.91×10^{-3}	0.083* 0.073	 0.26			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.28$; $\lambda_{exc} = 355$ nm.	87E497
	H_2O pH = 7.3	2.65×10^{-4}					CP/Pa-43	S′ = 4,7-DMAPs; A = Im; P = Imidazole endoperoxide; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.38$; $\lambda_{exc} = 365$ nm. RNO as monitor of P.	87E497
1.197	**Furo[2,3-*h*][1]benzopyran-2-one, 3-acetyl- (3-Acetoangelicin)**								
	C_6H_6	O_2	0.46* 0.40^T	 0.73			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.54$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
1.198	**Furo[2,3-*h*][1]benzopyran-2-one, 4,6-dimethyl- (6,4-Dimethylangelicin)**								
	C_6H_6	O_2	0.01^T	0.25			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.04$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
1.199	**Furo[2,3-*h*][1]benzopyran-2-one, 4,8-dimethyl- (4,5′-Dimethylangelicin)**								
	C_6H_6	O_2	0.02^T	0.25			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.08$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
	H_2O pH = 7.3	air[a]	0.02^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; $\lambda_{exc} = 365$ nm. Measured $\phi_T = 0.063$ in MeOH; RNO as monitor of P	84E794
1.200	**Furo[2,3-*h*][1]benzopyran-2-one, 4,9-dimethyl- (4,4′-Dimethylangelicin)**								
	C_6H_6	O_2	0.02^T	0.18			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.11$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
	H_2O pH = 7.3	O_2	0.03^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; $\lambda_{exc} = 365$ nm. Measured $\phi_T = 0.11$ in EtOH; RNO as monitor of P; $P_T^{O_2} = 1$.	84F111 84E794
1.201	**Furo[2,3-*h*][1]benzopyran-2-one, 5,9-dimethyl- (4′,5-Dimethylangelicin)**								
	H_2O pH = 7.3	O_2	0.007^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; $\lambda_{exc} = 365$ nm. Measured $\phi_T = 0.12$ in EtOH; RNO as monitor of P; $P_T^{O_2} = 1$.	84F111 84E794
1.202	**Furo[2,3-*h*][1]benzopyran-2-one, 6,9-dimethyl- (6,4′-Dimethylangelicin)**								
	C_6H_6	O_2	0.01^T	0.14			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.07$; $\lambda_{exc} = 355$ nm.	88E121
1.203	**Furo[2,3-*h*][1]benzopyran-2-one, 4-methyl- (4-Methylangelicin)**								
	H_2O pH = 7.3	air[a]	0.02^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; $\lambda_{exc} = 365$ nm. Measured $\phi_T = 0.05$ in MeOH; RNO as monitor of P	84E794

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.204	**Furo[2,3-*h*][1]benzopyran-2-one, 5-methyl- (5-Methylangelicin)**								
	H_2O pH = 7.3	air[a]	0.02^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; λ_{exc} = 365 nm. Measured $\phi_T = 0.12$ in MeOH; RNO as monitor of P	84E794
1.205	**Furo[2,3-*h*][1]benzopyran-2-one, 8-methyl- (5′-Methylangelicin)**								
	H_2O pH = 7.3	air[a]	0.007^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; λ_{exc} = 365 nm. Measured $\phi_T = 0.08$ in EtOH; RNO as monitor of P	84E794
1.206	**Furo[2,3-*h*][1]benzopyran-2-one, 9-methyl- (4′-Methylangelicin)**								
	H_2O pH = 7.3	O_2	0.01^T				CP/Pa-43	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; λ_{exc} = 365 nm. Measured $\phi_T = 0.08$ in EtOH; RNO as monitor of P; $P_T^{O_2} = 1$.	84F111 84E794
1.207	**Furo[2,3-*h*][1]benzopyran-2-one, 4,6,9-trimethyl- (6,4,4′-Trimethylangelicin)**								
	C_6H_6	O_2	0.02^T	0.16			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.13; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
1.208	**Furo[3,2-*f*][1]benzopyran-7-one (Isopseudopsoralen)**								
	C_6H_6	O_2	0.11*				PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.15; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
			0.10^T	0.67					
1.209	**Furo[3,2-*f*][1]benzopyran-7-one, 8-acetyl- (3-Acetoisopseudopsoralen)**								
	C_6H_6	O_2	0.73*				PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.65; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
			0.64^T	0.99					
1.210	**Furo[3,2-*g*][1]benzopyran-7-one, 2-acetyl-5,9-dimethyl- (5′-Aceto-4,8-dimethylpsoralen)**								
	C_6H_6	O_2	0.43*				PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.52; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
			0.38^T	0.72					
1.211	**Furo[3,2-*g*][1]benzopyran-7-one, 2-acetyl-9-methyl- (5′-Aceto-8-methylpsoralen)**								
	C_6H_6	O_2	0.13*				PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.28; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
			0.11^T	0.39					
1.212	**Furo[3,2-*h*][1]benzopyran-8-one, 7-acetyl- (3-Acetopseudoisopsoralen)**								
	C_6H_6	O_2	0.63*				PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.56; λ_{exc} = 355 nm. $P_T^{O_2} = 1$.	88E121
			0.55^T	0.99					
1.213	**Helianthrene**								
	n-C_5H_{12}	air	0.52				CP/Ac-A.18	A = S; λ_{exc} = 546 nm.	87F480
	$C_6H_5CH_3$	air	0.56				CP/Ac-14,38	A = S; meas. $\phi_T(S) = 0.46$; λ_{exc} = 546 nm. $f_T^{O_2}$ = 1, $[O_2]$ varied, $(f_\Delta^S + f_\Delta^T f_T^{O_2}) = 1.0$.	87F479
	CCl_4	air	0.50				CP/Ac-14	A = S; λ_{exc} = 546 nm. $[O_2]$ varied, $f_T^{O_2} = 1$.	87F479
	CH_3COCH_3	air	0.50				CP/Ac-A.18	A = S; λ_{exc} = 546 nm.	87F480
	MeOH /$C_6H_5CH_3$ (97:3)	air	0.42				CP/Ac-A.18	A = S; λ_{exc} = 546 nm.	87F480
	$C_6H_5CH_2OH$	air	0.24				CP/Ac-A.18	A = S; λ_{exc} = 546 nm.	87F480
	m-Cresol	air	0.18				CP/Ac-A.18	A = S; λ_{exc} = 546 nm.	87F480
1.214	**(*E,E,E*)-2,4,6-Heptatrienal, 5-methyl-7-(2,6,6-trimethyl-1-cyclohexen-1-yl)- (*all-trans*-C_{17} aldehyde)**								
	c-C_6H_{12}	air	0.66^T	1.0			PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 5 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.66$[c], $\varepsilon_T(AC) = 63000$ L mol^{-1} cm^{-1} at 410 nm.	85F041

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.214	**(*E,E,E*)-2,4,6-Heptatrienal, 5-methyl-7-(2,6,6-trimethyl-1-cyclohexen-1-yl)- (*all-trans*-C_{17} aldehyde)**—Continued								
	c-C_6H_{12}	O_2	0.72[T]	1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 5.0 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.66$[f], $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	84F005
	MeOH	air	~0.4[T]	1			PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 1 \times 10^5$ s^{-1}, $k_A = 8 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.41$[c], $\varepsilon_T(AC) = 57000$ L mol^{-1} cm^{-1} at 440 nm.	85F041
	MeOH	O_2	0.42[T]	1.0			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 1.0 \times 10^5$ s^{-1}, $k_A = 8.1 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.41$[f], $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	84F005
1.215	**Heterocoerdianthrone (HCD)**								
	$C_6H_3Cl_3$	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
	$C_6H_5CH_3$	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
	C_6H_6	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
	C_6H_6	$(2\text{-}9) \times 10^{-3}$				1.9	CP/Ac-14,38	A = DPBF; λ_{exc} = 578 nm. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.024$.	84F197
	CCl_4	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
	$CHCl_3$	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
	CS_2	$(1\text{-}50) \times 10^{-4}$		~1	~1		CP/Ac-14,38	A = S. Assumed $f_T^{O_2} = 1$.	767570
1.216	**1,3,5-Hexatriene, 1,6-diphenyl- (DPH)**								
	c-C_6H_{12}	air					PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 5 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(AC) = 114000$ L mol^{-1} cm^{-1} at 416 nm. $\phi_T \approx 0$; $f_\Delta^S + f_T^{O_2} f_\Delta^T = 1.7$.	85F041
	n-C_6H_{14}	O_2	1.0	≥0.24	≥0.17		CP/Ac-27	A = 2,5-DMF; λ_{exc} = 313 nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	MeOH	air					PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 1 \times 10^5$ s^{-1}, $k_A = 8 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(AC) = 121000$ L mol^{-1} cm^{-1} at 410 nm. $\phi_T \approx 0$; $f_\Delta^S + f_T^{O_2} f_\Delta^T = 1.6$.	85F041
1.217	**Indole, 1-methyl-**								
	C_6H_6	air[a]		0.35			PL/βCb-57	S′ = BP; TD = AP; rel. to $\phi_\Delta(S') = 0.35$. Measured $f_\Delta^T(S)/\phi_\Delta(S') = 1.0$.	76F904
	C_6H_6	air[a]		>0.2			PL/βCb-57	S′ = BP; TD = Xanthone; rel. to $\phi_\Delta(S') = 0.35$. Measured $f_\Delta^T(S)/\phi_\Delta(S') = 0.7$ but energy transfer efficiency < 100%.	76F904
1.218	**β-Ionone**								
	C_6H_6	O_2	0.22[e] 0.25[T]	~0.5			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S') = 0.4$; meas. $\phi_T(S) = 0.5$; λ_{exc} = 337 nm.	85E293
1.219	**Isobenzofuran, 1,3-diphenyl- (DPBF)**								
	c-C_6H_{12}	air[a]	0.22				CP/Ac-14	A = S; λ_{exc} = 365 nm. In presence of 5 g L^{-1} ethylene-propylene-ethylidenenorbornene terpolymer.	84P629
	C_6H_6	air	0.26				CP/Ac-14	A = S; λ_{exc} = 365 nm.	81F017
	C_6H_6	1.9×10^{-3}	0.28				CP/Ac-46	A = S; λ_{exc} = 365 nm. Assumed $f_T^{O_2} = 1$; measured $\phi_\Delta(S)/\phi_\Delta(S') = 0.30$ and 0.56 for S′ = Cor and BP, resp.	81F364
	C_6H_6	9.0×10^{-3}	0.78			1.5	CP/Ac-46	A = S; λ_{exc} = 365 nm. Assumed $f_T^{O_2} = 1$; measured $\phi_\Delta(S)/\phi_\Delta(S') = 0.80$ and 0.88 for S′ = Cor and BP, resp.	81F364

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.220	**Naphthalene (Np)**								
	Hexanes	O_2	0.73				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Independent of concentration.	78F016
	c-C_6H_{12}	air		1.0			PL/Ad,St-49	A = DPBF; AC = S; TD = p-MAP; λ_{exc} = 355 nm; used $k_d = 4.2 \times 10^4$ s^{-1}, $\varepsilon_T(S)$ = 24,500 L mol^{-1} cm^{-1} at 415 nm.	87E234
	n-C_6H_{14}	air	0.5				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S')$ = 1; λ_{exc} = 264 nm. $P_T^{O_2} = 1$.	82E258
	C_6D_6	air		0.59* 0.49			PR/LI-60	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.29.	89E113
	C_6H_6	air or O_2		0.62				See Table 4.	
	C_6H_6	air		0.68* 0.56			PR/βCb-59	S′ = BP; TA = Car; rel. to $f_\Delta^T(S')$ = 0.29; used $\varepsilon_T(S)$ = 13,200 L mol^{-1} cm^{-1} at 425 nm, $\varepsilon_T(S')$ = 7630 L mol^{-1} cm^{-1} at 532.5 nm. $P_T^{O_2}$ >0.94.	89E158
	C_6H_6	air		0.55			PL/Ad,St-49	A = DPBF; TD = p-MAP; λ_{exc} = 355 nm; used $k_d = 3.1 \times 10^4$ s^{-1}, $\varepsilon_T(S)$ = 13,200 L mol^{-1} cm^{-1} at 425 nm.	87E234
	C_6H_6	air[a]		0.65			PL/βCb-57	S′ = BP; TD = AP; rel. to $f_\Delta^T(S')$ = 0.35. Measured $f_\Delta^T(S)/f_\Delta^T(S')$ = 1.9.	76F904
	C_6H_6	air[a]		0.60			PL/βCb-57	S′ = BP; TD = Xanthone; rel. to $f_\Delta^T(S')$ = 0.35. Measured $f_\Delta^T(S)/f_\Delta^T(S')$ = 1.7.	76F904
	C_6H_6	O_2		0.5			PR/Ad,St-49	A = DPBF; used $\phi_T(S)$ = 0.82, $\varepsilon_T(S)$ = 13,200 L mol^{-1} cm^{-1} at 425 nm. Measured $G(^3S^*)$.	78E263
	D_2O (mic)	O_2		1.0			PL/Ad-49	A = DPBF; TD = BP; λ_{exc} = 355 nm; used $k_d = 2.4 \times 10^4$ s^{-1}. Soln. cont. 0.2-0.5 mol L^{-1} SDS; $\varepsilon_T(S)$ detd. in SDS at 415 nm by comparison with ε = 24500 L mol^{-1} cm^{-1} at 415 nm in cyclohexane.	87E234
	MeOH	O_2	0.41				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Assumed $f_T^{O_2}$ = 1; $P_S^{O_2} = P_T^{O_2} = 1$; [S] → 0.	78F016
	MeOH	O_2	0.14				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.14				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
1.221	**Naphthalene excimer**								
	MeOH	O_2	0.89				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Assumed f_Δ^T = 1; [S]→∞.	78F016
1.222	**Naphthalene, 1-bromo-**								
	MeOH	O_2	0.86				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm.	78F016
1.223	**Naphthalene, 1-methyl- (1MN)**								
	c-C_6H_{12}	→ ∞	0.77[ST]				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S')$ = 0.81; λ_{exc} = 355 nm.	91E297
	CH_3CN	→ ∞	0.30[ST]				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S')$ = 2.0; λ_{exc} = 355 nm.	91E297
1.224	**2-Naphthalenethione, 1,1-dimethyl-**								
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.6* 0.7[T]	0.7			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.4; meas. $\phi_T(S)$ = 1; λ_{exc} = 337 nm. Used $P_S^{O_2} = 0$.	86A240
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	1.0[T]	1.0			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S')$ = 1; meas. $\phi_T(S)$ = 1; λ_{exc} = 532 nm. Used $P_S^{O_2} = 0$.	86A240
1.225	**2-Naphthalenethione, 1,1,3-trimethyl-**								
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	1.0[T]	1.0			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S')$ = 1; meas. $\phi_T(S)$ = 1; λ_{exc} = 532 nm. Used $P_S^{O_2} = 0$.	86A240
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.7* 0.8[T]	0.8			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S')$ = 0.4; meas. $\phi_T(S)$ = 1; λ_{exc} = 337 nm. Used $P_S^{O_2} = 0$.	86A240

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.226	**Norharman (β-Carboline)**								
	D_2O pD = 7	air	0.03				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.30$; λ_{exc} = 337 nm.	87F290
1.227	**1,3,5,7-Octatetraene, 1,8-diphenyl- (DPO)**								
	c-C_6H_{12}	air				1.9	PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 5 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(AC) = 210000$ L mol^{-1} cm^{-1} at 437 nm. $\phi_T \approx 0$; $f_\Delta^S + f_T^{O_2} f_\Delta^T = 1.9$.	85F041
	MeOH	air				1.4	PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 1 \times 10^5$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\varepsilon_T(AC) = 191000$ L mol^{-1} cm^{-1} at 430 nm. $\phi_T \approx 0$; $f_\Delta^S + f_T^{O_2} f_\Delta^T = 1.4$.	85F041
1.228	**2,4,6-Octatriene, 2,6-dimethyl- (Neoalloocimene)**								
	C_6H_6	1×10^{-2}		0.54* 0.45			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S') = 0.29$; λ_{exc} = 355 nm. Measured $P_T^{O_2}$.	89A235
1.229	**3-Pentanethione, 2,2,4,4-tetramethyl- (DTBTK)**								
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.81^T	0.85			PL/Ad-49,39	A = DPBF; AC = DPH; TA = DPH; meas. $\phi_T(S) = 0.95$[c]; λ_{exc} = 490 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 100{,}000$ L mol^{-1} cm^{-1} at 426 nm.	85A300
1.230	**2-Pentanone**								
	neat	O_2	0.03				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Used $p_A = 1$.	79F184
1.231	**3-Pentanone**								
	neat	O_2	0.04				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Used $p_A = 1$.	79F184
1.232	**3-Pentanone, 2,4-dimethyl-**								
	neat	O_2	<0.0003				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Used $p_A = 1$.	79F184
1.233	**Perylene (Per)**								
	n-C_6H_{14}	O_2	1.3	≥0.65	≥0.65		CP/Ac-27	A = 2,5-DMF; λ_{exc} = 366 nm. $P_T^{O_2} = 1$; assumes $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	C_6H_6	air		0.88* 0.78			PL/LI-60	S′ = BP; TD = BP; rel. to $f_\Delta^T(S') = 0.31$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$, cor. for energy transfer efficiency.	90A328
	C_6H_6	air	0.29				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; λ_{exc} = 532 nm. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$.	90A328
	C_6H_6	var.			0.56	1.3	PL/LI-38,56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = \sim 0$. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$, used $f_\Delta^T = 0.78$.	90A328
	C_6H_6	O_2 var.		~1			CP/Ac-14,38	λ_{exc} = 435.8 nm. A = DMA and DMBA; results consistent with $f_\Delta^S \ll f_\Delta^T$; assumed $f_T^{O_2} = 1$; meas. $\phi_T f_\Delta^T / (f_\Delta^T + f_\Delta^S) = 0.06$.	69F388
1.234	**Perylo[1,12-*def*]-1,3-dioxepin-5,11-dione, 6,12-dihydroxy-8,9-bis(2-hydroxypropyl)-7,10-dimethoxy- (Cercosporin)**								
	C_6D_6	air or O_2	0.81				PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.81$; λ_{exc} = 532 nm.	83R123
	C_6D_6	air[a]	0.81				CP/Ac-43	S′ = MPDME; A = 2M2P; rel. to $\phi_\Delta(S') = 0.81$.	83R123
1.235	**Phenalen-1-one**								
	C_6D_6	air[a]	0.94^T	0.95			CP/LI-56,42	S′ = 9-Fluorenone; rel. to $\phi_\Delta(S') = 0.83$; meas. $\phi_T(S) = 1.0$[d]; λ_{exc} = 367 nm; used $\phi_T(S) = 1$[d]. Assumed $P_T^{O_2} = 1$.	91F023
	C_6H_6	air[a]	0.93^T	0.93			CP/LI-56,42	S′ = 9-Fluorenone; rel. to $\phi_\Delta(S') = 0.83$; meas. $\phi_T(S) = 1.0$; λ_{exc} = 367 nm. Assumed $P_T^{O_2} = 1$.	91F023

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.235	**Phenalen-1-one**—Continued								
	CCl_4	air[a]	0.95^T				CP/Ac-14	A = TME. D.E. Nicodem, R.S. da Silva, M.M. da Silva, personal communication.	91F023
	CD_3OD	air[a]	0.97^T	0.97			CP/LI-56,42	S′ = RB; rel. to $\phi_\Delta(S') = 0.76$; meas. $\phi_T(S) = 1.0$. $P_T^{O_2} = 1$; meas. ratio of I_a at $\lambda_{exc}(S) = 367$ and $\lambda_{exc}(S') = 547$ nm.	91F023
1.236	**Phenalen-1-one, 6-amino-**								
	EtOH	air[a]	0.043				CP/Ac-14	A = DMA. Extrapolated to [DMA] → ∞.	85F501
1.237	**Phenanthrene**								
	c-C_6H_{12}	→ ∞	0.44^{ST}				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S') = 0.81$; $\lambda_{exc} = 355$ nm.	91E297
	n-C_6H_{14}	air	0.3^T				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 264$ nm. $P_T^{O_2} = 1$.	82E258
	C_6H_6	O_2	0.59	0.84			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.70$. Measured $\phi_\Delta = 0.57$, $P_T^{O_2} = 0.97$ and ϕ_F.	88E449
	C_6H_6	O_2	0.62	0.88			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.70$. Measured $P_T^{O_2} = 0.97$.	88E449
	CH_3CN	→ ∞	0.24^{ST}				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S') = 2.0$; $\lambda_{exc} = 355$ nm.	91E297
	MeOH	O_2	0.50				CP/Ac-14	A = 2,5-DMF; $\lambda_{exc} = 313$ nm.	78F016
1.238	**Phenanthro[1,10,9,8-*opqra*]perylene-7,14-dione, 1,3,4,6,8,13-hexahydroxy-10,11-dimethyl- (Hypericin, HYP)**								
	D_2O (mic) pH = ~7	air	0.72	1			PL/Ad-49,42	A = DPBF; AC = S; meas. $\phi_T(S) = 0.70$; $\lambda_{exc} = 640$ nm; used $k_d = 2.0 \times 10^4$ s^{-1}, $k_A = 1.0 \times 10^9$ L mol^{-1} s^{-1}, $\varepsilon_T(AC) = 19400$ L mol^{-1} cm^{-1} at 640 nm. BRIJ 35 micelles.	88N343
	EtOH	2.1×10^{-3}	0.73	1	0		PL/Ad-49,39	A = MDH; P = Mesodiphenylhelianthrene endoperoxide; AC = S; $\lambda_{exc} = 308$ nm; used $k_d = 8.3 \times 10^4$ s^{-1}, $k_A = 7.0 \times 10^9$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.71$, $\varepsilon_T(AC) = 13100$ L mol^{-1} cm^{-1} at 630 nm.	87F541
1.239	**Phenazine (Pz)**								
	C_6H_6	air or O_2	0.88	1.0				See Table 4.	
	C_6H_6	air	0.83^T	0.98			PL/LI-57,42	used $\phi_T(S) = 0.85$. S′ = Pz in O_2, $\phi_\Delta(S') = 0.83$; $P_T^{O_2} = 1$.	90A328
	C_6H_6	O_2	0.83^T	0.98			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 0.85$. Measured $\phi_\Delta = 0.83$, $P_T^{O_2} = 1$ and ϕ_F.	88E449
	CH_2Cl_2	O_2	0.89^T				PL/Hp-52	$\lambda_{exc} = 354$ nm.	88Z155
	$CHCl_3$	O_2	0.84^T				PL/Hp-52	$\lambda_{exc} = 354$ nm.	88Z155
	i-octane/ H_2O (96:4) (mic)	O_2	0.80				PL/Hp 53	$\lambda_{exc} = 355$ nm. Soln. cont. 0.1 mol L^{-1} AOT; meas. $\phi_F = <0.01$.	91N191
1.240	**Phenothiazine**								
	CH_3CN	O_2	0.20	0.21			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; meas. $\phi_T(S) = 0.96$[f]; $\lambda_{exc} = 355$ nm.	91A308
1.241	**Phenothiazine, 2-acetyl-**								
	CH_3CN	O_2	~0.46				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.242	**Phenothiazine, 2-methoxy-**								
	CH_3CN	O_2	0.21				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.243	**Phenothiazine, 10-methyl-**								
	CH_3CN	O_2	0.19				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.244	**Phenothiazine, 2-(trifluoromethyl)-**								
	CH_3CN	O_2	0.18				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 355$ nm.	91A308
1.245	**Phenothiazinium, 3,7-bis(dimethylamino)- (Methylene Blue, MB)**								
	$C_6H_5CH_2OH$	air	0.48^T				CP/Ac-14	A = DPBF. $[O_2]$ varied.	87F479
	$C_6H_5CH_3$/ MeOH (99:1)	air	0.51^T				CP/Ac-14	A = DPBF. $[O_2]$ varied.	87F479
	CH_2Cl_2	air[a]	0.57^T	~1			CP/Ac-14,42	A = 2,5-DMF; used $\phi_T(S) = 0.52$. Assumed $P_T^{O_2} = 1$.	737339
	CH_3CN	air	0.52^T				CP/Pa-14	A = DPF; P = 2,5-Diphenylfuran endoperoxide. Method adapted to allow for chain reaction.	87F440
	EtOH	air[a]	0.52^T	1			CP/Ac-14,42	A = DMA; used $\phi_T(S) = 0.52$. Assumed $P_T^{O_2} = 1$.	737339
	EtOH	9.9×10^{-3}	0.50^T	~1			CP/Oc-43,39	A = TME; rel. to $\phi_\Delta(S') = 0.50$; used $\phi_T(S) = 0.52$[f]. Used $P_T^{O_2} = 1$; rel. to MB^+ in MeOH.	84F191
	H_2O	air	0.60^T				CP/Ac-27	A = 2,5-DMF. Assumed $f_r^A = 2$; $P_T^{O_2} = 1$.	78F061
	H_2O	air[a]	0.52^T	1			CP/Ac-14,42	A = 2,5-DMF; used $\phi_T(S) = 0.52$. Assumed $P_T^{O_2} = 1$.	737339
	H_2O pH = 7.4	O_2	0.39^T				CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 546$ nm. RNO as monitor of P.	85R008
	H_2O (mic) pH = 7.4	O_2	0.37^T				CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 546$ nm. RNO as monitor of P; 0.23 mg/mL egg phosphatidylcholine.	85R008
	MeOD	$\sim 10^{-3}$	0.70* 0.58^T				PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.57$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; rel. to S′ in EtOH; recalcd. using $\phi_\Delta(S') = 0.64$ [88Z155].	88A165
	MeOH	air	0.50^T				CP/Ac-14	A = DPBF.	90F157
	MeOH	air[a]	0.57^T				PL/LI-56	S′ = Ery; rel. to $\phi_\Delta(S') = 0.60$.	87R138
	MeOH	air[a]	0.52^T				CP/Ac-14,42	A = DPBF; used $\phi_T(S) = 0.52$. Assumed $P_T^{O_2} = 1$.	737339
	MeOH	O_2	0.52^T				CL/Ac-14	A = DPBF; $\lambda_{exc} = 633$ nm. Assumed $f_\Delta^T = 1$.	87E690
	MeOH/ $C_6H_5CH_3$ (97:3)	air	0.48^T				CP/Ac-14	A = DPBF. $[O_2]$ varied.	87F479
	2-Methoxy-ethanol	O_2	0.43^T				CL/Ac-14	A = DPBF; $\lambda_{exc} = 633$ nm. Assumed $f_\Delta^T = 1$.	87E690
	Propylene carbonate	O_2	0.35^T				CL/Ac-14	A = DPBF; $\lambda_{exc} = 633$ nm. Assumed $f_\Delta^T = 1$.	87E690
1.246	**Phenothiazinium, 3,7-diamino- (Thionine)**								
	CH_3CN	air	0.58^T				CP/Pa-14	A = DPF; P = 2,5-Diphenylfuran endoperoxide. Method adapted to allow for chain reaction.	87F440
	H_2O	air[a]	0.58^T	1			CP/Ac-43,42	S′ = MB^+; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.52$; used $\phi_T(S) = 0.55$. Assumed $P_T^{O_2} = 1$.	737339
1.247	**Pivalothiophenone**								
	C_6H_6	air	1.0^T	1.0			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S') = 1$; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 532$ nm.	87A340
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1$. $[S] \rightarrow 0$, $\phi_\Delta = 0.94$ at $[S] = 0.01$ mol L^{-1}.	83F028 82F140

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.248	**Pivalothiophenone, 4′-chloro-**								
	C_6H_6	air[a]	1.1^T	1			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S') = 1$; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 532$ nm.	87A340
1.249	**Pivalothiophenone, 4′-fluoro-**								
	C_6H_6	air	0.98^T	0.98			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S') = 1$; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 532$ nm.	87A340
1.250	**Pivalothiophenone, 4′-methoxy-**								
	C_6H_6	air	0.87^T	0.87			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S') = 1$; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 532$ nm.	87A340
	$CHCl_3$	air[a]	1.0^T	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1$. [S] → 0, ϕ_Δ = 0.86 at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.251	**1,2-Propanedione, 1-phenyl-**								
	C_6H_6	O_2	0.38				CP/Pa-14	A = 1,2-Dimethylcyclohexene; $\lambda_{exc} = 366$ nm. P = 3-Hydroxy-1,2-dimethylcyclohexene, 2-Hydroxy-2-methyl-1-methylidenecyclohexane, and 3-Hydroxy-2,3-dimethylcyclohexene.	85F153
1.252	**Pseudoisopsoralen (Furo[3,2-*h*][1]benzopyran-8-one)**								
	C_6H_6	O_2	0.01^T	0.33			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.03; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121
1.253	**Pseudopsoralen (Furo[2,3-*g*][1]benzopyran-6-one)**								
	C_6H_6	O_2	0.03^T	0.60			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.05; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
1.254	**Pseudopsoralen, 3-carbethoxy-**								
	C_6H_6	O_2	0.56* 0.49^T	 0.96			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.51; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
1.255	**Psoralen (Furo[3,2-*g*][1]benzopyran-7-one)**								
	C_6H_6	O_2	0.01^T	0.33			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.03; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
	CCl_4	air	0.0055				MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 652$ nm.	83E813
	D_2O pD = 7.0	O_2	0.18				CP/Ac-44	S′ = HP; A = Subtilisin Carlsberg; rel. to $\phi_\Delta(S') = 0.43$; $\lambda_{exc} = 365$ nm.	87R015
	D_2O	air	0.04				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.3$; $\lambda_{exc} = 337$ nm.	86E959 86F144
	MeOH	air	0.05				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.4$; $\lambda_{exc} = 337$ nm.	86E959 86F144
1.256	**Psoralen, 3-carbethoxy-**								
	C_6H_6	O_2	0.34* 0.30^T	 1.0			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.30; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
	H_2O pH = 7.3	O_2	0.3^T	1			CP/Pa-43,42	S′ = Ang; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.02$[b]; λ_{exc} = 365 nm; used $\phi_T(S) = 0.32$[d]. RNO as monitor of P; $P_T^{O_2} = 1$.	84F111
1.257	**Psoralen, 5,8-dimethoxy-**								
	C_6H_6	O_2	0.005* 0.004^T	 0.10			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S)$ = 0.04; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
1.258	**Psoralen, 5-methoxy-**								
	C_6H_6	air	0				PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; $\lambda_{exc} = 308$ nm. No emission detected.	91F273

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.258	**Psoralen, 5-methoxy-**—Continued								
	C_6H_6	O_2	0.02^T	0.29			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.07$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
	D_2O pD ≅ 7.0	O_2	0.013				CP/Ac-44	S′ = HP; A = Subtilisin Carlsberg; rel. to $\phi_\Delta(S') = 0.43$; $\lambda_{exc} = 365$ nm.	87R015
1.259	**Psoralen, 5-methoxy-, DNA complex**								
	D_2O/EtOH (97.5:2.5)	O_2					CP/Ac-43	S′ = 5-MOP; A = DOPA; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 3.2$; $\lambda_{exc} = 313$ nm. Soln. contg. 0.1% DNA, 2×10^{-3} mol L^{-1} NaCl.	81F482
	D_2O/EtOH (97.5:2.5)	O_2					CP/Ac-43	S′ = 5-MOP; A = DOPA; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 3.6$; $\lambda_{exc} = 335$ nm. Soln. contg. 0.1% DNA, 2×10^{-3} mol L^{-1} NaCl.	81F482
1.260	**Psoralen, 8-methoxy- (8-MOP)**								
	C_6H_6	air	<0.02				PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; $\lambda_{exc} = 308$ nm. No emission detected.	91F273
	C_6H_6	O_2	0.005* 0.004^T	0.4			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.01$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
	CCl_4	air	0.002^T				MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 652$ nm.	83E813
	CCl_4	air[a]	<0.03				MP/LI-56	S′ = An. Used $\phi_T(An) = 0.7$.	82F071
	D_2O pD = 7.0	O_2	0.035				CP/Ac-44	S′ = HP; A = Subtilisin Carlsberg; rel. to $\phi_\Delta(S') = 0.43$; $\lambda_{exc} = 365$ nm.	87R015
	D_2O	air	0.009				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.3$; $\lambda_{exc} = 337$ nm.	86E959 86F144
	H_2O	air	0.0007				CP/Ac-14	A = S; $\lambda_{exc} = 313$ nm.	83F188
	H_2O/EtOH (1:1)	air[a]	0.03^T				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 337$ nm.	86F144
	MeOH	air	0.02^T	~0.7			PL/LI-56,42	S′ = RF; rel. to $\phi_\Delta(S') = 0.4$; $\lambda_{exc} = 337$ nm; used $\phi_T(S) = 0.03$[d].	86E959 86F144
1.261	**Psoralen, 4,5′,8-trimethyl-**								
	C_6H_6	O_2	0.09* 0.08^T	0.38			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.21$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$.	88E121 86E160
1.262	**Pyranthrene**								
	$C_6H_5CH_3$	1.2×10^{-3}				0.97	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.55$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; used $\varepsilon_T(S) = 14{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.97$.	83F075
	C_6H_5CN	1.2×10^{-3}				0.45	PL/Ad,St-48	A = Rub; meas. $\phi_T(S) = 0.52$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; used $\varepsilon_T(S) = 8{,}000$ L mol^{-1} cm^{-1} at λ_{max}; $n_\Delta = 0.45$.	83F075
1.263	**Pyrene (Py)**								
	Hexanes	O_2	0.86				CP/Ac-14	A = 2,5-DMF; $\lambda_{exc} = 313$ nm.	78F016
	n-C_6H_{14}	O_2	0.79				CP/Ac-27	A = 2,5-DMF; $\lambda_{exc} = 313$ nm. $P_T^{O_2} = 1$; used $p_A = 1$.	79E643
	$C_6H_5CH_3$	1.2×10^{-3}	1.9				PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	82E010
	C_6D_6	1.2% O_2 in N_2		0.65			PR/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 0.55$. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	90A328
	C_6H_6	air	0.71				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$	90A328

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.263	**Pyrene (Py)**—Continued								
	C_6H_6	O_2	0.74^{ST}				PL/Hp-52	λ_{exc} = 355 nm. Measured $\phi_\Delta = 0.74$, $P_T^{O_2} = 1$ and $\phi_T^{O_2} = 0.96$ and ϕ_F. Authors assume $f_\Delta^S = 0$ and use $\phi_T^{O_2}(S) = 0.96$ to give $f_\Delta^T = 0.77$ but $P_S^{O_2} = 0.95$ so values of f_Δ^S and f_Δ^T are indeterminable.	88E449
	C_6H_6	O_2	0.74^{ST}				PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$. Measured $P_T^{O_2} = 1$ and $\phi_T^{O_2} = 0.96$. Authors assume $f_\Delta^S = 0$ and use $\phi_T^{O_2}(S) = 0.96$ to give $f_\Delta^T = 0.77$ but $P_S^{O_2} = 0.95$ so values of f_Δ^S and f_Δ^T are indeterminable.	88E449
	C_6H_6	var.			0.13	0.78	PL/LI-38,56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; meas. $\phi_T(S) = 0.29$. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$, used $f_\Delta^T = 0.65$.	90A328
	C_6H_6	1.9×10^{-3}, 9.0×10^{-3}	1.5^{ST}	~1	~0.5	1.5	CL/Ac-49,38	S′ = A = DMA; rel. to $\phi_\Delta(S') = 1.0$. Assumed $f_T^{O_2} = 1$.	83F116
	CH_3CN	$\rightarrow \infty$	0.42^{ST}				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S') = 2.0$; λ_{exc} = 355 nm.	91E297
	H_2O (mic)	O_2	0.9				CP/Ac-14	A = DPBF; λ_{exc} = 338 nm. [SDS] = 0.1 mol L^{-1}.	78A174
	H_2O (mic)	O_2	1.0				CP/Ac-14	A = DPBF; λ_{exc} = 338 nm. [DTAC] = 0.1 mol L^{-1}.	78A174
	MeOH	O_2	0.6				CP/Ac-14	A = DPBF; λ_{exc} = 338 nm.	78A174
	MeOH	O_2	0.76				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Assumed $f_\Delta^T = 1$; [S]→0.	78F016
	MeOH	O_2	0.60				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.63				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
1.264	**Pyrene, excimer**								
	C_6H_6	1.9×10^{-3}, 9.0×10^{-3}	0.8			0.8	CL/Ac-49,38	S′ = A = DMA; rel. to $\phi_\Delta(S') = 1.0$. Assumed $f_T^{O_2} = 1$.	83F116
	MeOH	O_2	0.46				CP/Ac-14	A = 2,5-DMF; λ_{exc} = 313 nm. Assumed $f_\Delta^T = 1$; [S]→∞.	78F016
1.265	**1-Pyrenecarboxaldehyde**								
	c-C_6H_{12}	O_2	0.87^T	1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 5.0 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.78^f$, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	84F005
	C_6H_6	O_2	0.68^T	1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.57^f$, $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7600$ L mol^{-1} cm^{-1} at 532 nm.	84F005
1.266	**Pyridine, 2,6-bis(2-thienyl)-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.53^T				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7640$ L mol^{-1} cm^{-1} at 525 nm. $p_A \approx 1$.	87E410
1.267	**α-Quaterthienyl**								
	EtOH	O_2	$\sim 0.2^T$	~1			PL/Ac-14,42	A = DPBF; meas. $\phi_T(S) = 0.20^f$; λ_{exc} = 353 nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020
1.268	**Quinoline**								
	MeOH	O_2	0.09				CP/Oc-14	A = 2,5-DMF; λ_{exc} = 283-373 nm.	70F735
	MeOH	O_2	0.10				CP/Oc-14	A = TME; λ_{exc} = 283-373 nm.	70F735
1.269	**Quinoline-2-carboxylic acid, 4-hydroxy- (Kynurenic acid)**								
	D_2O pD = 7	air	0.16				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.30$; λ_{exc} = 337 nm.	87F290

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.269	**Quinoline-2-carboxylic acid, 4-hydroxy- (Kynurenic acid)**—Continued								
	H_2O pH = 7.4	air	0.42				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 332 nm. RNO as monitor of P.	91R141
1.270	**Quinoxaline**								
	C_6H_6	air	~0.91	~0.91			PL/Hp-52,42	λ_{exc} = 337 nm. Measured ϕ_T; assumed $P_T^{O_2}$ = 1, [S] > 5×10^{-4} mol L^{-1}, $\phi_\Delta = 0.73$ extrapolating [S] → 0.	91F198
1.271	**13-(*Z*)-Retinal**								
	CCl_4	air	0.6				MP/LI-56	S′ = PPDME; rel. to $\phi_\Delta(S') = 0.8$; λ_{exc} = 385 nm.	78F700
1.272	**(*all-E*)-Retinal**								
	c-C_6H_{12}	air		1			PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 337 nm; used $k_d = 5 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}. ε_T(AC) not given.	85F041
	c-C_6H_{12}	O_2	0.66^T	~1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 5.0 \times 10^4$ s^{-1}, $k_A = 3.4 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.4\text{-}0.7^f$, ϕ_T(AC) = 1, ε_T(AC) = 7600 L mol^{-1} cm^{-1} at 532 nm.	84F005
	CCl_4	air	0.6^T				MP/LI-56	S′ = PPDME; rel. to $\phi_\Delta(S') = 0.8$; λ_{exc} = 385 nm.	78F700
	EtOH	O_2	0.096^T				CP/Ac-15	A = 2,5-DMF; λ_{exc} = 365 nm.	78F201
	MeOH	air	0.13^T	1			PL/Ad-49,39	A = DPBF; λ_{exc} = 337 nm; used $k_d = 1 \times 10^5$ s^{-1}, $k_A = 8 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.12^c$. ε_T(AC) not given.	85F041
	MeOH	O_2	0.20^T	~1			PL/Ad-49,42	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 1.0 \times 10^5$ s^{-1}, $k_A = 8.1 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.12^f$, ϕ_T(AC) = 1, ε_T(AC) = 7600 L mol^{-1} cm^{-1} at 532 nm.	84F005
1.273	**(*all-E*)-Retinol**								
	n-C_6H_{14}	air		0.78			PL/Ad-61	S′ = NMTA; A = DPBF; TD = NMTA; rel. to $f_\Delta^T(S') = 1.1$; λ_{exc} = 337 nm. $P_T^{O_2} = 1$; cor. for S quenching.	85E190
	n-C_6H_{14}	1.4×10^{-4}	0.25				PL/Ad-43	S′ = An; A = DPBF; TD = Triphenylene; rel. to $\phi_\Delta(S') = 0.81$; λ_{exc} = 254 nm. Used $P_T^{O_2} = 1$, $f_\Delta^T(S') = 1$.	83E084
	C_6H_6	var			0.42		PL/Ad-49,39	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ε_T(AC) = 7.630 L mol^{-1} cm^{-1} at 532 nm. $P_T^{O_2} = 1$; measured $f_T^{O_2} = 0.36$, $f_\Delta^S + (f_\Delta^T - \phi_T) f_T^{O_2} = 0.71$, used $f_\Delta^T = 0.75$.	85E190
	C_6H_6	air		0.75			PL/Ad-61	S′ = NMTA; A = DPBF; TD = NMTA; rel. to $f_\Delta^T(S') = 0.92$; λ_{exc} = 337 nm. $P_T^{O_2} = 1$; cor. for S quenching.	85E190
	MeOH	var.			0.30		PL/Ad-49,39	A = DPBF; AC = BP; λ_{exc} = 337 nm. $P_T^{O_2} = 1$; measured $f_T^{O_2} = 0.47$, $f_\Delta^S + (f_\Delta^T - \phi_T) f_T^{O_2} = 0.68$, used $f_\Delta^T = 0.72$.	85E190
	MeOH	air		0.78			PL/Ad-61	S′ = $Ru(bpy)_3^{2+}$; A = DPBF; TD = $Ru(bpy)_3^{2+}$; rel. to $f_\Delta^T(S') = 0.92$; λ_{exc} = 337 nm. $P_T^{O_2} = 1$; cor. for S quenching.	85E190
1.274	**Riboflavine (RF)**								
	D_2O	air[a]	0.3				MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. Reference value in CCl_4.	82Z317
	H_2O pH = 7.4	air	0.49				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 445 nm. RNO as monitor of P.	91R141

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.274	**Riboflavine (RF)**—Continued								
	H_2O/EtOH (1:1)	air[a]	0.5				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.3$[b]; λ_{exc} = 337 nm. Rel. to RF in D_2O.	86F144
	MeOD	$\sim 10^{-3}$	0.58* 0.48	0.79			PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.61$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$; rel. to S′ in EtOH; recalcd. using $\phi_\Delta(S') = 0.64$ [88Z155].	88A165
	MeOH	air[a]	0.47				PL/LI-56	S′ = Ery; rel. to $\phi_\Delta(S') = 0.60$.	87R138
	MeOH	air[a]	0.4				PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.3$[b]; λ_{exc} = 337 nm. Rel. to RF in D_2O.	86F144
1.275	**Riboflavine 5′-(dihydrogen phosphate) (FMN)**								
	H_2O pH = 7.4	air	0.49				CP/Pa-43	S′ = RB; A = Im; rel. to $\phi_\Delta(S') = 0.76$; λ_{exc} = 445 nm. RNO as monitor of P.	91R141
1.276	**Riboflavin-2′,3′,4′,5′-tetraacetate**								
	CH_3CN	O_2	0.65				CP/Pa-14	λ_{exc} = 442 nm. A = Oleic, linoleic or linolenic acid; hydroperoxide formation.	89F484
1.277	**Rubicene (Benz(*a*)indeno(1,2,3-*hi*)aceanthrylene)**								
	C_6H_6	air	0.31				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	C_6H_6	air	0.24				CP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.67$.	88E609
	CCl_4	air	0.30				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	CH_3CN	air	0.18				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	$CHCl_3$	air	0.31				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	CS_2	air	0.46				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	$ClCF_2CCl_2F$	air	0.23				CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
1.278	**Rubrene (Tetracene, 5,6,11,12-tetraphenyl-, Rub)**								
	c-C_6H_{12}	O_2	0.95			1.4	CP/Ac-14,38	S′ = A = DPBF; λ_{exc} = 546 nm. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$; used $P_S^{O_2} = 0.67$ and $\phi_T = 0$.	79E611
	n-C_6H_{14}	O_2	1.1			1.5	CP/Ac-14,38	S′ = A = DPBF; λ_{exc} = 546 nm. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$; used $P_S^{O_2} = 0.78$ and $\phi_T = 0$.	79E611
	n-C_6H_{14}	O_2	1.2	≥0.54	≥0.54		CP/Ac-27	A = 2,5-DMF; λ_{exc} = 313 nm. $P_T^{O_2} = 1$; assumes $f_T^{O_2} = 1$; used $p_A = 1$.	79E643
	i-octane	O_2	1.1			1.4	CP/Ac-14,38	S′ = A = DPBF; λ_{exc} = 546 nm. $P_T^{O_2} = 1$; Assumed $f_T^{O_2} = 1$; used $P_S^{O_2} = 0.76$ and $\phi_T = 0$.	79E611
	$C_6H_5CH_3$	air				2	PL/Ad,St-48	A = S; λ_{exc} = 530 nm; used $k_d = 3.2 \times 10^4\ s^{-1}$, $k_A = 2.5 \times 10^7$ L mol^{-1} s^{-1}, $\varepsilon_T(S) = 26000$ L mol^{-1} cm^{-1} at 500 nm. $n_\Delta = 2$.	82E072
	$C_6H_5CH_3$	$(0.6\text{-}1.2) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Measured $f_\Delta^T + f_\Delta^S f_T^{O_2} = 1.6$	756223
	$C_6H_5CH_3$	O_2 (10 atm)	1.8				PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	82E010
	C_6H_6	$(0.6\text{-}1.2) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Measured $f_\Delta^T + f_\Delta^S f_T^{O_2} = 1.7$.	756223
	C_6H_6	1.8×10^{-3}	0.36				CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$; λ_{exc} = 535, 546, 577 nm. rel. to S′ in MeOH.	83F608
	C_6H_6	1.9×10^{-3}	0.30				CP/Ac-46	S′ = BP; A = S; rel. to $\phi_\Delta(S') = 0.54$; λ_{exc} = 365 nm. Assumed $f_T^{O_2} = 1$.	81F364
	C_6H_6	air	0.44				CP/Ac-14	A = S; λ_{exc} = 365 nm.	81F017
	C_6H_6	air[a]	0.07^T			1.9	CP/Ac-14,40	A = S. Assumed $f_T^{O_2} = 1$; $f_\Delta^T + f_\Delta^S$ from ϕ_Δ when $P_S^{O_2} = 1$; $\phi_T f_\Delta^T = \phi_\Delta$ when $P_S^{O_2} = 0$.	767422
	C_6H_6	air[a]			≥0.67	≥1.7	CP/Ac-14,38	A = S. Assumed $f_\Delta^T = 1$ and $f_T^{O_2} = 1$.	76F905
	C_6H_6	4.6×10^{-3}	0.64				CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$; λ_{exc} = 535, 546, 577 nm. rel. to S′ in MeOH.	83F608

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.278	**Rubrene (Tetracene, 5,6,11,12-tetraphenyl-, Rub)**—Continued								
	C_6H_6	6.5×10^{-3}	1.0				CP/Pa-14	A = S; P = 5,12-Dihydro-5,6,11,12-tetraphenyl-5,12-epidioxytetracene; λ_{exc} = 546 nm.	337002 377005
	C_6H_6	O_2 var.					CP/Ac-14,38	A = S; λ_{exc} = 435.8 nm. $\phi_T f_\Delta^T / (f_\Delta^T + f_\Delta^S)$ = 0.04 ± 0.02.	68F286
	C_6H_6	9.1×10^{-3}	0.90				CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S')$ = 0.50; λ_{exc} = 535, 546, 577 nm. rel. to S′ in MeOH; $\phi_T f_\Delta^T$ = 0.03 ($P_S^{O_2}$ = 0); $f_\Delta^S + f_\Delta^T f_T^{O_2}$ = 1.5	83F608
	C_6H_6	9.0×10^{-3}	0.88			1.4	CP/Ac-46	S′ = BP; A = S; rel. to $\phi_\Delta(S')$ = 0.90; λ_{exc} = 365 nm; used $\phi_T(S)$ = 0.03. Assumed $f_T^{O_2}$ = 1.	81F364
	C_6H_6	O_2	0.91			1.5	CP/Ac-14,38	S′ = A = DPBF; λ_{exc} = 546 nm. $P_T^{O_2}$ = 1; Assumed $f_T^{O_2}$ = 1; used $P_S^{O_2}$ = 0.62 and ϕ_T = 0.	79E611
	C_6H_6	O_2	1^{ST}				CP/Ac-14	A = S; λ_{exc} = 366, 436, 546 nm.	34F004
	C_6H_6	$\rightarrow \infty$	1.2^{ST}			~1.2	CP/Ac-14,38	A = DPBF; λ_{exc} = 545 nm. Assumed $f_T^{O_2}$ = 1, extrapolated ϕ_Δ = 1.2 when $[O_2] \rightarrow \infty$.	78E036
	CH_3COCH_3	O_2	0.88			1.5	CP/Ac-14,38	S′ = A = DPBF; λ_{exc} = 546 nm. $P_T^{O_2}$ = 1; Assumed $f_T^{O_2}$ = 1; used $P_S^{O_2}$ = 0.58 and ϕ_T = 0.	79E611
	$CHCl_3$	$(0.3\text{-}5) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Assumed $f_T^{O_2}$ = 1, $f_\Delta^T = f_\Delta^S$ = 1, measured $f_\Delta^T + f_\Delta^S f_T^{O_2}$ = 2.1; ϕ_Δ = 0.11 when $P_S^{O_2}$ = 0.	756223
	$C_6H_3Cl_3$	$(0.5\text{-}2.5) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Measured $f_\Delta^T + f_\Delta^S f_T^{O_2}$ = 1.7.	756223
	CCl_4	$(0.3\text{-}3) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Measured $f_\Delta^T + f_\Delta^S f_T^{O_2}$ = 1.9.	756223
	CS_2	$(0.5\text{-}1) \times 10^{-3}$					CP/Ac-14,38	A = S; λ_{exc} = 436 nm. Measured $f_\Delta^T + f_\Delta^S f_T^{O_2}$ = 2.1	756223
	CS_2	$(2\text{-}9) \times 10^{-3}$		1	1	2	CP/Ac-14,38	A = DPBF; λ_{exc} = 546 nm. Assumed $f_T^{O_2}$ = 1, $\phi_T f_\Delta^T$ = 0.21.	84F197
1.279	***(E)*-Stilbene**								
	C_6H_6	air[a]		~0.08			PR/βCb-59	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.35. Measured $f_\Delta^T(S)/f_\Delta^T(S')$ = 0.23.	76F904
	C_6H_6	O_2		0.21* 0.18			PL/LI-60	S′ = 2-ACN; rel. to $f_\Delta^T(S')$ = 0.7; λ_{exc} = 355 nm. $P_T^{O_2}$ >0.96.	85F291
	C_6H_6	O_2		0.22* 0.18			PL/LI-60	S′ = BP; rel. to $f_\Delta^T(S')$ = 0.29; λ_{exc} = 355 nm. $P_T^{O_2}$ >0.96.	85F291
1.280	**Sydnone, 3,4-diphenyl-**								
	C_6H_6	air		0.78			PL/Ad,TDt-62	A = DPBF; AC = TD = NMTA; λ_{exc} = 485 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, ε_T(AC) = 9300 L mol^{-1} cm^{-1} at 520 nm. $P_T^{O_2}$ = 0.82.	86A380
1.281	**Sydnone, 3-(4-methylphenyl)-**								
	C_6H_6	air		0.38			PL/Ad,TDt-62	A = DPBF; AC = TD = CQ; λ_{exc} = 485 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, ε_T(AC) = 900 L mol^{-1} cm^{-1} at 700 nm. $P_T^{O_2}$ = 0.89.	86A380
1.282	**Sydnone, 3-(4-methylphenyl)-4-phenyl-**								
	C_6H_6	air		0.88			PL/Ad,TDt-62	A = DPBF; AC = TD = NMTA; λ_{exc} = 485 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, ε_T(AC) = 9300 L mol^{-1} cm^{-1} at 520 nm. $P_T^{O_2}$ = 0.78.	86A380

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.283	**Sydnone, 3-phenyl-**								
	C_6H_6	air		0.80			PL/Ad,TDt-62	A = DPBF; AC = TD = CQ; λ_{exc} = 485 nm; used $k_d = 4.0 \times 10^4$ s^{-1}, $k_A = 8.0 \times 10^8$ L mol^{-1} s^{-1}, ε_T(AC) = 900 L mol^{-1} cm^{-1} at 700 nm. $P_T^{O_2} = 0.88$.	86A380
1.284	***p*-Terphenyl**								
	C_6H_6	O_2		0.9			PR/Ad,St-49,42	A = DPBF; used $\phi_T(S) = 0.11$, $\varepsilon_T(S) = 90{,}000$ L mol^{-1} cm^{-1} at 460 nm. Measured $G(^3S^*)$.	78E263
1.285	**α-Terthienyl**								
	C_6D_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.67[T]				PL/LI-56	S′ = Np; rel. to ϕ_Δ(S′) = 0.54; λ_{exc} = 355 nm.	90E691
	C_6D_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.84[T]				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.84; λ_{exc} = 355 nm.	90E691
	C_6H_6	air	0.75[T]	~0.7			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.83; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	CD_3CN	$(1.7\text{-}8.1) \times 10^{-3}$	0.79[T]				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.84; λ_{exc} = 355 nm.	90E691
	CD_3OD	air	0.67[T]	~0.7			PL/LI-56,42	S′ = An; rel. to ϕ_Δ(S′) = 0.55; meas. ϕ_T(S) = ~0.9-1.0; λ_{exc} = 337 nm.	90F355
	CD_3OD	air	0.70[T]	~0.7			PL/LI-56,42	S′ = $Ru(bpy)_3^{2+}$; rel. to ϕ_Δ(S′) = 0.86; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	$CDCl_3$	air	0.73[T]	~0.7			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.84; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.86[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ϕ_T(AC) = 1, ε_T(AC) = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
	CH_2Cl_2	air	0.75[T]	~0.7			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.89; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	CH_3CN	air	0.68[T]	~0.7			PL/LI-56,42	S′ = Ac; rel. to ϕ_Δ(S′) = 0.82; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	$CHCl_3$	air	0.67[T]	~0.7			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.84; meas. ϕ_T(S) = ~0.9-1; λ_{exc} = 337 nm.	90F355
	EtOH	O_2	~0.2[T]	~1			PL/Ac-14,42	A = DPBF; meas. ϕ_T(S) = 0.20[f]; λ_{exc} = 353 nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020
	EtOH/H_2O (95:5)	air	0.22[T]	~1			CP/Ac-14,42	A = Im; λ_{exc} = 365 nm; used ϕ_T(S) = 0.20.	89F115
1.286	**2,2′:5′,2″-Terthiophene, 5-bromo-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.70[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ϕ_T(AC) = 1, ε_T(AC) = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
1.287	**2,2′:5′,2″-Terthiophene, 5-cyano-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.86[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ϕ_T(AC) = 1, ε_T(AC) = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
1.288	**2,2′:5′,2″-Terthiophene, 5,5″-dibromo-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.69[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ϕ_T(AC) = 1, ε_T(AC) = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
	EtOH	O_2	~0.3[T]	~1			PL/Ac-14,42	A = DPBF; meas. ϕ_T(S) = 0.35[f]; λ_{exc} = 353 nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020
1.289	**2,2′:5′,2″-Terthiophene, 5-methyl-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.93[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used ϕ_T(AC) = 1, ε_T(AC) = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.290	**2,2′:5′,2″-Terthiophene-5-carboxylic acid**								
	EtOH	O_2	~0.2[T]	~1			PL/Ac-14,42	A = DPBF; meas. $\phi_T(S) = 0.2$[f]; $\lambda_{exc} = 353$ nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020
1.291	**Tetracene**								
	$C_6H_5CH_3$	O_2	0.86				PL/LI-38,56	used $\phi_T(S) = 0.61$. Assumed $f_T^{O_2} = 1$; used $f_\Delta^T + f_\Delta^S = 1.2$.	87E668
	$C_6H_5CH_3$	0.2 atm O_2	0.71				PL/LI-38,56	used $\phi_T(S) = 0.61$. Assumed $f_T^{O_2} = 1$; used $f_\Delta^T + f_\Delta^S = 1.2$.	87E668
	$C_6H_5CH_3$	$(2\text{-}9) \times 10^{-3}$				1.2	CP/Ac-14,38	A = DPBF; $\lambda_{exc} = 470$ nm. Assumed $f_T^{O_2} = 1$, $\phi_T f_\Delta^T = 0.61$.	84F197
	C_6H_6	air	0.70				CP/Ac-40	A = DPBF. Assumed $f_\Delta^S = 0, f_\Delta^T = 1$.	78E036
	C_6H_6	O_2	0.83				CP/Ac-40	A = DPBF. Assumed $f_\Delta^S = 0, f_\Delta^T = 1$.	78E036
	C_6H_6	air	0.68				CP/Ac-14	A = DPBF.	78E036
	C_6H_6	O_2	0.85				CP/Ac-14	A = DPBF.	78E036
	C_6H_6	air[a]	0.71[T]			1.2	CP/Ac-14,40	A = S. Assumed $f_T^{O_2} = 1$; $f_\Delta^T + f_\Delta^T$ from ϕ_Δ when $P_S^{O_2} = 1$; $\phi_T f_\Delta^T = \phi_\Delta$ when $P_S^{O_2} = 0$.	767422
	C_6H_6	air[a]		~1	~0	~1	CP/Ac-14,38	A = S. Assumed $f_\Delta^T = 1$ and $f_T^{O_2} = 1$.	76F905
	C_6H_6	O_2 var.					CP/Ac-14,38	A = S; $\lambda_{exc} = 435.8$ nm. $\phi_T f_\Delta^T / (f_\Delta^T + f_\Delta^S) = 0.61$.	68F286
1.292	**α-Tetralone**								
	C_6H_6	O_2	0.25[T]	0.25			PL/Hp-52,42	$\lambda_{exc} = 355$ nm; used $\phi_T(S) = 1$. Measured $\phi_\Delta = 0.25$, $P_T^{O_2} = 1$ and ϕ_F.	88E449
	C_6H_6	O_2	0.29[T]	0.25			PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 1$. Measured $P_T^{O_2} = 1$.	88E449
1.293	**Thiobenzophenone, 4,4′-dimethoxy- (DMTBP)**								
	C_6H_6	O_2	0.88* 1.0[T]	 1.0			PL/Ad-43,42	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S') = 0.4$; meas. $\phi_T(S) = 1$[f]; $\lambda_{exc} = 337$ nm. Assumed $\phi_T(S) = \phi_T(S')$.	84A221
	$CHCl_3$	air[a]	1.0[T]	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1$. [S] → 0, $\phi_\Delta = 0.83$ at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.294	**Thiobenzophenone, 4-phenyl-**								
	$CHCl_3$	air[a]	1.0[T]	1.0			CP/Ac-14,42	A = DTBF; used $\phi_T(S) = 1$. [S] → 0, $\phi_\Delta = 0.56$ at [S] = 0.01 mol L^{-1}.	83F028 82F140
1.295	**Thiocoumarin**								
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	0.7* 0.8[T]	 0.8			PL/Ad-43,39	S′ = BP; A = DPBF; rel. to $\phi_\Delta(S') = 0.4$; meas. $\phi_T(S) = 1$; $\lambda_{exc} = 337$ nm. Used $P_S^{O_2} = 0$.	86A240
	C_6H_6	$(1.9\text{-}9.1) \times 10^{-3}$	1.0[T]	1.0			PL/Ad-43,39	S′ = DMTBP; A = DPBF; rel. to $\phi_\Delta(S') = 1$; meas. $\phi_T(S) = 1$; $\lambda_{exc} = 532$ nm. Used $P_S^{O_2} = 0$.	86A240
1.296	**Thiophene, 2,5-diphenyl-**								
	EtOH	O_2	~0.3	~1			PL/Ac-14,42	A = DPBF; meas. $\phi_T(S) = 0.30$; $\lambda_{exc} = 353$ nm. $P_T^{O_2} = 1$, $p_A = 0.75$.	85N020
1.297	**Thiophene, 2-(1-naphthalenyl)-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.76[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; $\lambda_{exc} = 337$ nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 525$ L mol^{-1} cm^{-1} at 7640 nm. $p_A = 1$.	87E410
1.298	**Thiophene, 2-(2-naphthalenyl)-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.63[T]				PL/Ad,ACt-49	A = DPBF; AC = BP; $\lambda_{exc} = 337$ nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC) = 7640$ L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.299	**Thiophene, 2,2′-(1,3-phenylene)bis-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.75^T				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC)$ = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
1.300	**Thiophene, 2,2′-(1,4-phenylene)bis-**								
	$CDCl_3$	$\sim 1.16 \times 10^{-2}$	0.69^T				PL/Ad,ACt-49	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $\phi_T(AC) = 1$, $\varepsilon_T(AC)$ = 7640 L mol^{-1} cm^{-1} at 525 nm. $p_A = 1$.	87E410
1.301	**4-Thiouridine**								
	CH_3CN	air	0.6^T	1			PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; meas. $\phi_T(S)$ = 0.61; λ_{exc} = 355 nm. $P_T^{O_2} = 0.92$.	90E312
	CH_3CN	O_2	0.4^T	0.67			PL/Hp-53,42	meas. $\phi_T(S) = 0.61$; λ_{exc} = 355 nm; used $\phi_F(S)$ = 0. $P_T^{O_2} = >0.98$.	90E312
	CH_3CN	O_2	0.5^T	0.84			PL/Hp-52,42	meas. $\phi_T(S) = 0.61$; λ_{exc} = 353 nm. $P_T^{O_2}$ = >0.98.	90E312
	CH_3CN	O_2	0.70^T				PL/LI-56,42	S′ = DCA; rel. to $\phi_\Delta(S') = 1.6$; λ_{exc} = 355 nm.	83F604
	D_2O	air	0.18^T	0.93			PL/LI-56,42	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.80$; meas. $\phi_T(S) = 0.67$; λ_{exc} = 353 nm. $P_T^{O_2} = 0.29$.	90E312
1.302	**1,4,7-Triazacyclononanetri(isothiocyanato)chromium(III) ($Cr(tacn)(NCS)_3$)**								
	$(CH_3)_2CO$	O_2	0.62				CP/Pa-43	S′ = RB; A = Furan; P = Furan endoperoxide; rel. to $\phi_\Delta(S') = 0.80$[b].	89F067
1.303	**Tribenzo[*a,f,j*]perylene, 9,18-diphenyl- (Mesodiphenylbenzhelianthrene, MDBH)**								
	$C_6H_5CH_2OH$	air	0.17				CP/Ac-A.18	A = S; λ_{exc} = 632.8 nm. $f_r^A = 0.026$.	87F480
	m-Cresol	air	0.12				CP/Ac-A.18	A = S; λ_{exc} = 632.8 nm; used $\phi_T(S) = 0.61$. $f_r^A = 0.026$.	87F480
	CCl_4	air	0.18				CP/Ac-14,38	A = S; meas. $\phi_T(S) = 0.09$; λ_{exc} = 632.8 nm. $f_T^{O_2} = 1$, $f_r^A = 0.026$, $[O_2]$ varied, $(f_\Delta^S + f_\Delta^T f_T^{O_2})$ = 0.91.	87F479
1.304	**Triphenylene**								
	c-C_6H_{12}	$\rightarrow \infty$	0.49^{ST}				PL/LI-56	S′ = Py; rel. to $\phi_\Delta(S') = 0.81$; λ_{exc} = 355 nm.	91E297
	n-C_6H_{14}	air	0.25				PL/Ad-43	S′ = An; A = DPBF; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 264 nm. $P_T^{O_2} = 1$.	82E258
	CH_3CN	$\rightarrow \infty$	0.27^{ST}				PL/LI-56	S′ = DCA; rel. to $\phi_\Delta(S') = 2.0$; λ_{exc} = 355 nm.	91E297
1.305	**Tris(2,2′-bipyridine)iridium(III) ion**								
	MeOH	O_2	$\sim 1^T$				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.306	**Tris(2,2′-bipyridine)ruthenium(II) ion**								
	MeOH	air[a]	0.81^T	0.92			PL/Ad-49,39	A = DPBF; AC = BP; λ_{exc} = 532 nm; used $k_d = 1.0 \times 10^5$ s^{-1}, $k_A = 8.1 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.95$[c], $\phi_T(AC) = 1$, $\varepsilon_T(AC)$ = 7600 L mol^{-1} cm^{-1} at 532 nm. $P_T^{O_2} = 0.93$.	85E190
	MeOH	O_2	0.83^T	0.94			PL/Ad-49,41	A = DPBF; AC = BP; λ_{exc} = 337 nm; used $k_d = 1.0 \times 10^5$ s^{-1}, $k_A = 8.1 \times 10^8$ L mol^{-1} s^{-1}, $\phi_T(S) = 0.95$[f], $\phi_T(AC) = 1$, $\varepsilon_T(AC)$ = 7600 L mol^{-1} cm^{-1} at 532 nm. $P_T^{O_2} = 0.93$.	84F005
	MeOH	O_2	0.90^T	0.95			CP/Ac-43,42	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$[b]; λ_{exc} = 546 nm; used $\phi_T(S) = 0.95$[d]. Measured $P_T^{O_2}$ = 1.	80F304
	MeOH	O_2	0.86^T	0.91			CL/Oc-14,42	A = TME; λ_{exc} = 488, 514.4, 457.9 nm; used $\phi_T(S) = 0.95$[d]. Used $P_T^{O_2} = 1$.	767423

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.
1.307	**Tris(1,10-phenanthroline)iridium(III) ion**								
	MeOH	O_2	~1[T]				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.308	**Tris(1,10-phenanthroline)osmium(II) ion**								
	MeOH	O_2	0.76[T]				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
1.309	**Tris(1,10-phenanthroline)ruthenium(II) ion**								
	MeOH	O_2	0.75[T]				CL/Oc-14	A = TME; λ_{exc} = 488 nm.	777221
	MeOH	O_2	0.95[T]				CL/Oc-14	A = H_2NCSNH_2; λ_{exc} = 488 nm.	777221
1.310	**Vitamin D_3**								
	C_6H_6	2×10^{-3}		0.28* 0.25			PL/LI-60	S′ = Np; TD = p-MAP; rel. to f_Δ^T(S′) = 0.55; λ_{exc} = 355 nm. $P_T^{O_2} \rightarrow 1$; Cor. for 12% oxygen quenching of p-MAP triplet.	90E030
	C_6H_6	2×10^{-3}		0.30* 0.25			PL/LI-60	S′ = BP; rel. to f_Δ^T(S′) = 0.29; λ_{exc} = 355 nm. Measured $P_T^{O_2}$.	89A235
1.311	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-4,5-diiodo-, dianion**								
	DMF	air[a]	0.30				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	88F618
1.312	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-2,4,5,7-tetrabromo-, dianion**								
	DMF	air[a]	0.13				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	88F618
1.313	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-2,4,5,7-tetraiodo-, dianion**								
	DMF	air[a]	0.44				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	88F618
1.314	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-2,4,5-triiodo-, dianion**								
	DMF	air[a]	0.41				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	88F618
1.315	**Xanthen-3-one, 9-(2,3,4,5-tetrachlorophenyl)-6-hydroxy-2,4,5,7,-tetraiodo-, anion**								
	MeOH	air[a]	0.87				CP/Ac-43	S′ = Eos; A = DPBF; rel. to ϕ_Δ(S′) = 0.32. Rel. to S′ in ethanol.	90F251
	MeOH	air[a]	0.76				CP/Ac-43	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76.	90F251
1.316	**Xanthen-9-one**								
	C_6H_6	air[a]	0.33[T]	0.33			PL/βCb-43,42	S′ = BP; rel. to f_Δ^T(S′) = 0.35; used ϕ_T(S) = 1[d]. Measured ϕ_Δ(S)/ϕ_Δ(S′) = 0.95.	76F904
	C_6H_6	O_2	0.24[T]	0.28			PL/LI-56,42	S′ = Pz; rel. to ϕ_Δ(S′) = 0.83; used ϕ_T(S) = 1. Measured $P_T^{O_2}$ = 0.82.	88E449
	C_6H_6	O_2	0.28[T]	0.28			PL/Hp-52,42	λ_{exc} = 355 nm; used ϕ_T(S) = 1. Measured ϕ_Δ = 0.23, $P_T^{O_2}$ = 0.82 and ϕ_F.	88E449
1.317	**O_2:solvent CT state**								
	Decalin	air	~0.12				PL/LI-56	S′ = Biph; rel. to ϕ_Δ(S′) = 0.7; λ_{exc} = 239 nm.	89E309
	c-C_6H_{12}	air	~0.22				PL/LI-56	S′ = Biph; rel. to ϕ_Δ(S′) = 0.7; λ_{exc} = 239 nm.	89E309
	c-C_8H_{16}	air	~0.18				PL/LI-56	S′ = Biph; rel. to ϕ_Δ(S′) = 0.7; λ_{exc} = 239 nm.	89E309
	1,3,5-$C_6H_3(CH_3)_3$	air	~0.17				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.8; λ_{exc} = 355 nm.	89E309
	1,2-$C_6H_4(CH_3)_2$	air	~0.20				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.8; λ_{exc} = 355 nm.	89E309
	1,4-$C_6H_4(CH_3)_2$	air	~0.20				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.8; λ_{exc} = 355 nm.	89E309
	$C_6H_5CH_3$	O_2	0.25				PL/LI-56	S′ = TPP; rel. to ϕ_Δ(S′) = 0.82; λ_{exc} = 347 nm.	90E760
	$C_6H_5CH_3$	air	~0.20				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.8; λ_{exc} = 355 nm.	89E309
	C_6H_6	air	~0.20				PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.8; λ_{exc} = 355 nm.	89E309

[a] Oxygen concentration not given; assumed to be air saturated.

[b] Value of ϕ_Δ(S′) used in this work to calculate ϕ_Δ(S) from authors' reported ϕ_Δ(S)/ϕ_Δ(S′).

Table 1, Quantum yields of photosensitized production of singlet oxygen.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	f_Δ^S	Σf or n_Δ	Method	Comment	Ref.

[c] Value of $\phi_T(S)$ from the literature used in this work to calculate ϕ_Δ.
[d] Value of $\phi_T(S)$ from the literature used in this work to calculate f_Δ^T.
[e] Value of $\phi_T(S)$ measured or quoted by the authors, used in this work to calculate ϕ_Δ.
[f] Value of $\phi_T(S)$ measured or quoted by the authors, used in this work to calculate f_Δ^T.
[g] Value of $\phi_T(S)$ used in this work to calculate ϕ_Δ or f_Δ^T, average of 0.73 [776258] and 1.0 [81E147].
[T] Value corrected for 100% quenching of T_1.
[ST] Value corrected for 100% quenching of S_1 and T_1.
* Values recalculated using $\phi_\Delta(S')$ or $f_\Delta^T(S')$ from Table 4 or from the quoted reference.

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.1	**Bacteriochlorophyll *a***						
	$(C_2H_5)_2O$	air[a]	0.43		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_5H_5N	air[a]	0.4		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_6D_6	air[a]	0.34		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.7$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.5$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	C_6H_6	air[a]	0.40* 0.35		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.32$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 1$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	CCl_4	O_2	0.6		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$. Used $P_T^{O_2} = 1$; supersedes [79A010], [77E617], [78E881].	85F517
	D_2O (mic)	air[a]	0.11		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Soln. cont. 2% Triton X-100.	90E324
	D_2O/EtOH (95:5)	air[a]	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	MeOD	air[a]	0.2		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.22$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = \sim 1$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
2.2	**Bacteriochlorophyll *b***						
	$(C_2H_5)_2O$	air[a]	0.48		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_5H_5N	air[a]	0.43		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	CCl_4	O_2	0.65		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85F517
	D_2O (mic)	air[a]	0.15		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Soln. cont. 2% Triton X-100.	90E324
	D_2O/EtOH (95:5)	air[a]	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
2.3	**Chlorophyll *a***						
	$(C_2H_5)_2O$	air[a]	0.52		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	i-$C_5H_{11}OH$	air[a]	0.77		CP/Oc-14	A = ATU; $\lambda_{exc} = 436$ nm.	56F007
	C_5H_5N	air[a]	0.59		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_5H_5N	O_2	0.49		CP/Oc-14	A = H_2NCSNH_2; $\lambda_{exc} = 430$ nm. Assumed $f_r^A = 2$.	737347 74E522
	c-$C_6H_{11}OH$	air[a]	0.77		CP/Oc-14	A = ATU; $\lambda_{exc} = 436$ nm.	56F007
	$C_6H_5CH_2OH$	air[a]	0.77		CP/Oc-14	A = ATU; $\lambda_{exc} = 436$ nm.	56F007
	$C_6H_5CH_3$	air[a]	0.60		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	$C_6H_5CH_3$	8.5×10^{-3}	0.68		CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$. Rel. to S′ in MeOH.	84F191
	C_6H_6	9.1×10^{-3}	0.60		CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$. Rel. to S′ in MeOH.	84F191
	CCl_4	air	0.57		MP/LI-56	S′ = Ph a. $P_T^{O_2} = 1$; reported 0.55 in [79A010]; recalcd. in [90R045] rel. to $\phi_\Delta(TPP) = 0.70$.	79A010 90R045
	CH_3CN	air[a]	0.60		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	D_2O (mic)	air[a]	0.35		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Soln. cont. 2% Triton X-100.	90E324
	D_2O/EtOH (95:5)	air[a]	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	H_2O (mic) pH = 7.0	air	0.70- 0.85		CP/Oc-14	A = Im; P = Imidazole endoperoxide; $\lambda_{exc} = 660$ nm. Soln. contg. 1% Triton X-100; assumed $f_r^A = 0.17$-0.2.	79N115
	MeOH	air[a]	0.77		CP/Oc-14	A = ATU; $\lambda_{exc} = 436$ nm.	56F007
2.4	**Chlorophyll *b***						
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	C_6D_6	1.2% O_2 in N_2		0.92	PR/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 0.55$. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	91A358
	CH_3CN	air[a]	0.85		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.5	**Chlorophyll (oil soluble)**						
	C_6H_6	9.1×10^{-3}	0.50		CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$. Rel. to S′ in MeOH.	84F191
2.6	**[22]Coproporphyrin II**						
	CH_2Cl_2	air[a]	1.1		CP/Pa-43	S′ = RB; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.80$[b].	90R215
2.7	**Methyl acetal of oxidized octaethylpurpurin ethyl ester**						
	MeOH	air	0.4		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.6$. $f_\Delta^T = 0.7$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; secondary $\phi_\Delta(S') = 0.41$, S′ = ZnPCS.	90E491
2.8	**Naphthalocyanine, 2,11,20,29-tetrakis(1,1-dimethylethyl)-**						
	CCl_4	air[a]	0.15* 0.17		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.9	**Naphthalocyanine, 2,11,20,29-tetrakis(1,1-dimethylethyl)-, chloroaluminum(III)**						
	CCl_4	air[a]	0.37* 0.42		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.10	**Naphthalocyanine, 2,11,20,29-tetrakis(1,1-dimethylethyl)-, copper(II)**						
	CCl_4	air[a]	0		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm. Not detectable.	90R204
2.11	**Naphthalocyanine, bis(trihexylsilanolato)silicon (SiNC)**						
	C_6H_6	O_2	0.35		PL/LI-56	S′ = Np; rel. to $\phi_\Delta(S') = 0.55$; meas. $\phi_T(S) = 0.39$; $\lambda_{exc} = 355$ nm.	87R032
	C_6D_6	air	0.19		PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.20$; $\lambda_{exc} = 355$ nm.	88E657
2.12	**Pheophytin *a***						
	$(C_2H_5)_2O$	air	0.67		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	C_5H_5N	O_2	0.64		CP/Oc-14	A = H_2NCSNH_2. Used $f_r^A = 2$.	74E522
	$C_6H_5CH_3$	air[a]	0.73		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	CCl_4	air	0.71* 0.80		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045 79A010
	CH_3CN	air[a]	0.85		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	D_2O/EtOH (90:10) (mic)	air	0.70		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$. Soln. cont. 2% Triton X-100.	90R045
	D_2O/EtOH (95:5)	air	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	EtOH	air	0.60		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
2.13	**Pheophytin *b***						
	$C_6H_5CH_3$	air[a]	0.70		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	CH_3CN	air[a]	0.84		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
2.14	**20-Phorbinecarboxylic acid, 3,4-didehydro-3,4,8,9,13,14,18,19-octaethyl-18,19-dihydro-, ethyl ester (Octaethyldihydropurpurin ethyl ester)**						
	MeOH	air	0.71		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.86$. $f_\Delta^T = 0.83$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; secondary $\phi_\Delta(S') = 0.41$, S′ = ZnPCS.	90E491
2.15	**20-Phorbinecarboxylic acid, 3,4-didehydro-3,4,8,9,13,14,18,19-octaethyl-18,19-dihydro-, ethyl ester, dichlorotin(IV)**						
	MeOH	air	0.82		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.96$. $f_\Delta^T = 0.85$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; secondary $\phi_\Delta(S') = 0.41$, S′ = ZnPCS.	90E491
2.16	**20-Phorbinecarboxylic acid, 3,4,20,21-tetradehydro-3,4,8,9,13,14,18,19-octaethyl-18,19-dihydro-, ethyl ester (Octaethylpurpurin, ethyl ester)**						
	C_6H_6	air[a]	0.70		PL/LI-56,42	S′ = BChl a; rel. to $\phi_\Delta(S') = 0.35$; meas. $\phi_T(S) = 0.81$; $\lambda_{exc} = 694$ nm. $f_\Delta^T = 0.86$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	88R200
	C_6H_6	air[a]	0.74* 0.65		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.81$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.80$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	88R200
	MeOH	air	0.68		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.82$. $f_\Delta^T = 0.83$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; secondary $\phi_\Delta(S') = 0.41$, S′ = ZnPCS.	90E491

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.17	**20-Phorbinecarboxylic acid, 3,4,20,21-tetradehydro-4,9,14,19-tetraethyl-18,19-dihydro-3,8,13,18-tetramethyl-, ethyl ester, zinc(II) (Etiopurpurin ethyl ester, zinc(II))**						
	C_6H_6	air[a]	0.54		PL/LI-56,42	S′ = BChl a; rel. to $\phi_\Delta(S') = 0.35$; meas. $\phi_T(S) = 0.84$; $\lambda_{exc} = 694$ nm. $f_\Delta^T = 0.71$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	88R200
	C_6H_6	air[a]	0.68* 0.60		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.84$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.64$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	88R200
2.18	**3-Phorbinepropanoic acid, 9-acetyl-14-ethyl-13,14-dihydro-21-(methoxycarbonyl)-4,8,13,18-tetramethyl-20-oxo-, 3,7,11,15-tetramethyl-2-hexadecenyl ester (Bacteriopheophytin *a*)**						
	$(C_2H_5)_2O$	air[a]	0.48		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_5H_5N	air[a]	0.8		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	C_6D_6	air[a]	0.53* 0.46		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.8$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.6$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	C_6H_6	air[a]	0.46		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.73$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.63$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	CCl_4	O_2	0.75		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85F517
	CCl_4	air	0.69		MP/LI-56	S′ = Chl a; rel. to $\phi_\Delta(S') = 0.55$. $P_T^{O_2} = 1$.	79A010
	D_2O (mic)	air[a]	0.36		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Soln. cont. 2% Triton X-100.	90E324
	D_2O/EtOH (95:5)	air[a]	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	MeOD	air[a]	0.2-0.3		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.6$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.4$-0.5 assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
2.19	**3-Phorbinepropanoic acid, 9-acetyl-14-ethylidene-13,14-dihydro-21-(methoxycarbonyl)-4,8,13,18-tetramethyl-20-oxo-, 3,7,11,15-tetramethyl-2-hexadecenyl ester (Bacteriopheophytin *b*)**						
	$(C_2H_5)_2O$	air[a]	0.43		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Used $P_T^{O_2} = 1$.	90E324
	C_5H_5N	air[a]	0.50		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
	CCl_4	O_2	0.75		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85F517
	D_2O (mic)	air[a]	0.35		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Soln. cont. 2% Triton X-100.	90E324
	D_2O/EtOH (95:5)	air[a]	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90E324
2.20	**3-Phorbinepropanoic acid, 3,4-didehydro-9-ethenyl-14-ethyl-21-(methoxycarbonyl)-4,8,13,18-tetramethyl-20-oxo-, magnesium(II) (Protochlorophyllide)**						
	$(C_2H_5)_2O$	air[a]	0.77		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$.	88F450
	D_2O	air[a]	≤0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Colloidal soln. contg. 0.5% NH_4OH.	88F450
	D_2O (mic)	air[a]	0.84		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Soln. cont. 1% Triton X-100.	88F450
2.21	**3-Phorbinepropanoic acid, 3,4-didehydro-9-ethenyl-14-ethyl-21-(methoxycarbonyl)-4,8,13,18-tetramethyl-20-oxo-, 3,7,11,15-tetramethyl-2-hexadecenyl ester (Protopheophytin)**						
	$C_6H_5CH_3$	air[a]	0.70		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	CCl_4	air	0.88		MP/LI-56	S′ = Chl a; rel. to $\phi_\Delta(S') = 0.55$. $P_T^{O_2} = 1$.	79A010
	CH_3CN	air[a]	0.87		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
2.22	**3-Phorbinepropanoic acid, 9-ethenyl-14-ethyl-21-(methoxycarbonyl)-4,6,13,18-tetramethyl-20-oxo- (Pheophorbide a)**						
	$(C_2H_5)_2O$	air	0.74		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	CCl_4	air	0.71* 0.80		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	D_2O/EtOH (90:10) (mic)	air	0.70		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$. Soln. cont. 2% Triton X-100.	90R045
	D_2O/EtOH (95:5) (mic)	air	0.49		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$. Soln. cont. 2% Triton X-100.	90R045

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.22	**3-Phorbinepropanoic acid, 9-ethenyl-14-ethyl-21-(methoxycarbonyl)-4,6,13,18-tetramethyl-20-oxo- (Pheophorbide a)**—Continued						
	D_2O/EtOH (95:5)	air	<0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	EtOH	air	0.60		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. $P_T^{O_2} = 1$.	90R045
	EtOH	air[a]	0.51		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 514.5$ nm.	90R204
2.23	**3-Phorbinepropanoic acid, [3,7,11,15-tetramethyl-2-hexadecenyl 3,4-didehydro-9-ethenyl-14-ethyl-21-(methoxycarbonyl)-4,8,13,18-tetramethyl-20-oxo-3-phorbinepropanoatomagnesium (Protochlorophyll)**						
	$(C_2H_5)_2O$	air[a]	0.84		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$.	88F450
	$C_6H_5CH_3$	air[a]	0.68		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	CCl_4	air	0.63		MP/LI-56	S′ = Chl a; rel. to $\phi_\Delta(S') = 0.55$. $P_T^{O_2} = 1$.	79A010
	CH_3CN	air[a]	0.78		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
	D_2O	air[a]	≤0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Colloidal soln. contg. 0.5% NH_4OH.	88F450
	D_2O (mic)	air[a]	0.84		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. *Soln. cont. 1% Triton X-100.*	88F450
2.24	**Phthalocyanine, magnesium(II)**						
	C_5H_5N	O_2	0.40		CP/Oc-14	A = H_2NCSNH_2; $\lambda_{exc} = 669$ nm. Assumed $f_r^A = 2$.	737347 74E522
2.25	**Phthalocyanine, zinc(II), bis(pyridine)**						
	C_6H_6	O_2	0.50		PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.73$; $\lambda_{exc} = 600$ nm. $P_T^{O_2} = 0.95$.	89N079 90N126
	D_2O (ves) pD = 7.4	O_2	0.49		PL/LI-56	S′ = UP; rel. to $\phi_\Delta(S') = 0.71$; $\lambda_{exc} = 600$ nm. [DPPC] = 6.7×10^{-4} mol L^{-1}, S′ in D_2O-Tris buffer.	90N126
	D_2O (ves) pD = 7.4	O_2	0.47		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.72$; $\lambda_{exc} = 600$ nm. [DPPC] = 6.7×10^{-4} mol L^{-1}, S′ in D_2O-Tris buffer.	90N126
	EtOH	air	0.53		CP/Ac-14	A = DPBF; $\lambda_{exc} = 600$ nm. Extrapolated to [A] → ∞.	88A284
	EtOH	air	0.4		PL/LI-56	S′ = An; rel. to $\phi_\Delta(S') = 0.53$; $\lambda_{exc} = 354$ nm.	88A284
	EtOH	air	0.4		PL/LI-56	S′ = ZnTPP; rel. to $\phi_\Delta(S') = 0.55$; $\lambda_{exc} = 600$ nm.	88A284
	H_2O (ves)	air	0.7		CP/Ac-14	A = DPBF; $\lambda_{exc} = 600$ nm. Extrapolated to [A] → ∞; unilamellar DPPC vesicles.	88A284
2.26	**Phthalocyanine, 1,4,8,11,15,18,22,25-octabutoxy-, zinc(II)**						
	C_6D_6	air	0.45		PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.46$; $\lambda_{exc} = 532$ nm. Soln. cont. 1% pyridine.	89E453
	C_6D_6	air	0.50		PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; meas. $\phi_T(S) = 0.52$; $\lambda_{exc} = 532$ nm. *Soln. cont. 0.01% morpholine.*	89E453
2.27	**Phthalocyanine, sulfo- (mixed di-, tri- and tetrasulfo)**						
	D_2O (mic)	air[a]	0.1		PL/LI-56,42	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; meas. $\phi_T(S) = 0.25$; λ_{exc} = 347 nm. $f_\Delta^T = 0.4$ assuming $P_S^{O_2} = 0$. Soln. cont. 0.01 mol L^{-1} CTAB.	86F541 87R188
	H_2O pH = 7	air	0.14		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 670$ nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at $\lambda_{exc} = 550$ nm, cor. to 670 nm.	86R060
	H_2O/MeOH (1:1) pH = 7	O_2	0.12		CP/Pa-14	A = TrpH; $\lambda_{exc} = 688$ nm.	87F104
	H_2O/MeOH (1:1) pH = 7	O_2	0.10		CP/Pa-14	A = TrpH; $\lambda_{exc} = 654$ nm.	87F104
	MeOD	air[a]	0.21* 0.17		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.22$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.93$ *assuming* $P_S^{O_2} = 0$; *used* $P_T^{O_2} = 1$; *recalcd. using* $\phi_\Delta(S') = 0.64$ from [88Z155].	87R185 87R188
	MeOD	air[a]	0.1		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.22$; $\lambda_{exc} = 694$ nm. $f_\Delta^T = 0.6$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.28	**Phthalocyanine, trisulfo-, chloroaluminum(III)**						
	D_2O pH = 7	O_2	0.34		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.62; meas. $\phi_T(S)$ = 0.46; λ_{exc} = 355 nm. Rel. to S′ in H_2O; soln. contg. 2×10^{-3} mol L^{-1} phosphate buffer and 1% NaCl wt/wt.; $P_T^{O_2} = 1$.	90A022 89R092
2.29	**Phthalocyanine, sulfo-, chloroaluminum(III)**						
	H_2O pH = 7	air	0.34		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
2.30	**Phthalocyanine, sulfo-, aluminum(III)**						
	MeOD	air[a]	0.36		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S')$ = 0.64; meas. $\phi_T(S)$ = 0.42; λ_{exc} = 347 nm. f_Δ^T = 0.86 assuming $P_S^{O_2} = 0$.	91R242 87R188
2.31	**Phthalocyanine, sulfo(phthalimido)-, aluminum(III)**						
	MeOD	air[a]	0.36		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S')$ = 0.64; λ_{exc} = 347 nm.	91R242
2.32	**Phthalocyanine, sulfo-, cobalt(II)**						
	H_2O pH = 7	air	0		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
2.33	**Phthalocyanine, sulfo-, copper(II)**						
	H_2O pH = 7	air	0		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
	H_2O/MeOH (1:1) pH = 7	O_2	0.12		CP/Pa-14	A = TrpH; λ_{exc} = 668 nm.	87F104
2.34	**Phthalocyanine, sulfo-, iron(II)**						
	H_2O pH = 7	air	0		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
2.35	**Phthalocyanine, tetrasulfo-, chlorogallium(III)**						
	H_2O/MeOH (1:1) pH = 7	O_2	0.47		CP/Pa-14	A = TrpH; λ_{exc} = 680 nm.	87F104
2.36	**Phthalocyanine, sulfo-, chlorogallium(III)**						
	H_2O/MeOH (1:1) pH = 7	O_2	0.56		CP/Pa-14	A = TrpH; λ_{exc} = 680 nm.	87F104
2.37	**Phthalocyanine, sulfo-, oxovanadium(IV)**						
	H_2O pH = 7	air	0		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
2.38	**Phthalocyanine, trisulfo-, zinc(II)**						
	D_2O pH = 7	O_2	0.36		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.62; meas. $\phi_T(S)$ = 0.51; λ_{exc} = 355 nm. Rel. to S′ in H_2O; soln. contg. 2×10^{-3} mol L^{-1} phosphate buffer and 1% NaCl wt/wt.; $P_T^{O_2} = 1$.	90A022
2.39	**Phthalocyanine, sulfo-, zinc(II)**						
	H_2O pH = 7	air	0.45		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 670 nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at λ_{exc} = 550 nm, cor. to 670 nm.	86R060
	H_2O/MeOH (1:1) pH = 7	O_2	0.62		CP/Pa-14	A = TrpH; λ_{exc} = 669 nm.	87F104
	MeOD	air[a]	0.43* 0.36		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S')$ = 0.53; meas. $\phi_T(S)$ = 0.56; λ_{exc} = 347 nm. f_Δ^T = 0.78 assuming $P_S^{O_2} = 0$. $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S')$ = 0.64 from [88Z155].	87R188 87R185

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.39	**Phthalocyanine, sulfo-, zinc(II)**—Continued						
	MeOD	air[a]	0.50* 0.41		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.56$; $\lambda_{exc} = 694$ nm. $f_\Delta^T = 0.88$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155].	87R185
	MeOD	air[a]	0.38* 0.32		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.56$; $\lambda_{exc} = 650$ nm. $f_\Delta^T = 0.69$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155].	86F541
2.40	**Phthalocyanine, tetracarboxy-, copper(II)**						
	DMSO	O_2	0.16		CP/Ac-15	A = DPBF. Independent of $[S] = (2\text{-}26) \times 10^{-6}$ mol L^{-1}; dimers and oligomers may be present.	89F260
2.41	**Phthalocyanine, 2,9,16,23-tetrakis(1,1-dimethylethyl)-**						
	CCl_4	air	0.15* 0.17		MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$.	90F095
	CCl_4	air[a]	0.14* 0.16		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.42	**Phthalocyanine, 2,9,16,23-tetrakis(1,1-dimethylethyl)-, chloroaluminum(III)**						
	CCl_4	air[a]	0.28* 0.31		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.43	**Phthalocyanine, 2,9,16,23-tetrakis(1,1-dimethylethyl)-, copper(II)**						
	CCl_4	air[a]	0.12* 0.13		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.44	**Phthalocyanine, [2,9,16,23-tetrakis(1,1-dimethylethyl)]-, magnesium(II)**						
	CCl_4	air[a]	0.06* 0.07		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 652$ nm.	90R204
2.45	**Phthalocyanine, tetrakis[methylenethio[(dimethyamino)methylidyne]]tetrakis[*N*-methylmethanaminiumato]-, copper(II), tetrachloride**						
	H_2O pH = 7	air	0		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 670$ nm. RNO as monitor of P; used $P_T^{O_2} = 1$, $\phi_\Delta(S')$ at $\lambda_{exc} = 550$ nm, cor. to 670 nm.	86R060
2.46	**Porphine**						
	$C_6H_5CH_3$	air[a]	0.67		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
	CCl_4	air	0.75		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. $P_T^{O_2} = 1$.	82F161
2.47	**Porphine-21,23-d_2**						
	$C_6H_5CH_3$	air[a]	0.70		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.48	**Porphine, 5-amino-2,7,12,17-tetraethyl-3,8,13,18-tetramethyl- (5-Aminoetioporphyrin I)**						
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.49	**Porphine, 2,18-bis[3-(dimethylammonio)propyl]-7,12-diethyl-3,8,13,17-tetramethyl-, dimethanesulfonate**						
	D_2O/EtOH (7:3)	air[a]	0.49		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 337$ nm. Rel. to TPP in CCl_4.	86F316
2.50	**Porphine, 2,18-bis[3-(dimethylammonio)propyl]-7,12-diethyl-3,8,13,17-tetramethyl-, dimethanesulfonate, cobalt(II)**						
	D_2O/EtOH (7:3)	air[a]	≤0.02		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 337$ nm. Rel. to TPP in CCl_4.	86F316
2.51	**Porphine, 2,18-bis[3-(dimethylammonio)propyl]-7,12-diethyl-3,8,13,17-tetramethyl-, dimethanesulfonate, manganese(II)**						
	D_2O/EtOH (7:3)	air[a]	≤0.02		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 337$ nm. Rel. to TPP in CCl_4.	86F316
2.52	**Porphine, 2,18-bis[3-(dimethylammonio)propyl]-7,12-diethyl-3,8,13,17-tetramethyl-, dimethanesulfonate, zinc(II)**						
	D_2O/EtOH (7:3)	air[a]	0.24		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 337$ nm. Rel. to TPP in CCl_4.	86F316

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.53	**Porphine, 21,23-dideutero-2,3-dihydro-5,10,15,20-tetraphenyl- (Tetraphenylchlorin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.70		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.54	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl- (Octaethylporphyrin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.55	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl-2,3-dihydro- (Octaethylchlorin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.60		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.56	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl-5-methyl- (α-Methyloctaethylporphyrin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.81		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.57	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl-21-methyl- (*N*-Methyloctaethylporphyrin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.55		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.58	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl-5-phenyl- (α-Phenyloctaethylporphyrin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.60		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.59	**Porphine, 21,23-dideutero-2,3,7,8,12,13,17,18-octamethyl-5,10,15,20-tetraphenyl-**						
	$C_6H_5CH_3$	air[a]	0.67		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.60	**Porphine, 21,23-dideutero-2,3,12,13-tetraethyl-**						
	$C_6H_5CH_3$	air[a]	0.72		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.61	**Porphine, 21,23-dideutero-2,7,12,17-tetraethyl-3,8,13,18-tetramethyl- (Etioporphyrin-d_2)**						
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.62	**Porphine, 21,23-dideutero-5,10,15,20-tetrakis(2-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.84		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.63	**Porphine, 21,23-dideutero-5,10,15,20-tetrakis(3-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.89		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.64	**Porphine, 21,23-dideutero-5,10,15,20-tetrakis(4-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.83		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.65	**Porphine, 21,23-dideutero-5,10,15,20-tetraphenyl- (TPP-d_2)**						
	$C_6H_5CH_3$	air[a]	0.86		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.66	**Porphine, 21,23-dideutero-5,10,15,20-tetrapropyl-**						
	$C_6H_5CH_3$	air[a]	0.92		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.67	**Porphine, 2,3-dihydro-5,10,15,20-tetraphenyl- (Tetraphenylchlorin, TPC)**						
	$C_6H_5CH_3$	air[a]	0.65		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
	CCl_4	air	0.55		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.68	**Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-**						
	$C_6H_5CH_3$	air[a]	0.80		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.80$; $\lambda_{exc} = 347$ nm.	91E392
2.69	**Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, copper(II)**						
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.86$; $\lambda_{exc} = 347$ nm.	91E392
2.70	**Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, copper(II)zinc(II)**						
	$C_6H_5CH_3$	air[a]	0.35		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.36$; $\lambda_{exc} = 347$ nm.	91E392

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.71	**Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, biszinc(II)**						
	$C_6H_5CH_3$	air[a]	0.88		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 347$ nm.	91E392
2.72	**Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octapropyl-, biscopper(II)**						
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.09$; $\lambda_{exc} = 347$ nm.	91E392
2.73	**Porphine, 2,3,7,8,12,13,17,18-octaethyl- (Octaethylporphyrin, OEP)**						
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504 87E667
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.72$; $\lambda_{exc} = 347$ nm.	91E392
2.74	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, cadmium(II) (CdOEP)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.80		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.75	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, copper(II)**						
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.74$; $\lambda_{exc} = 347$ nm.	91E392
2.76	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, lead(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.78		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.77	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, indium(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.76		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.78	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, oxotitanium(IV)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.80		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.79	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, oxovanadium(IV)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.84		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.80	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, palladium(II)**						
	$C_6H_5CH_3$	air[a]	1			Reference value, same as PdMPDME, see 2.73, 2.83.	
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.86$; $\lambda_{exc} = 347$ nm.	91E392
2.81	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, scandium(III)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.88		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.82	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, dichlorotin(IV)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.40		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.83	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-, zinc(II) (ZnOEP)**						
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504 87E667 87E543
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.72$; $\lambda_{exc} = 347$ nm.	91E392
	CH_3CN	air[a]	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
2.84	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-2,3-dihydro-**						
	$C_6H_5CH_3$	air[a]	0.60		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.85	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-5-methyl-**						
	$C_6H_5CH_3$	air[a]	0.74		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
	$C_6H_5CH_3$	air[a]	0.75		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.77$; $\lambda_{exc} = 347$ nm.	91E392

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.86	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-5-methyl-, copper(II)**						
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.25$; $\lambda_{exc} = 347$ nm.	91E392
2.87	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-5-methyl-, zinc(II)**						
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.78$; $\lambda_{exc} = 347$ nm.	91E392
2.88	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-21-methyl-**						
	$C_6H_5CH_3$	air[a]	0.55		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.89	**Porphine, 2,3,7,8,12,13,17,18-octaethyl-5-phenyl-**						
	$C_6H_5CH_3$	air[a]	0.54		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.90	**Porphine, 2,3,7,8,12,13,17,18-octamethyl-5,10,15,20-tetraphenyl-**						
	$C_6H_5CH_3$	air[a]	0.52		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.91	**Porphine, 2,3,7,8-tetraethyl-**						
	$C_6H_5CH_3$	air[a]	0.64		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.92	**Porphine, 2,3,12,13-tetraethyl-**						
	$C_6H_5CH_3$	air[a]	0.72		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.93	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl- (Etioporphyrin I)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.75		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E667 89A504
2.94	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-, zinc(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.80		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E667 89A504
2.95	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5,10-dinitro-**						
	$C_6H_5CH_3$	air[a]	0.33		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.96	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5,10-dinitro-, zinc(II)**						
	$C_6H_5CH_3$	air[a]	0.44		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.97	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5,15-dinitro-**						
	$C_6H_5CH_3$	air[a]	0.31		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.98	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5,15-dinitro-, zinc(II)**						
	$C_6H_5CH_3$	air[a]	0.34		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.99	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5-nitro-**						
	$C_6H_5CH_3$	air[a]	0.57		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.100	**Porphine, 2,7,12,17-tetraethyl-3,8,13,18-tetramethyl-5,10,15-trinitro-**						
	$C_6H_5CH_3$	air[a]	0.36		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.101	**Porphine, 7,8,17,18-tetrahydro-5,10,15,20-tetraphenyl-, (*E*) (Tetraphenylbacteriochlorin, TPBC)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.48		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667 89A504
	CCl_4	air	0.45		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.102	**Porphine, 5,10,15,20-tetrakis(4-bromophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.81		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.103	**Porphine, 5,10,15,20-tetrakis(4-carboxyphenyl)-**						
	H_2O pH = 7.4	air[a]		0.70	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.51$; meas. $\phi_T(S) = 0.76$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 27{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.53$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$	86A407

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.103	**Porphine, 5,10,15,20-tetrakis(4-carboxyphenyl)—Continued**						
	H_2O pH = 7	air	0.58		CP/Pa-43	S′ = H_2TMpyP^{4+}; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm. RNO as monitor of P.	84F253
	H_2O pH = 7	air	0.58		CP/Oc-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
	H_2O (mic)	air[a]		0.98	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.67$; meas. $\phi_T(S) = 0.85$; λ_{exc} = 532 nm. $\Delta\varepsilon_T(S)$ = 36,500 L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.83$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; soln. cont. 2% Triton X-100.	86A407
2.104	**Porphine, 5,10,15,20-tetrakis(2-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.84		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.105	**Porphine, 5,10,15,20-tetrakis(3-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.81		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.106	**Porphine, 5,10,15,20-tetrakis(4-chlorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.71		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.107	**Porphine, 5,10,15,20-tetrakis(2,6-dichloro-3-sulfonatophenyl)-, zinc(II)**						
	H_2O pH = 7	O_2	0.74		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.62$. $\phi_\Delta = 0.76$ for dye bound with human serum albumin.	90R041
2.108	**Porphine, 5,10,15,20-tetrakis(2-fluorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.71		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.109	**Porphine, 5,10,15,20-tetrakis(2-fluorophenyl)-, zinc(II)**						
	$C_6H_5CH_3$	air[a]	0.93		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.110	**Porphine, 5,10,15,20-tetrakis(4-fluorophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.65		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.111	**Porphine, 5,10,15,20-tetrakis(2-hydroxyphenyl)-**						
	MeOD	air	0.65* 0.54		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.68$; λ_{exc} = 347 nm. $f_\Delta^T = 1$ assuming $P_S^{O_2} = 0$. $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155].	88E519
2.112	**Porphine, 5,10,15,20-tetrakis(3-hydroxyphenyl)-**						
	EtOH	air[a]	0.50		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 514,5 nm.	90R204
	MeOD	air	0.69* 0.57		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.69$; λ_{exc} = 347 nm. $f_\Delta^T = 1$ assuming $P_S^{O_2} = 0$. $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155].	88E519
2.113	**Porphine, 5,10,15,20-tetrakis(4-hydroxyphenyl)- (T(p-HOP)P)**						
	EtOH	air[a]	0.58		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 514.5 nm.	90R204
	MeOD	air	0.70* 0.56		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.65$; λ_{exc} = 347 nm. $f_\Delta^T = 1$ assuming $P_S^{O_2} = 0$. $P_T^{O_2} = 1$; recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155].	88E519
2.114	**Porphine, 5,10,15,20-tetrakis(4-iodophenyl)-**						
	$C_6H_5CH_3$	air[a]	0.97		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.115	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-2-yl)-**						
	H_2O pH = 7	air	0.68		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162
2.116	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-3-yl)-**						
	H_2O pH = 7	air	0.77		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.117	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)- (H_2TMpyP^{4+})**						
	H_2O pH = 7	air	0.74		CP/Oc-14	A = FFA; λ_{exc} = 436 nm. $P_T^{O_2} = 1$.	84F253
2.118	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, cadmium(II)**						
	H_2O pH = 7	air	0.75		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm.	84F253
2.119	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, cobalt(II)**						
	H_2O pH = 7	air	<0.001		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
2.120	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, copper(II)**						
	H_2O pH = 7	air	<0.001		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
2.121	**Porphine, 5,10,15-20-tetrakis(1-methylpyridinium-4-yl)-, iron(II)**						
	H_2O pH = 7	air	<0.001		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162
2.122	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, lutetium(III)**						
	D_2O pD = 7	O_2	0.78		PL/LI-56	S′ = AlPCS; rel. to $\phi_\Delta(S') = 0.34$.	91E452
2.123	**Porphine, 5,10,15-20-tetrakis(1-methylpyridinium-4-yl)-, magnesium(II)**						
	H_2O pH = 7	air	0.69		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm.	84F253
2.124	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, manganese(III)**						
	H_2O pH = 7	air	<0.001		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
2.125	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, nickel(II)**						
	H_2O pH = 7	air	<0.001		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162
2.126	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, palladium(II)**						
	H_2O pH = 7	air	0.12		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm. $P_T^{O_2} \neq 1$.	84F253
2.127	**Porphine, 5,10,15-20-tetrakis(1-methylpyridinium-4-yl)-, tin(IV)**						
	H_2O pH = 7	air	0.78		CP/Pa-43	S′ = H_2TMpyP^{4+}; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm. RNO as monitor of P.	84F253
2.128	**Porphine, 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)-, zinc(II)**						
	H_2O pH = 7	air	0.88		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm.	84F253
2.129	**Porphine, tetrakis(4-sulfonatophenyl)-**						
	D_2O pH = 7	O_2	0.64		PL/LI-56	meas. $\phi_T(S) = 0.79$; λ_{exc} = 532 nm. Rel. to $\phi_\Delta = 0.62$ for H_2TPPS^{4-} in H_2O; soln. contg. 2×10^{-3} mol L^{-1} phosphate buffer and 1% NaCl wt/wt.: $P_T^{O_2} = 1$.	90A022
	D_2O	2.45×10^{-4}	0.76		PL/LI-56	S′ = $PdTPPS^{4-}$; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	87E941
	D_2O	air[a]	0.42		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; λ_{exc} = 337 nm. Rel. to TPP in CCl_4.	86F316
	H_2O pH = 7.4	O_2	0.71		CP/Oc-14	A = Im; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	0.33		PL/Ac-14	A = TrpH; λ_{exc} = 630 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	0.48		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer; RNO as monitor for P.	88N170
	H_2O pH = 7.4	O_2	0.50		CP/Ac-14	A = TrpH; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.129	**Porphine, tetrakis(4-sulfonatophenyl)**—Continued						
	H_2O pH = 7.4	air[a]		1.3	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.51$; meas. $\phi_T(S) = 0.57$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 52{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.75$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	86A407
	H_2O pH = 7	air	0.62		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
	H_2O pH = 7	air	0.67		CP/Pa-43	S′ = H_2TMpyP^{4+}; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm. RNO as monitor of P.	84F253
	H_2O (mic)	air[a]		1.2	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.67$; meas. $\phi_T(S) = 0.65$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 57{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.80$ assuming $P_S^{O_2} = 0$; soln. cont. 2% Triton X-100.	86A407
2.130	**Porphine, 5,10,15,20-tetrakis(4-sulfonatophenyl)-, palladium(II)**						
	D_2O	2.45×10^{-4}	1.0			$\lambda_{exc} = 347$ nm. $\phi_T = 1$; used as reference value.	87E941
2.131	**Porphine, 5,10,15,20-tetrakis(4-sulfonatophenyl)-, dichlorotin(IV)**						
	D_2O pH = 7	O_2	0.77		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.62$; meas. $\phi_T(S) = 1.0$; $\lambda_{exc} = 532$ nm. Rel. to for S′ in H_2O; soln. contg. 2×10^{-3} mol L^{-1} phosphate buffer and 1% NaCl wt/wt.; $P_T^{O_2} = 1$.	90A022
	H_2O pH = 7	air	0.67		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162
2.132	**Porphine, 5,10,15,20-tetrakis(4-sulfonatophenyl)-, ytterbium(II)**						
	H_2O pH = 7.0	O_2	0.04		CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
2.133	**Porphine, 5,10,15,20-tetrakis(4-sulfonatophenyl)-, zinc(II)**						
	D_2O	2.45×10^{-4}	0.77		PL/LI-56	S′ = $PdTPPS^{4-}$; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E941
2.134	**Porphine, 5,10,15,20-tetrakis(4-trimethylammoniophenyl)-**						
	H_2O pH = 7.4	air[a]		0.85	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.51$; meas. $\phi_T(S) = 0.56$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 48{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.48$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	86A407
	H_2O pH = 7	air	0.77		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
	H_2O pH = 7	air	0.69		CP/Pa-43	S′ = H_2TMpyP^{4+}; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 546 nm. RNO as monitor of P.	84F253
	H_2O (mic)	air[a]		1.3	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.67$; meas. $\phi_T(S) = 0.58$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 53{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.73$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; Soln. cont. 2% Triton X-100.	86A407
2.135	**Porphine, 3,7,12,18-tetramethyl-2,8-diethyl-**						
	$C_6H_5CH_3$	air[a]	0.67		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
2.136	**Porphine, 5,10,15,20-tetraphenyl- (TPP)**						
	C_5H_5N	O_2	0.74		CP/Oc-14	A = H_2NCSNH_2; λ_{exc} = 430 nm. Assumed $f_r^A = 2$.	737347 74E522
	n-C_3H_7I	air	0.77		CP/Ac-14	A = DPBF.	90E215
	c-C_4H_8O	air	0.62		CP/Ac-14	A = DPBF.	90E215
	c-C_6H_{12}	air	0.67		CP/Ac-14	A = DPBF.	90E215
	C_6D_5Br	air	0.69		CP/Ac-14	A = DPBF.	90E215
	C_6D_6	air	0.62		CP/Ac-14	A = DPBF.	90E215
	C_6F_5Br	air	0.66		CP/Ac-14	A = DPBF.	90E215
	C_6F_5Cl	air	0.57		CP/Ac-14	A = DPBF.	90E215
	C_6F_5I	air	0.75		CP/Ac-14	A = DPBF.	90E215
	C_6F_6	air	0.57		CP/Ac-14	A = DPBF.	90E215

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.136	**Porphine, 5,10,15,20-tetraphenyl- (TPP)**—Continued						
	$C_6H_5CH_3$	1.1×10^{-3}	0.69		PL/LI-56	S′ = PdTPP; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E941
	$C_6H_5CH_3$	1.8×10^{-3}	0.70		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667 89A504
	$C_6H_5CH_3$	8.5×10^{-3}	0.88		CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$. Rel. to S′ in MeOH.	84F191
	$C_6H_5CH_3$	O_2	0.88		CP/Tr,St-51	A = DPBF; $\lambda_{exc} = 546$ nm; used $\phi_F(S) = 0.05$. Measured $\phi_{ox} = 0.88$ and $\Delta H_{ox} = -185$ kJ mol^{-1}.	80C002
	C_6H_5Br	air	0.69		CP/Ac-14	A = DPBF.	90E215
	C_6H_5Cl	air	0.61		CP/Ac-14	A = DPBF.	90E215
	C_6H_5F	air	0.60		CP/Ac-14	A = DPBF.	90E215
	C_6H_5I	air	0.70		CP/Ac-14	A = DPBF.	90E215
	C_6H_6	0.1×10^{-3}	0.41^T	0.71	PL/LI-56,38	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 532$ nm; used $\phi_T(S) = 0.63$. $P_T^{O_2} = 1$.	90A328
	C_6H_6	air	0.55	0.74	PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; used $\phi_T(S) = 0.63$. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$.	90A328
	C_6H_6	air	0.62		CP/Ac-14	A = DPBF. Ave. with value from [89E223].	90E215
	C_6H_6	air	0.67		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	C_6H_6	air	0.72* 0.63		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.67$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.92$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	88E519
	C_6H_6	air	0.58		PL/Hp-52	$\lambda_{exc} = 590$ nm.	85E591
	C_6H_6	9×10^{-3}	0.62		PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$.	90A328
	C_6H_6	9.1×10^{-3}	0.89		CP/Oc-43	S′ = MB^+; A = TME; rel. to $\phi_\Delta(S') = 0.50$. Rel. to S′ in MeOH.	84F191
	CCl_4	air	0.62			See Table 4.	
	CCl_4	air	0.54		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	CCl_4	air	0.65		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. $P_T^{O_2} = 1$.	82F161
	CCl_4	air	0.7		MP/LI-56	S′ not given, probably Chl a, $\phi_\Delta = 0.55$.	81E631
	CCl_4	O_2	0.88		CP/Tr-51	$\lambda_{exc} = 546$ nm. A = DPBF, 2,5-DMF and TME; measured ϕ_F, $\phi_{ox} = 0.88$ and $\Delta H_{ox} = -205$, –95, and –175 kJ mol^{-1} for DPBF, 2,5-DMF and TME, resp.; $P_T^{O_2} = 1$.	80C002
	CH_3CN	air	0.60		CP/Ac-14	A = DPBF. Ave. with value from [89E223].	90E215
	CH_3CN	air	0.50		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	$CHCl_3$	air	0.55		CP/Ac-14	A = DPBF. Ave. with value from [89E223].	90E215
	$CHCl_3$	air	0.50		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	CS_2	air	0.51		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	$ClCF_2CCl_2F$	air	0.41		CP/Ac-14	A = MDH. $f_r^A = 0.30$.	89E223
	$ClCF_2CCl_2F$	O_2	~1		CP/Tr-51	A = DPBF; $\lambda_{exc} = 404$ nm. Measured $\phi_F(S) = 0.03$, $\phi_{ox} = 1.0$ and $\Delta H_{ox} = -195$ kJ mol^{-1}; $P_T^{O_2} = 1$	80C002
	2-EtNp	air	0.63		CP/Ac-14	A = DPBF.	90E215
	1-MeNp	air	0.34		CP/Ac-14	A = DPBF.	90E215
2.137	**Porphine, tetraphenyl-, cadmium(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.96		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
	$C_6H_5CH_3$	1.1×10^{-3}	0.98		PL/LI-56	S′ = PdTPP; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E941
2.138	**Porphine, 5,10,15,20-tetraphenyl-, chloroaluminum(III)**						
	CCl_4	air	0.90		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.139	***Porphine, 5,10,15,20-tetraphenyl-, cobalt(II)***						
	CCl_4	air	<0.01		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.140	**Porphine, 5,10,15,20-tetraphenyl-, copper(II)**						
	CCl_4	air	<0.01		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.141	**Porphine, 5,10,15,20-tetraphenyl-, dichlorotin(IV)**						
	CCl_4	air	0.55		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$	82F161
2.142	**Porphine, 5,10,15,20-tetraphenyl-, gallium(II)**						
	$C_6H_5CH_3$	air[a]	0.85		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; λ_{exc} = 347 nm.	91E392
2.143	**Porphine, 5,10,15,20-tetraphenyl-, iron(III)**						
	CCl_4	air	<0.01		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.144	**Porphine, 5,10,15,20-tetraphenyl-, manganese(III)**						
	CCl_4	air	<0.01		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.145	**Porphine, 5,10,15,20-tetraphenyl-, nickel(II)**						
	CCl_4	air	<0.01		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.146	**Porphine, 5,10,15,20-tetraphenyl-, zinc(II) (ZnTPP)**						
	C_5H_5N	O_2	0.79		CP/Oc-14	A = H_2NCSNH_2; λ_{exc} = 405 nm. Assumed $f_r^A = 2$.	737347 74E522
	$C_6H_5CH_3$	air[a]	0.92		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504 87E667
	$C_6H_5CH_3$	1.1×10^{-3}	0.93		PL/LI-56	S′ = PdTPP; rel. to $\phi_\Delta(S') = 1.0$.	87E941
	C_6H_6	0.1×10^{-3}	0.57^T	0.65	PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; λ_{exc} = 532 nm; used $\phi_T(S) = 0.87$. $P_T^{O_2} = 1$.	90A328
	C_6H_6	air		0.78	PL/LI-56,38	S′ = Pz; rel. to $f_\Delta^T(S') = 1.0$; λ_{exc} = 532 nm. $P_T^{O_2} = 1$.	90A328
	C_6H_6	air	0.68		PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$.	90A328
	C_6H_6	air	0.73		PL/Hp-52	λ_{exc} = 560 nm.	85E591
	C_6H_6	O_2	0.75		PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$. $P_T^{O_2} = 1$; assumed $f_T^{O_2} = 1$.	90A328
	CCl_4	air	0.50		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. $P_T^{O_2} = 1$.	82F161
2.147	**Porphine, 5,10,15,20-tetrapropyl-**						
	$C_6H_5CH_3$	air[a]	0.74		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$.	90E615
2.148	**Porphine, 5,10,15-tris(4-*N*-methylpyridyl)-20-[2-[*N*-[20-[5,10,15-tris(4-*N*-methylpyridylporphinyl]-3-phenoxypropyl]-4-carboxamidobutyl]phenyl-**						
	H_2O pH = 7	air	0.69		CP/Oc or Pa-43	S′ = H_2TMpyP^{4+}; rel. to $\phi_\Delta(S') = 0.74$; λ_{exc} = 436 or 546 nm. A = Im or FFA, assumed $P_T^{O_2} = 1$.	86R162
2.149	**Porphine-5-carboxaldehyde, 21,23-dideutero-2,3,7,8,12,13,17,18-octaethyl-**						
	$C_6H_5CH_3$	air[a]	0.63		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$.	90E615
2.150	**Porphine-5-carboxaldehyde, 2,3,7,8,12,13,17,18-octaethyl-**						
	$C_6H_5CH_3$	air[a]	0.63		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 347 nm. $P_T^{O_2} = 1$.	90E615 89A504
2.151	**Porphine-2,20-dicarboxylic acid, 18-(20-carboxyethyl)-12-ethenyl-7-ethyl-17,18-dihydro-3,8,13,17-tetramethyl-, cyclic 2,20-anhydride**						
	$(C_2H_5)_2O$	4×10^{-3}	0.83		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$.	90E401
2.152	**Porphine-2,18-dipropanoic acid, 7,12-bis[1-[(2-amino-2-carboxyethyl)thio]ethyl]-3,8,13,17-tetramethyl- (Porphyrin c)**						
	H_2O pH = 7.5	O_2	0.40		CP/Oc-43	S′ = RB; A = FFA; rel. to $\phi_\Delta(S') = 0.75$; λ_{exc} = 360, 400 nm.	89F093
	H_2O pH = 7.5	O_2	0.59		CP/Oc-43	S′ = RB; A = FFA; rel. to $\phi_\Delta(S') = 0.75$; λ_{exc} = 555, 580 nm. Meas. $\phi_\Delta = 0.33$ for porphyrin c aggregate.	89F093
2.153	**Porphine-2,18-dipropanoic acid, 7,12-bis[1-[(2-amino-2-carboxyethyl)thio]ethyl]-3,8,13,17-tetramethyl-, zinc(II)**						
	H_2O pH = 7.5	O_2	0.29		CP/Oc-43	S′ = RB; A = FFA; rel. to $\phi_\Delta(S') = 0.75$; λ_{exc} = 400, 575 nm.	89F093

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.154	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl- (Hematoporphyrin, HP)**						
	D_2O	air[a]	0.28		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.70; λ_{exc} = 337 nm.	89E729
	D_2O (mic)	air[a]	0.77		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.70; λ_{exc} = 337 nm. Soln. contg. 2% Triton X-100.	89E729
	D_2O (mic)	air[a]	0.35		PL/LI-56,42	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.67; meas. $\phi_T(S)$ = 0.71; λ_{exc} = 347 nm. f_Δ^T = 0.49 assuming $P_S^{O_2}$ = 0. Soln. cont. 10^{-2} mol L^{-1} CTAB.	87R188
	D_2O (mic)	O_2			PL/LI-56,42	S′ = HP; meas. $\phi_\Delta(S)/\phi_\Delta(S')$ = 2.3; λ_{exc} = 355 nm; used $\phi_T(S)$ = 0.90. Calculated $f_\Delta^T(S)/f_\Delta^T(S')$ = 2.43. Soln. cont. 0.01 mol L^{-1} CTAB; rel. to HP in D_2O.	86E061
	D_2O (mic)	air[a]	0.35		PL/LI-56,42	S′ = H_2TPPS^{4-}; meas. $\phi_T(S)$ = 0.94; λ_{exc} = 347 nm. f_Δ^T = 0.37 assuming $P_S^{O_2}$ = 0. Soln. cont. CTAB micelles.	86F541
	D_2O (mic) pD = 7.4	O_2	0.22	0.32	PL/Ad-49,39	A = DPBF; AC = S; meas. $\phi_T(S)$ = 0.70; λ_{exc} = 532 nm; used k_A = 1×10^9 L mol^{-1} s^{-1}. $\Delta\varepsilon_T(S)$ = 9,770 L mol^{-1} cm^{-1} at 460 nm; soln. cont. 0.01 mol L^{-1} CTAB; value questioned in [84F327].	83E667
	D_2O (mic) pD = 7.4	*O_2*	*0.27*	*0.32*	*PL/Ad-49,39*	*A = DPBF; AC = S; meas. $\phi_T(S)$ = 0.87; λ_{exc} = 532 nm; used k_A = 1×10^9 L mol^{-1} s^{-1}. $\Delta\varepsilon_T(S)$ = 6,660 L mol^{-1} cm^{-1} at 460 nm; soln. cont. 0.07 mol L^{-1} SDS.*	*83E667*
	D_2O/EtOH (7:3)	air[a]	0.21		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S')$ = 0.7; λ_{exc} = 337 nm. Rel. to TPP in CCl_4.	86F316
	EtOH	air[a]	0.60		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.70; λ_{exc} = 514.5 nm.	90R204
	EtOH	air[a]	0.67		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S')$ = 0.70; λ_{exc} = 337 nm.	89E729
	EtOH	air	0.53		PL/Hp-52,42	meas. $\phi_T(S)$ = 0.71; λ_{exc} = 354 nm. f_Δ^T = 0.75 assuming $P_S^{O_2}$ = 0.	87E054
	EtOH-d_1	O_2	0.53		PL/Hp-52	λ_{exc} = 354 nm.	88Z155
	EtOH-d_6	O_2	0.53		PL/Hp-52	λ_{exc} = 354 nm.	88Z155
	H_2O pH = 7.0	O_2	0.48		CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S')$ = 0.75. RNO as monitor of P.	89F580
	H_2O pH = 7.4	O_2	0.08		CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer; RNO as monitor for P.	88N170
	H_2O pH = 7.4	O_2	0.37		CP/Oc-14	A = Im; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	*0.04*		*PL/Ac-14*	*A = TrpH; λ_{exc} = 630 nm. Soln. cont. 1.6% NaCl in phosphate* buffer.	*88N170*
	H_2O pH = 7.4	O_2	0.16		CP/Ac-14	A = TrpH; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	air[a]		0.51	PL/LI,St-55,42	meas. $\phi_T(S)$ = 0.63; λ_{exc} = 532 nm. $\Delta\varepsilon_T(S)$ = 4200 L mol^{-1} cm^{-1} at 440 nm; ϕ_Δ = 0.32 assuming $P_S^{O_2}$ = 0; $P_T^{O_2}$ = 1; rel. to f_Δ^T = 0.67 for HP in micellar soln.	86A407
	H_2O pH = 7.4	O_2	0.45		CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 546 nm. RNO as monitor of P; ϕ_Δ = 0.36 to 0.47 at [S] = (18-160) × 10^{-6}, 0.35 at pH 7.0 at [S] = 3.0 × 10^{-5} mol L^{-1}.	85R008
	H_2O pH = 7.4	O_2	0.41	0.65	PL/Ad-49,39	A = DPBF; AC = S; λ_{exc} = 532 nm; used k_A = 1×10^9 L mol^{-1} s^{-1}, $\phi_T(S)$ = 0.63, $\varepsilon_T(AC)$ = 4200 L mol^{-1} cm^{-1} at 460 nm. $\Delta\varepsilon_T(S)$ = 4,200 L mol^{-1} cm^{-1} at 460 nm; authors suggest this supersedes f_Δ^T = 0.32 determined in [83E667].	84F327
	H_2O pH = 7	air	0.22		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S')$ = 0.74; λ_{exc} = 546 nm.	84F253
	H_2O pH = 9	air	0.44		CP/Oc-43	S′ = H_2TMpyP^{4+}; A = FFA; rel. to $\phi_\Delta(S')$ = 0.74; λ_{exc} = 436 nm.	84F253
	H_2O pH = 7	air	0.20		CP/Pa-43	S′ = H_2TMpyP^{4+}; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.74; λ_{exc} = 546 nm. RNO as monitor of P.	84F253
	H_2O (mic)	air[a]	0.53	0.67	PL/Ad-49,39	A = DPBF; AC = S; meas. $\phi_T(S)$ = 0.78; λ_{exc} = 532 nm. $\Delta\varepsilon_T(S)$ = 9,200 L mol^{-1} cm^{-1} at 460 nm; $P_T^{O_2}$ = 1; Soln. cont. 2% Triton X-100.	86A407

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.154	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl- (Hematoporphyrin, HP)**—Continued						
	H_2O (mic) pH = 7.4	O_2	0.77		CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to ϕ_Δ(S′) = 0.75; λ_{exc} = 546 nm. Soln. cont. 0.23 mg/mL egg phosphatidylcholine; RNO as monitor of P.	85R008
	$HCONH_2/D_2O$ (9:1)	O_2	0.43	0.60	PL/Ad-49,39	A = DPBF; AC = S; meas. ϕ_T(S) = 0.72; λ_{exc} = 532 nm; used k_A = 1.1×10^9 L mol^{-1} s^{-1}. $\Delta\varepsilon_T$(S) = 10,200 L mol^{-1} cm^{-1} at 460 nm.	83E667
	MeOD	O_2	0.64		*PL/Hp-52*	*λ_{exc} = 354 nm.*	*88Z155*
	MeOH	air[a]	0.52		PL/LI-56	S′ = Ery; rel. to ϕ_Δ(S′) = 0.60.	87R138
	MeOH/D_2O (9:1)	O_2	0.65	0.78	PL/Ad-49,39	A = DPBF; AC = S; meas. ϕ_T(S) = 0.83; λ_{exc} = 532 nm; used k_A = 1×10^9 L mol^{-1} s^{-1}. $\Delta\varepsilon_T$(S) = 10,400 L mol^{-1} cm^{-1} at 460 nm; $P_T^{O_2} = 1$.	83E667
2.155	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, cobalt(III)**						
	H_2O pH = 7	air	<0.001		CP/Oc-43	S′ = H_2TMpyP^{4+}; rel. to ϕ_Δ(S′) = 0.74; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
2.156	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, copper(II)**						
	H_2O pH = 8.0	air	0		CP/Pa-43	S′ = HP; A = 2,2,6,6-Tetramethyl-4-piperidone; P = 2,2,6,6-Tetramethyl-4-piperidone *N*-oxyl. P monitored by esr.	83N270
	H_2O pH = 8.0	air	0		CP/Pa-43	S′ = HP; A = Im; P = Imidazole endoperoxide. Tris-buffer, RNO as monitor of P.	83N270
2.157	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, diacetate (Hematoporphyrin diacetate)**						
	H_2O pH = 7.0	O_2	0.56		CP/Pa-43	S′ = RB; A = His; rel. to ϕ_Δ(S′) = 0.75. RNO as monitor of P.	89F580
2.158	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, dimethyl ester (HPDME)**						
	C_6D_6	1.2% O_2 in N_2		0.76	PR/LI-60	S′ = Np; TD = BP; rel. to f_Δ^T(S′) = 0.55. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	91A358
	C_6H_6	O_2	0.57* 0.50		PL/LI-56,42	S′ = Ac; rel. to ϕ_Δ(S′) = 0.73; meas. ϕ_T(S) = 0.72; λ_{exc} = 355 nm. $f_\Delta^T = 0.70$ assuming $P_S^{O_2} = 0$.	86E061
2.159	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, manganese(III)**						
	H_2O pH = 7	air	<0.001		CP/Oc-43	S′ = H_2TMpyP^{4+}; rel. to ϕ_Δ(S′) = 0.74; λ_{exc} = 436 or 546 nm. A = Im or FFA.	84F253
2.160	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, nickel(II)**						
	DMF	O_2	0.02		CP/Pa-43	S′ = HP; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethyl-piperidine *N*-oxyl; rel. to ϕ_Δ(S′) = 0.6[b]. Obs. P by esr	91F203
	DMF	O_2	0.02		CP/Ac-43	S′ = HP; A = Pd(phen)(dmt); rel. to ϕ_Δ(S′) = 0.6[b]. Obs. P by esr	91F203
	DMF	O_2	0.02		CP/Ac-43	S′ = HP; A = Pd(bpy)(dmt); rel. to ϕ_Δ(S′) = 0.6[b].	91F203
2.161	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, palladium(II)**						
	DMF	O_2	0.39		CP/Pa-43	S′ = HP; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethyl-piperidine *N*-oxyl; rel. to ϕ_Δ(S′) = 0.6[b]. Obs. P by esr	91F203
	DMF	O_2	0.36		CP/Ac-43	S′ = HP; A = Pd(phen)(dmt); rel. to ϕ_Δ(S′) = 0.6[b].	91F203
	DMF	O_2	0.38		CP/Ac-43	S′ = HP; A = Pd(bpy)(dmt); rel. to ϕ_Δ(S′) = 0.6[b].	91F203
2.162	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-hydroxyethyl)-3,8,13,17-tetramethyl-, platinum(II)**						
	DMF	O_2	0.26		CP/Pa-43	S′ = HP; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethyl-piperidine *N*-oxyl; rel. to ϕ_Δ(S′) = 0.6[b]. Obs. P by esr	91F203
	DMF	O_2	0.25		CP/Ac-43	S′ = HP; A = Pd(phen)(dmt); rel. to ϕ_Δ(S′) = 0.6[b].	91F203
	DMF	O_2	0.24		CP/Ac-43	S′ = HP; A = Pd(bpy)(dmt); rel. to ϕ_Δ(S′) = 0.6[b].	91F203
2.163	**Porphine-2,18-dipropanoic acid, 7,12-bis(2-hydroxyethyl)-3,8,13,17-tetramethyl- (Isohematoporphyrin)**						
	CH_2Cl_2	air[a]	0.66		CP/Pa-43	S′ = [22]Coproporphyrin II; A = 2,5-DMF. Rel. to ϕ_Δ(S′) = 1.1, using ϕ_Δ(RB) = 0.80[b].	90R215

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.164	**Porphine-2,18-dipropanoic acid, 7,12-bis(1-methoxyethyl)-3,7,12,17-tetramethyl-, dianion**						
	D_2O/EtOH (7:3)	air[a]	0.49		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; $\lambda_{exc} = 337$ nm. Rel. to TPP in CCl_4.	86F316
2.165	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl- (Protoporphyrin, PP)**						
	D_2O	air[a]	≤0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Colloidal soln. contg. 0.5% NH_4OH.	88F450
	D_2O (mic)	air[a]	0.56		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Soln. cont. 1% Triton X-100.	88F450
	H_2O pH = 8.0	air	0.14		CP/Pa-43	S′ = HP; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.4[b]. Tris-buffer, RNO as monitor of P.	83N270
	H_2O pH = 8.0	air	0.16		CP/Pa-43	S′ = HP; A = 2,2,6,6-Tetramethyl-4-piperidone; P = 2,2,6,6-Tetramethyl-4-piperidone *N*-oxyl; rel. to $\phi_\Delta(S') = 0.4$[b]. P monitored by esr.	83N270
2.166	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dimethyl ester (PPDME)**						
	$(C_2H_5)_2O$	air[a]	0.77		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$.	88F450
	C_5H_5N	O_2	0.70		CP/Oc-14	A = H_2NCSNH_2. Assumed $f_r^A = 2$.	74E522
	C_5H_5N	O_2	1.1		CP/Oc-14	A = Pregnenolone.	587002
	$C_6H_5CH_3$	air[a]	0.80		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
	C_6D_6	0.1×10^{-3}	0.45^T	0.68	PL/LI-56,42	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 532$ nm; used $\phi_T(S) = 0.66$. $P_T^{O_2} = 1$.	90A328
	C_6D_6	1.2% O_2 in N_2		0.79	PR/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 0.55$. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	90A328
	C_6D_6	air		0.73	PL/LI-56,38	S′ = Pz; rel. to $f_\Delta^T(S') = 1.0$; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$.	90A328
	C_6D_6	air	0.59		PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2}$ = 1.	90A328
	C_6D_6	air[a]	0.65* 0.57		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.66$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.86$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	C_6D_6	O_2	0.63		PL/LI-56	S′ = Pz; rel. to $\phi_\Delta(S') = 0.83$; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$; assumed $f_T^{O_2}$ = 1.	90A328
	C_6H_6	O_2	0.57		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; $\lambda_{exc} = 347$ nm; used $\phi_T(S) = 0.80$. $f_\Delta^T = 0.71$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185 86E061
	CCl_4	air	0.70		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. $P_T^{O_2} = 1$.	82F161
	CCl_4	air	0.77		MP/LI-56	S′ = Chl a; rel. to $\phi_\Delta(S') = 0.55$. $P_T^{O_2} = 1$.	80E714 79A010
2.167	**Porphine-2,18-dipropanoic acid, 21,23-dideutero-7,12-diethenyl-3,8,13,17-tetramethyl-, dimethyl ester (PPDME-d_2)**						
	$C_6H_5CH_3$	air[a]	0.80		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.168	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dimethyl ester, magnesium(II)**						
	$(C_2H_5)_2O$	air[a]	0.77		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$.	88F450
2.169	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dimethyl ester, zinc(II)**						
	CCl_4	air	0.65		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$.	82F161
2.170	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, magnesium(II) (MgPP)**						
	D_2O	air[a]	≤0.02		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Colloidal soln. contg. 0.5% NH_4OH.	88F450
	D_2O (mic)	air[a]	0.56		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$. Soln. cont. 1% Triton X-100.	88F450
2.171	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dimethyl ester, palladium(II) (PdPPDME)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.95		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.172	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dichlorotin(IV)**						
	D_2O (mic)	air[a]	0.33		PL/LI-56,42	S′ = H_2TPPS^{4-}; meas. $\phi_T(S) = 0.68$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.48$ assuming $P_S^{O_2} = 0$; soln. cont. CTAB micelles.	86F541

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.172	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, dichlorotin(IV)**—Continued						
	MeOD	O_2	0.70* 0.58		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; $\lambda_{exc} = 347$ nm. Recalcd. using $\phi_\Delta(S') = 0.64$ from [88Z155]; $P_T^{O_2} = 1$.	88R194
2.173	**Porphine-2,18-dipropanoic acid, 7,12-diethenyl-3,8,13,17-tetramethyl-, zinc(II) (ZnPP)**						
	H_2O pH = 8.0	air	0.05		CP/Pa-43	S′ = HP; A = 2,2,6,6-Tetramethyl-4-piperidone; P = 2,2,6,6-Tetramethyl-4-piperidone *N*-oxyl; rel. to $\phi_\Delta(S') = 0.4$[b]. P monitored by esr.	83N270
	H_2O pH = 8.0	air	0.04		CP/Pa-43	S′ = HP; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.4$[b]. Tris-buffer, RNO as monitor of P.	83N270
2.174	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, di[4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] ester**						
	CH_2Cl_2	air	0.22		PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.65$*; 0.57; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$; rel. to S′ in benzene.	91E134
	CH_2Cl_2	O_2	0.16		CP/Ac-43	S′ = MPDME; A = BRH_2; rel. to $\phi_\Delta(S') = 0.57$.	89F267
2.175	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, di[4-(diphenylmethylaminocarbonylphenylmethyl] ester**						
	CH_2Cl_2	air	0.57		PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.57$; $\lambda_{exc} = 532$ nm. $P_T^{O_2} = 1$; rel. to S′ in benzene.	91E134
	CH_2Cl_2	O_2	0.54		CP/Ac-43	S′ = MPDME; A = BRH_2; rel. to $\phi_\Delta(S') = 0.57$.	89F267
2.176	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, diethyl ester (MPDEE)**						
	C_5H_5N	O_2	0.70		CP/Oc-14	A = H_2NCSNH_2; $\lambda_{exc} = 430$ nm. Assumed $f_r^A = 2$.	737347 74E522
2.177	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester (MPDME)**						
	$C_6H_5CH_3$	air[a]	0.73		PL/LI-56,42	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543 87E667
	C_6D_6	1.2% O_2 in N_2		0.88	PR/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 0.55$. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	91A358
	C_6D_6	air[a]	0.61		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.81$; $\lambda_{exc} = 347$ nm. $f_\Delta^T = 0.73$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185
	C_6H_6	O_2	0.65* 0.57		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; $\lambda_{exc} = 347$ nm; used $\phi_T(S) = 0.81$. $f_\Delta^T = 0.71$ assuming $P_S^{O_2} = 0$; used $P_T^{O_2} = 1$.	87R185 86E061
	CCl_4	air	0.90		MP/LI-56	S′ = Ph a; rel. to $\phi_\Delta(S') = 0.8$. $P_T^{O_2} = 1$.	82F161
	CH_3CN	air[a]	0.61		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
2.178	**Porphine-2,18-dipropanoic acid, 21,23-dideutero-7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester (MPDME-d_2)**						
	$C_6H_5CH_3$	air[a]	0.73		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.179	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, cadmium(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.76		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.180	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, copper(II)**						
	$C_6H_5CH_3$	air[a]	~0.5		PL/LI-56	S′ = PdOEP; rel. to $\phi_\Delta(S') = 1$[b]; $\lambda_{exc} = 347$ nm.	91E392
	CCl_4	air[a]			PL/LI-56	S′ = GaTPP; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.62$; $\lambda_{exc} = 347$ nm.	91E392
2.181	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, magnesium(II)**						
	$C_6H_5CH_3$	air[a]	0.56		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543 87E667
	CH_3CN	air[a]	0.56		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm.	87E543
2.182	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, mercury(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.58		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; $\lambda_{exc} = 347$ nm.	87E667
2.183	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, palladium(II)**						
	$C_6H_5CH_3$	air[a]	1.0			Reference value justified in [74E522] and [78E893].	82E010

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.184	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, oxovanadium(IV)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.96		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	87E667
2.185	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, dimethyl ester, zinc(II)**						
	$C_6H_5CH_3$	1.8×10^{-3}	0.82		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$; λ_{exc} = 347 nm.	87E667
2.186	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, [4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] methyl ester**						
	CH_2Cl_2	air	0.40		PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.57$; λ_{exc} = 532 nm. $P_T^{O_2} = 1$; rel. to S′ in benzene.	91E134
2.187	**Porphine-2,18-dipropanoic acid, 7,12-diethyl-3,8,13,17-tetramethyl-, mono[4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] ester**						
	CH_2Cl_2	air	0.37		PL/LI-56	S′ = MPDME; rel. to $\phi_\Delta(S') = 0.57$; λ_{exc} = 532 nm. $P_T^{O_2} = 1$; rel. to S′ in benzene.	91E134
2.188	**Porphine-2,18-dipropanoic acid, 7,12-diformyl-l-3,8,13,17-tetramethyl-, dimethyl ester**						
	CH_2Cl_2	air[a]	0.68		CP/Ac-43	S′ = PPDME; A = DPF; rel. to $\phi_\Delta(S') = 0.77$; λ_{exc} = 405-408 nm.	82F333
2.189	**Porphine-2,18-dipropanoic acid, 7-[2-(dimethylamino)-2-oxoethyl]-8-ethyl-7,8-dihydro-3,7,12,17-tetramethyl, dimethyl ester, (Z)**						
	$CHCl_3$	air	0.62^T	0.9	CP/Ac-14,42	A = MDH; meas. $\phi_T(S) = 0.69$; λ_{exc} = 405, 660 nm. $P_T^{O_2} = 1$. Used $f_r^A = 0.30$, cor. for quenching of fluorescence of S.	90R006
	$CHCl_3$	air	0.54^T	0.8	CP/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.50$; meas. $\phi_T(S) = 0.69$; λ_{exc} = 405 nm. $P_T^{O_2} = 1$. Same value in O_2, cor. for quenching of fluorescence of S and S′.	90R006
2.190	**Porphine-2,18-dipropanoic acid, 7-[2-(dimethylamino)-2-oxoethyl]-8-ethylidene-7,8-dihydro-3,7,12,17-tetramethyl, dimethyl ester,**						
	CCl_4	air	0.58		CP/Ac-14	A = MDH. $P_T^{O_2} = 1$; used $f_r^A = 0.30$.	90R006
	$CHCl_3$	$(1.2\text{-}9) \times 10^{-3}$		0.95	CP/Ac-14,39	A = MDH; meas. $\phi_T(S) = 0.57$. $P_T^{O_2} = 1$; used $f_r^A = 0.30$; measured $f_\Delta^T\phi_T = 0.54$, $f_\Delta^T f_T^{O_2} = 0.87$; cor. for quenching of fluorescence of S.	90R006
	$CHCl_3$	air	0.54^T	0.95	CP/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.50$; meas. $\phi_T(S) = 0.57$; λ_{exc} = 405 nm. $P_T^{O_2} = 1$. cor. for quenching of fluorescence of S and S′.	90R006
2.191	**Porphine-2,18-dipropanoic acid, 7-[2-(dimethylamino)-2-oxoethyl]-8-heptyl-7,8-dihydro-3,7,12,17-tetramethyl, dimethyl ester, (Z)**						
	$CHCl_3$	air[a]	0.60	0.85	CP/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.5$; meas. $\phi_T(S) = 0.71$; λ_{exc} = 405 nm. $P_S^{O_2} = 0$.	91R253
2.192	**Porphine-2,18-dipropanoic acid, 7-[2-(dimethylamino)-2-oxoethyl]-8-heptyl-7,8-dihydro-3,7,12,17-tetramethyl, dimethyl ester, tin(IV), (Z)**						
	$CHCl_3$	air[a]	0.62	0.65	CP/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.5$; meas. $\phi_T(S) = 0.95$; λ_{exc} = 405 nm. $P_S^{O_2} = 0$.	91R253
2.193	**Porphine-2,18-dipropanoic acid, 7-[2-(dimethylamino)-2-oxoethyl]-8-heptyl-7,8-dihydro-3,7,12,17-tetramethyl, dimethyl ester, zinc(II), (Z)**						
	$CHCl_3$	air[a]	0.61	0.69	CP/LI-56,42	S′ = TPP; rel. to $\phi_\Delta(S') = 0.5$; meas. $\phi_T(S) = 0.88$; λ_{exc} = 405 nm. $P_S^{O_2} = 0$.	91R253
2.194	**Porphine-2,18-dipropanoic acid, 7(12)-ethenyl-12(7)-formyl, dimethyl ester**						
	CH_2Cl_2	air[a]	0.71		CP/Ac-43	S′ = PPDME; A = DPF; rel. to $\phi_\Delta(S') = 0.77$; λ_{exc} = 405-408 nm.	82F333
2.195	**Porphine-2,18-dipropanoic acid, 7-ethenyl-12-(1-hydroxyethyl)-3,8,13,17-tetramethyl-**						
	EtOD	air	0.45	0.65	PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.53$; meas. $\phi_T(S) = 0.69$; λ_{exc} = 347 nm. $P_S^{O_2} = 0$.	87E054
	D_2O	O_2	0.2		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.4$[b]; meas. $\phi_T(S) = 0.34$; λ_{exc} = 355 nm. Calculated $f_\Delta^T(S)/f_\Delta^T(S') = 1.19$.	86E061
	D_2O (mic)	O_2	0.6		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.4$[b]; meas. $\phi_T(S) = 0.63$; λ_{exc} = 355 nm. Calculated $f_\Delta^T(S)/f_\Delta^T(S') = 2.25$; soln. cont. 0.01 mol L^{-1} CTAB.	86E061
2.196	**Porphine-2,18-dipropanoic acid, 12(7)-ethenyl-8(13)-hydroxy-3,8,13,17-tetramethyl-7(12)-(oxoethylidene)-, dimethyl ester**						
	C_6H_6	O_2	0.56* 0.49		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; λ_{exc} = 355 nm; used $\phi_T(S) = 0.66$. $f_\Delta^T = 0.74$ assuming $P_S^{O_2} = 0$.	86E061
	CH_2Cl_2	air[a]	0.69		CP/Ac-43	S′ = PPDME; A = DPF; rel. to $\phi_\Delta(S') = 0.77$; λ_{exc} = 405-408 nm.	82F333

Table 2, Quantum yields of photosensitized production of singlet oxygen, porphyrins.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.197	**Porphine-2,18-dipropanoic acid, 3,7,12,17-tetramethyl- (Deuteroporphyrin, DP)**						
	H_2O pH = 7.0	O_2	0.51		CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
	H_2O pH = 8.0	air	0.22		CP/Pa-43	S′ = HP; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.4^b$. Tris-buffer, RNO as monitor of P.	83N270
	H_2O pH = 8.0	air	0.23		CP/Pa-43	S′ = HP; A = 2,2,6,6-Tetramethyl-4-piperidone; P = 2,2,6,6-Tetramethyl-4-piperidone *N*-oxyl; rel. to $\phi_\Delta(S') = 0.4^b$. P monitored by esr.	83N270
2.198	**Porphine-2,18-dipropanoic acid, 3,7,12,17-tetramethyl-, dimethyl ester (DPDME)**						
	$C_6H_5CH_3$	air[a]	0.53		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1.0$.	89A504
	C_6D_6	1.2% O_2 in N_2		0.75	PR/LI-60	S′ = Np; TD = BP; rel. to $f_\Delta^T(S') = 0.55$. $P_T^{O_2} = 1$; cor. for energy transfer efficiency.	91A358
	C_6H_6	O_2	0.64* 0.56		PL/LI-56,42	S′ = Ac; rel. to $\phi_\Delta(S') = 0.73$; meas. $\phi_T(S) = 0.72$; $\lambda_{exc} = 355$ nm. $f_\Delta^T = 0.78$ assuming $P_S^{O_2} = 0$.	86E061
2.199	**Porphine-2,18-dipropanoic acid, 21,23-dideutero-3,7,12,17-tetramethyl-, dimethyl ester (DPDME-d_2)**						
	$C_6H_5CH_3$	air[a]	0.58		PL/LI-56	S′ = PdMPDME; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$.	90E615
2.200	**Porphine-2-propanoic acid, 18-carboxy-20-(carboxymethyl)-8-ethenyl-13-ethyl-2,3-dihydro-3,7,12,17-tetramethyl- (Chlorin a_6)**						
	C_5H_5N	air[a]	0.74		PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.74$; meas. $\phi_T(S) = 0.81$; $\lambda_{exc} = 347$ nm.	89E505
	D_2O pD = 8.1	air[a]	0.75		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.7$; meas. $\phi_T(S) = 0.82$; $\lambda_{exc} = 347$ nm. Complex with HSA.	89E505
	D_2O pD = 8.1	air[a]	0.76		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.7$; meas. $\phi_T(S) = 0.80$; $\lambda_{exc} = 347$ nm.	89E505
	D_2O (mic) pD = 8.1	air[a]	0.70		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.7$; meas. $\phi_T(S) = 0.80$; $\lambda_{exc} = 347$ nm. Soln. cont. 10^{-3} mol L^{-1} Triton X-100.	89E505
2.201	**5-Porphinepropenoic acid, octaethyl-, ethyl ester**						
	MeOH	air	0.08		PL/LI-56,42	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.08$. $f_\Delta^T = \sim 1$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$; secondary $\phi_\Delta(S') = 0.41$, S′ = ZnPCS.	90E491
2.202	**Porphine-2-propionamide, *N*-[4-[(7-chloro-4-quinolyl)amino]butyl]-5,10,15,20-tetraphenyl-**						
	H_2O (mic)	air			CP/Ac-43	S′ = HP; A = His; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.65$; $\lambda_{exc} = 405$ nm. Tris buffer, 1% Triton X-100.	90F450
2.203	**Porphine-2,7,12,17-tetrapropanoic acid, 3,8,13,18-tetrakis(carboxymethyl)- (Uroporphyrin I)**						
	H_2O pH = 7.4	air[a]		0.56	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.51$; meas. $\phi_T(S) = 0.93$; $\lambda_{exc} = 532$ nm; used $\varepsilon_T(S) = 19000$ L mol^{-1} cm^{-1} at 440 nm. $\Delta\varepsilon_T(S) = 19{,}000$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.52$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	86A407
	H_2O pH = 7.4	O_2	0.71		CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 546$ nm. RNO as monitor of P.	85R008
	H_2O pH = 8.0	air	0.80		CP/Pa-43	S′ = HP; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.4^b$. Tris-buffer, RNO as monitor of P.	83N270
	H_2O pH = 8.0	air	0.62		CP/Pa-43	S′ = HP; A = 2,2,6,6-Tetramethyl-4-piperidone; P = 2,2,6,6-Tetramethyl-4-piperidone *N*-oxyl; rel. to $\phi_\Delta(S') = 0.4^b$. P monitored by esr.	83N270
	H_2O (mic) pH = 7.4	O_2	0.92		CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; $\lambda_{exc} = 546$ nm. Soln. cont. 0.23 mg/mL egg phosphatidylcholine; RNO as monitor of P.	85R008
2.204	**Porphine-2,7,12,17-tetrapropanoic acid, 3,8,13,18-tetramethyl- (Coproporphyrin I)**						
	H_2O pH = 7.0	O_2	0.60		CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
2.205	**Porphine-2,7,12,18-tetrapropanoic acid, 3,8,13,17-tetramethyl- (Coproporphyrin III)**						
	H_2O pH = 7.4	air[a]		0.46	PL/LI,St-55,42	S′ = HP; rel. to $f_\Delta^T(S') = 0.51$; meas. $\phi_T(S) = 0.61$; $\lambda_{exc} = 532$ nm. $\Delta\varepsilon_T(S) = 6500$ L mol^{-1} cm^{-1} at 440 nm; $\phi_\Delta = 0.28$ assuming $P_S^{O_2} = 0$; $P_T^{O_2} = 1$.	86A407

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.205	**Porphine-2,7,12,18-tetrapropanoic acid, 3,8,13,17-tetramethyl- (Coproporphyrin III)**—Continued						
	H_2O (mic)	air[a]		0.71	PL/LI,St-55,42	S′ = HP; rel. to f_Δ^T(S′) = 0.67; meas. ϕ_T(S) = 0.81; λ_{exc} = 532 nm. $\Delta\varepsilon_T$(S) = 12,200 L mol^{-1} cm^{-1} at 440 nm; ϕ_Δ = 0.58 assuming $P_S^{O_2}$ = 0; $P_T^{O_2}$ = 1; Soln. cont. 2% Triton X-100.	86A407
2.206	**Porphine-2,7,12,18-tetrapropanoic acid, 3,8,13,17-tetramethyl-, tetramethyl ester**						
	C_6D_6	1.2% O_2 in N_2		0.74	PR/LI-60	S′ = Np; TD = BP; rel. to f_Δ^T(S′) = 0.55. $P_T^{O_2}$ = 1; cor. for energy transfer efficiency.	*91A358*
2.207	**Porphine-2,7,18-tripropanoic acid, 13,13′-(1,6-hexanediyl)bis[3,8,12,17-tetramethyl-**						
	D_2O (mic)	O_2	0.18		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to ϕ_Δ(S′) = 0.67; λ_{exc} = 355 nm. Soln. cont. 10^{-2} mol L^{-1} CTAB.	88R204
2.208	**Porphine-2,7,18-tripropanoic acid, 13,13′-(1,3-propanediyl)bis[3,8,12,17-tetramethyl-**						
	D_2O (mic)	O_2	0.18		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to ϕ_Δ(S′) = 0.67; λ_{exc} = 355 nm. Soln. cont. 10^{-2} mol L^{-1} CTAB.	88R204
2.209	**Porphine-2,7,18-tripropanoic acid, 13,13′-(1,11-undecanediyl)bis[3,8,12,17-tetramethyl-**						
	D_2O (mic)	O_2	0.18		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to ϕ_Δ(S′) = 0.67; λ_{exc} = 355 nm. Soln. cont. 10^{-2} mol L^{-1} CTAB.	88R204
2.210	**[26] Porphyrin**						
	$CHCl_3$	air	0.14^T		PL/LI-56,42	S′ = TPP; rel. to ϕ_Δ(S′) = 0.50; meas. ϕ_T(S) = 0.15; λ_{exc} = 546 nm. f_Δ^T = ~1 assuming $P_S^{O_2}$ = 0; $P_T^{O_2}$ = 1.	90E530
2.211	**Porphycene**						
	$C_6H_5CH_3$	air	0.30		PL/LI-56,42	S′ = An; rel. to ϕ_Δ(S′) = 0.61; meas. ϕ_T(S) = 0.42; λ_{exc} = 347 and 354 nm. Assumed $P_S^{O_2}$ = 0 and $P_T^{O_2}$ = 1 to give f_Δ^T = 0.7.	86E633
	C_6H_6	O_2	0.34		PL/LI-56	S′ = ZnTPP; rel. to ϕ_Δ(S′) = 0.73; λ_{exc} = 600 nm. $P_T^{O_2}$ = 1.	90E374
	C_6H_6	O_2	0.34		PL/LI-56,42	S′ = An; rel. to ϕ_Δ(S′) = 0.68; meas. ϕ_T(S) = 0.3; λ_{exc} = 354 nm. Assumed $P_S^{O_2}$ = 0 and $P_T^{O_2}$ = 1 to give f_Δ^T = 1.	90E374
	D_2O (ves) pD = 7.4	O_2	0.17-0.37		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to ϕ_Δ(S′) = 0.72; λ_{exc} = 600 nm. [DPPC] = 6.7 × 10^{-4} mol L^{-1}, S′ in D_2O-Tris buffer; concn. dependent.	90N126
	EtOH	air	0.30		PL/LI-56	S′ = An; rel. to ϕ_Δ(S′) = 0.61; λ_{exc} = 347 and 354 nm. Also relative to ϕ_Δ = 0.73 for ZnTPP.	86E633
2.212	**Porphycene, 2,7,12,17-tetrapropyl-**						
	$C_6H_5CH_3$	air	0.35		PL/LI-56	S′ = An; rel. to ϕ_Δ(S′) = 0.61; λ_{exc} = 347 and 354 nm. Also relative to ϕ_Δ = 0.73 for ZnTPP; some singlet quenching.	86E633
	C_6H_6	O_2	0.36		PL/LI-56	S′ = ZnTPP; rel. to ϕ_Δ(S′) = 0.73; λ_{exc} = 600 nm.	90E374
	C_6H_6	O_2	0.36		PL/LI-56,42	S′ = An; rel. to ϕ_Δ(S′) = 0.68; meas. ϕ_T(S) = 0.4; λ_{exc} = 354 nm. Measured $P_S^{O_2}$ = 0 and $P_T^{O_2}$ = 1 to give f_Δ^T = 1.	90E374
	D_2O (ves) pD = 7.4	O_2	0.22-0.37		PL/LI-56	S′ = H_2TPPS^{4-}; rel. to ϕ_Δ(S′) = 0.72; λ_{exc} = 553 nm. [DPPC] = 6.7 × 10^{-4} mol L^{-1}, S′ in D_2O-Tris buffer; concn. dependent.	90N126
2.213	**Sapphyrin, 3,8,12,13,17,22-hexaethyl-2,7,18,23-tetramethyl-, diprotonated**						
	CD_2Cl_2	O_2	0.28		PL/LI-56,41	S′ = RBEE; rel. to ϕ_Δ(S′) = 0.61; λ_{exc} = 355, 532 nm. f_Δ^T = ~0.5 assuming $P_S^{O_2}$ = 0; SAP^{2+} exists as monomer in $CHCl_3$ where ϕ_T(S) = 0.54.	90E194
	CD_3CN	O_2	0.19		PL/LI-56	S′ = BP; rel. to ϕ_Δ(S′) = 0.37; λ_{exc} = 355 nm. SAP^{2+} exists as mixt. of monomer and dimer in this solvent; at high concn. of SAP^{2+} (1×10^{-4} mol L^{-1}), ϕ_Δ = 0.17.	90E194
	CD_3OD	air	0.13		PL/LI-56	S′ = T(m-HOP)P; rel. to ϕ_Δ(S′) = 0.57; λ_{exc} = 355, 532 nm. SAP^{2+} exists as mixt. of monomer and dimer in this solvent.	90E194
2.214	**Tetrabenzoporphine, zinc(II)**						
	C_5H_5N/ diox (1:1)	O_2	0.7		PL/LI-56	S′ = HP; rel. to ϕ_Δ(S′) = 0.6[b]; λ_{exc} = 633 nm.	91F205

Table 2, Quantum yields of photosensitized production of singlet oxygen, from porphyrins and related species.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	f_Δ^T	Method	Comment	Ref.
2.215	**Tetrabenzo[*b,g,l,q*]porphine, 6,13-diphenyl-, cadmium(II)**						
	diox	O_2	0.5		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.6$[b]; $\lambda_{exc} = 633$ nm.	91F205
2.216	**Tetrabenzo[*b,g,l,q*]porphine, 6,13-diphenyl-, magnesium(II)**						
	diox	O_2	0.4		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.6$[b]; $\lambda_{exc} = 633$ nm.	91F205
2.217	**Tetrabenzo[*b,g,l,q*]porphine, 6,13-diphenyl-, zinc(II)**						
	C_5H_5N/ diox (1:1)	O_2	0.6		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.6$[b]; $\lambda_{exc} = 633$ nm.	91F205
	diox	O_2	0.6		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.6$[b]; $\lambda_{exc} = 633$ nm.	91F205
2.218	**Tetrabenzo[*b,g,l,q*]porphine, 6,13,20-triphenyl-, zinc(II)**						
	diox	O_2	0.7		PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.6$[b]; $\lambda_{exc} = 633$ nm.	91F205
2.219	**Cadmium(II) chlorotexaphyrin nitrate**						
	MeOH	air	0.74	0.76	PL/LI-56,42	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; meas. $\phi_T(S) = 0.97$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.220	**Cadmium(II) texaphyrin nitrate**						
	MeOH	air	0.69	0.78	PL/LI-56,42	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; meas. $\phi_T(S) = 0.88$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.221	**Europium(III) dimethyltexaphyrin dihydroxide**						
	MeOH	air	<0.05		PL/LI-56	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.222	**Manganese(II) texaphyrin, hydroxide**						
	MeOH	air	<0.05		PL/LI-56	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.223	**Samarium(II) dimethyltexaphyrin dihydroxide**						
	MeOH	air	<0.05		PL/LI-56	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; $\lambda_{exc} = 355$ nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.224	**Zinc(II) chlorotexaphyrin chloride**						
	MeOH	air	0.65	0.73	PL/LI-56,42	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; meas. $\phi_T(S) = 0.88$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.225	**Zinc(II) texaphyrin chloride**						
	MeOH	air	0.61	0.74	PL/LI-56,42	S′ = T(p-HOP)P; rel. to $\phi_\Delta(S') = 0.56$; meas. $\phi_T(S) = 0.82$; λ_{exc} = 355 nm. $P_T^{O_2} = 1$, used $P_S^{O_2} = 0$.	89A356
2.226	**Zinc methyl pyroverdin**						
	C_6H_6	air[a]	0.17		PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; $\lambda_{exc} = 355$ nm.	91R193
2.227	**Mesoverdin methyl ester**						
	C_6H_6	air[a]	0.10		PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; $\lambda_{exc} = 355$ nm.	91R193
2.228	**Deuteroverdin methyl ester**						
	C_6H_6	air[a]	0.18		PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; $\lambda_{exc} = 355$ nm.	91R193
2.229	**Coproverdin II trimethyl ester**						
	C_6H_6	air[a]	0.14		PL/LI-56	S′ = Ac; rel. to $\phi_\Delta(S') = 0.84$; $\lambda_{exc} = 355$ nm.	91R193

[a] Oxygen concentration not given; assumed to be air saturated.
[b] Value of $\phi_\Delta(S')$ used in this work to calculate $\phi_\Delta(S)$ from authors' reported $\phi_\Delta(S)/\phi_\Delta(S')$.
[T] Value corrected for 100% quenching of T_1.
* Values recalculated using $\phi_\Delta(S')$ or $f_\Delta^T(S')$ from Table 4 or from the quoted reference.

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.1	**Anthra[9,1,2-*cde*]benzo[*rst*]pentaphene-5,10-dione (Dibenzanthrone)**					
	$CDCl_3$	air	0.03	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.2	**Anthra[9,1,2-*cde*]benzo[*rst*]pentaphene-5,10-dione, dibromo-16,17-dimethoxy-**					
	$CDCl_3$	air	<0.02	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.3	**Anthra[9,1,2-*cde*]benzo[*rst*]pentaphene-5,10-dione, 16,17-dinitro-**					
	$CDCl_3$	air	<0.02	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.4	**Anthra[9,1,2-*cde*]benzo[*rst*]pentaphene-10,18-dione, 6,15-dichloro-**					
	CCl_4	air	0.2	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
	$CDCl_3$	air	0.085	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.5	**Anthra[2,1-*d*:6,5-*d*′]bisthiazole-6,12-dione, 1,8-diphenyl-**					
	$EtOH/C_6H_6$	O_2	0.51	CP/Oc-27	A = Furan; $\lambda_{exc} = 365$ nm.	73F677
3.6	**2-Anthracenesulfonic acid, 1-amino-9,10-dihydro-9.10-dioxo-4-[3-[[2-(sulfooxy)ethyl]sulfonyl]phenyl]amino]-, disodium salt**					
	2-PrOH/ H_2O (10:1)	air	0.017	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 546$ nm.	79F662
3.7	**Benzenesulfonic acid, 2-[(4-amino-3-bromo-9,10-dihydro-9,10-dioxo-1-anthracenyl)amino]-5-methyl-, monosodium salt**					
	2-PrOH/ H_2O (10:1)	air	0.015	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 546$ nm.	79F662
3.8	**Benzenesulfonic acid, 4-[(4-amino-9,10-dihydro-9,10-dioxo-1-anthracenyl)amino]phenyl]amino]-6-(2-chloro-1,3,5-triazin-4-yl)amino**					
	2-PrOH/ H_2O (10:1)	air	0.014	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 546$ nm.	79F662
3.9	**Benzenesulfonic acid, 4-[(2-methoxy-5-(2-sulfatoethyl)sulfonylphenyl]azo-3-[2-hydroxy-5-methyl-imidaz-1-yl]-, disodium salt**					
	2-PrOH/ H_2O (10:1)	air	>0.1	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 546$ nm.	79F662
3.10	**Benzimidazo[2,10*a*]benz[*de*]isoquinolin-7-one, 4-benzoyl-**					
	$CHCl_3$	air[a]	0.55	PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631
	EtOH	air[a]	0.56	CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S') = 0.77$. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
3.11	**Benzo[*d*]naphtho[1,2-*b*]pyran-6-one, 4-(6-deoxy-α-galactofuranosyl)-1-hydroxy-10,12-dimethoxy-8-methyl- (Gilvocarcin V)**					
	DMSO	air	0.15	CP/Pa-43	S′ = RB; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethyl-piperidine *N*-oxyl; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 405$ nm.	89D112
3.12	**Benzo[*a*]phenothiazinium, 5-amino-9-diethylamino-**					
	MeOH	air[a]	0.024	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 630$ nm. Soln. cont. 0.04% acetic acid.	87R190
3.13	**Benzo[*a*]phenothiazinium, 5-amino-9-diethylamino-6-iodo-**					
	MeOH	air[a]	0.28	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$. Acidic soln.; data from Cincotta (unpubl.).	90E288
	MeOH	air[a]	0.17	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 630$ nm. Soln. cont. 0.04% acetic acid.	87R190
3.14	**Benzo[*a*]phenothiazinium, 5-benzylamino-9-diethylamino-**					
	MeOH	air[a]	0.021	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 630$ nm. Soln. cont. 0.04% acetic acid.	87R190
3.15	**Benzo[*a*]phenoxazinium, 5-amino-6-bromo-9-diethylamino-**					
	MeOH	air[a]	0.007	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 630$ nm. Soln. cont. 0.04% acetic acid.	87R190
3.16	**Benzo[*a*]phenoxazinium, 5-amino-6,8-dibromo-9-ethylamino-**					
	MeOH	air[a]	0.082	CP/Ac-45	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 630$ nm. Soln. cont. 0.04% acetic acid.	87R190

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.17	**Benzo[*a*]phenoxazinium, 5-amino-9-diethylamino-**					
	MeOH	air[a]	0.005	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.18	**Benzo[*a*]phenoxazinium, 5-amino-9-diethylamino-2,6-diiodo-**					
	MeOH	air[a]	0.034	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.19	**Benzo[*a*]phenoxazinium, 5-amino-9-ethylamino-6,8-diiodo-**					
	MeOH	air[a]	0.50	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.20	**Benzo[*a*]phenoxazinium, 5-amino-9-diethylamino-2-iodo-**					
	MeOH	air[a]	0.008	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.21	**Benzo[*a*]phenoxazinium, 5-amino-9-diethylamino-6-iodo-**					
	MeOH	air[a]	0.06	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76. Acidic soln.; data from Cincotta (unpubl.).	90E288
	MeOH	air[a]	0.036	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.22	**Benzo[*a*]phenoxazinium, 5-benzylamino-9-diethylamino-**					
	MeOH	air[a]	0.005	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 630 nm. Soln. cont. 0.04% acetic acid.	87R190
3.23	**1,2-Benzothiazine-3-carboxamide, 4-hydroxy-2-methyl-*N*-(2-pyridyl)- 1,1-dioxide (Piroxicam)**					
	C_6H_6	air	<0.02	PL/LI-56	S′ = BP; rel. to ϕ_Δ(S′) = 0.29; λ_{exc} = 308 nm. No emission detected.	91F273
	C_6H_6	air[a]	≤0.01	PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.73; λ_{exc} = 355 nm.	87R130
	D_2O pH = ~7	air[a]	≤0.002	PL/LI-56	S′ = H_2TMpyP^{4+}; rel. to ϕ_Δ(S′) = 0.74; λ_{exc} = 265, 355 nm.	87R130
3.24	**1,2-Benzothiazin-4-one, 2,3-dihydro-2-methyl-, 1,1-dioxide**					
	C_6H_6	air[a]	0.40* 0.35	PL/LI-56	S′ = Ac; rel. to ϕ_Δ(S′) = 0.73; λ_{exc} = 355 nm.	87R130
	D_2O pH = ~7	air[a]	0.20	PL/LI-56	S′ = H_2TMpyP^{4+}; rel. to ϕ_Δ(S′) = 0.74; λ_{exc} = 265 nm.	87R130
	D_2O pH = ~7	air[a]	0.18	PL/LI-56	S′ = H_2TMpyP^{4+}; rel. to ϕ_Δ(S′) = 0.74; λ_{exc} = 355 nm.	87R130
3.25	**Benzothiazolium, 5-chloro-2-[2-[3-[(5-chloro-3-ethyl-2-benzothiazolidene)ethylidene]-2-(diphenylamino)-1-cyclopenten-1-yl)ethenyl]-3-ethyl-, perchlorate**					
	Propylene carbonate	O_2	0.014	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.26	**Benzothiazolium, 6-chloro-3-methyl-2-[7-(1,3,3-trimethyl-2-indolylidene)-1-(4-iodo-1,3,5-heptatrienyl)-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.017	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.27	**Benzothiazolium, 3,6-dimethyl-2-[7-(1,3,3-trimethyl-2-indolylidene)-1-(4-iodo-1,3,5-heptatrienyl)-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.012	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.28	**Benzothiazolium, 6-fluoro-3-methyl-2-[7-(1,3,3-trimethyl-2-indolylidene)-1-(4-iodo-1,3,5-heptatrienyl)-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.012	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.29	**Benzothiazolium, 6-methoxy-3-methyl-2-[7-(1,3,3-trimethyl-2-indolylidene)-1-(4-iodo-1,3,5-heptatrienyl)-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.006	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.30	**Benzothiazolium, 3-methyl-2-[7-(1,3,3-trimethyl-2-indol-2-ylidene)-1,3,5-heptatrienyl]-, iodide**					
	Propylene carbonate	O_2	0.017	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.31	**5-Benzoxazoleacetic acid, 2-(4-chlorophenyl)-α-methyl- (Benoxaprofen)**					
	H_2O pH = 8.0	air	0.18	CP/Oc-14	A = His. Assumed $\phi_{ox} = \phi_\Delta$ in the presence of 0.1 mol L^{-1} His, but measured $\phi_T = 0.19$ was reduced by 2.6 in the presence of His. Thus $2.6 \times \phi_{ox} = \phi_\Delta$ in the absence of His.	85E163
3.32	**3-Benzoxazolepropanesulfonic acid, 2-[4-(1,3-dibutyltetrahydro-4,6-dioxo-2-thioxo-5-pyrimidinylidene)-2-butenylidene]-, sodium salt (*Merocyanine 540*)**					
	H_2O (ves)	O_2	0.015-0.05	CP/Ac-43	A = DMA; λ_{exc} = 376 nm. rel. to ϕ_Δ(MC540) in EtOH = 0.007; DMPC liposomes	91R140
	H_2O (ves)	O_2	0.035-0.05	CP/Ac-43	S′ = RB; A = ADPA; rel. to ϕ_Δ(S′) = 0.75; λ_{exc} = 376 nm. DMPC liposomes; rel. to S′ in H_2O; at 38°C ϕ_Δ increases by factor of 1.3	91R140
	D_2O/MeOD (1:1)	air[a]	0.02	PL/LI-56	S′ = Ery; rel. to ϕ_Δ(S′) = 0.60.	91A208
	H_2O/EtOH (94:6)	O_2	0.003	CP/Oc-43	S′ = RB; A = His; rel. to ϕ_Δ(S′) = 0.76; λ_{exc} = 568 nm. λ_{exc} = 550 for RB.	91R063
	EtOH	air	0.007	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.86.	88F151
	MeOH	air	0.004	CP/Ac-45	S′ = RB; A = DPBF; rel. to ϕ_Δ(S′) = 0.86. Rel. to S′ in ethanol.	88F151
	CD_3OD	O_2	0.03	PL/LI-56	S′ = T(m-HOP)P; rel. to ϕ_Δ(S′) = 0.57; λ_{exc} = 532 nm. $P_T^{O_2} = 1$.	91R017
3.33	**Biline-8,12-dipropanoic acid, 18-ethenyl-3-ethylidene-1,2,3,15,16,19,22,24-octahydro-2,7,13,17-tetramethyl-1,19-dioxo-, dimethyl ester**					
	$C_6H_5CH_3$	air	0.0008	CP/Ac-14	A = DPBF; λ_{exc} = 597 nm.	91R184
3.34	**(2,2′-Bipyridine)bis(bromo)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.05$. Obs. P by esr.	88A276
3.35	**(2,2′-Bipyridine)bis(chloro)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.19$. Obs. P by esr.	88A276
3.36	**(2,2′-Bipyridine)bis(cyano)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.31$. Obs. P by esr.	88A276
3.37	**(2,2′-Bipyridine)bis(iodo)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.02$. Obs. P by esr.	88A276
3.38	**(2,2′-Bipyridine)bis(thiocyanato)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.16$. Obs. P by esr.	88A276
3.39	**2,2′-Bipyridine(2,3-naphthalenediolato)palladium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.04$. Obs. P by esr	91F203
3.40	**2,2′-Bipyridine(2,3-naphthalenediolato)platinium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.15$. Obs. P by esr	91F203
3.41	**2,2′-Biquinoline(2,3-naphthalenediolato)palladium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.05$. Obs. P by esr	91F203

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—*Continued*

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.42	**2,2′-Biquinoline(2,3-naphthalenediolato)platinium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dln); A – TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.07$. Obs. P by esr	91F203
3.43	**Bis(azido)(2,2′-biquinoline)palladium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.04$. Obs. P by esr.	90F196
3.44	**Bis(azido)(2,2′-biquinoline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.05$. Obs. P by esr.	90F196
3.45	**Bis(azido)(2,2′-bipyridine)palladium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.18$. Obs. P by esr.	90F196
3.46	**Bis(azido)(4,7-diphenyl-1,10-phenanthroline)palladium(II) Pd(4,7-Ph_2phen)$(N_3)_2$**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.34$. Obs. P by esr.	90F196
3.47	**Bis(azido)(4,7-diphenyl-1,10-phenanthroline)platinum(II) Pt(4,7-Ph_2phen)$(N_3)_2$**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.76$. Obs. P by esr.	90F196
3.48	**Bis(azido)(1,10-phenanthroline)palladium(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.17$. Obs. P by esr.	90F196
3.49	**Bis(azido)(1,10-phenanthroline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(bpy)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.82$. Obs. P by esr.	90F196
3.50	**4-*tert*-Butylcatechol(1,10-phenanthroline)palladium(II) Pd(phen)(BCAT)**					
	DMF	O_2	~0.18	CP/Pa-43	S′ = Pt(phen)(BCAT); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = \sim 0.15$[b]. Obs. P by esr.	89F181
3.51	**4-*tert*-Butylcatechol(1,10-phenanthroline)platinum(II) Pt(phen)(BCAT)**					
	DMF	O_2	~0.15	CP/Pa-43	S′ = HP; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = 0.6$[b]. Obs. P by esr.	89F181
3.52	**4,4′-Carbocyanine, 1,1′-diethyl- (Kryptocyanine)**					
	D_2O (mic) pH = ~7	O_2	<0.03	PL/LI-56	S′ = T(m-HOP)P; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 355, 532 nm. Triton X-100; same results for HSA-bound dye.	90R164
	H_2O (cells)	O_2	<0.05	PL/LI-56	S′ = T(m-HOP)P; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 355, 532 nm.	90R164
	MeOD	O_2	<0.02	PL/LI-56	S′ = T(m-HOP)P; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 355, 532 nm. $P_S^{O_2} = 0$, $P_T^{O_2} = 1$.	90R164
3.53	**Catechol(1,10-phenanthroline)palladium(II) Pd(phen)(CAT)**					
	DMF	O_2	~0.09	CP/Pa-43	S′ = Pt(phen)(BCAT); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = \sim 0.15$[b]. Obs. P by esr.	89F181

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.54	**Catechol(1,10-phenanthroline)platinum(II) Pt(phen)(CAT)**					
	DMF	O_2	~0.07	CP/Pa-43	S′ = Pt(phen)(BCAT); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = \sim 0.15$[b]. Obs. P by esr.	89F181
3.55	**Cobrynic acid, bis(cyano)-7-de(carboxymethyl)-7,8-didehydro-, hexamethyl ester**					
	C_6D_6	O_2	0.13	CP/Ac-14	A = DMA; λ_{exc} = 710 nm.	83F222
	C_6H_6	O_2	0.13	CP/Ac-14	A = DMA; λ_{exc} = 710 nm.	83F222
	$CDCl_3$	O_2	0.12	CP/Ac-14	A = DMA; λ_{exc} = 710 nm.	83F222
	$CHCl_3$	O_2	0.12	CP/Ac-14	A = DMA; λ_{exc} = 710 nm.	83F222
	MeOD	O_2	0.18	CP/Ac-14	A = DMA; λ_{exc} = 710 nm.	83F222
3.56	**Diazene, 1-(4-acetylamino-5-hydroxy-2-methylphenyl)-2-phenyl-**					
	$CHCl_3$	air[a]	0.04	PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631
	EtOH	air[a]	0.05	CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S') = 0.77$. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
3.57	**Diazene, 1-(2-bromo-6-cyano-4-nitrophenyl)-2-[2-(acetylamino)-4-[*N*-(2-cyanoethyl)-*N*-(2-hydroxyethyl)amino]-5-methoxyphenyl]-**					
	Dibutyl terephthalate	air[a]	~0.0007	CP/Ac-43	A = TPCP; λ_{exc} = 589 nm. Rel. to ϕ_Δ(TPP) = 0.74 and ϕ_Δ(ZnTPP) = 0.79 in pyridine. Short lifetime indicates $P_T^{O_2} < 1$.	81F609
3.58	**Diazene, 1-(2-bromo-4,6-dinitrophenyl)-2-[2-(acetylamino)-4-[*N*-(2-cyanoethyl)-*N*-(2-hydroxyethyl)amino]-5-methoxyphenyl]-**					
	Dibutyl terephthalate	air[a]	~0.0007	CP/Ac-43	A = TPCP; λ_{exc} = 589 nm. Rel. to ϕ_Δ(TPP) = 0.74 and ϕ_Δ(ZnTPP) = 0.79 in pyridine. Short lifetime indicates $P_T^{O_2} < 1$.	81F609
3.59	**Diazene, 1-(2-chloro-4,6-dinitrophenyl)-2-[2-(acetylamino)-4-[*N*-(2-cyanoethyl)-*N*-(2-hydroxyethyl)amino]-5-methoxyphenyl]-**					
	Dibutyl terephthalate	air[a]	~0.0007	CP/Ac-43	A = TPCP; λ_{exc} = 589 nm. Rel. to ϕ_Δ(TPP) = 0.74 and ϕ_Δ(ZnTPP) = 0.79 in pyridine. Short lifetime indicates $P_T^{O_2} < 1$.	81F609
3.60	**Diazene, 1-(4,6-dinitrophenyl)-2-[2-(acetylamino)-4-[*N*-(2-cyanoethyl)-*N*-(2-hydroxyethyl)amino]-5-methoxyphenyl]-**					
	Dibutyl terephthalate	air[a]	~0.0007	CP/Ac-43	A = TPCP; λ_{exc} = 589 nm. Rel. to ϕ_Δ(TPP) = 0.74 and ϕ_Δ(ZnTPP) = 0.79 in pyridine. Short lifetime indicates $P_T^{O_2} < 1$.	81F609
3.61	**Diazene, 1-(4-methylphenyl)-2-[1-(phenylaminocarbonyl)-2-oxopropyl]-**					
	DMAA	air	<0.0022	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
	DMF	air	<0.012	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 564 nm.	86F622
	DMF	air	<0.0021	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
3.62	**Diazene, 1-phenyl-2-[1-(phenylaminocarbonyl)-2-oxopropyl]-**					
	DMAA	air	<0.026	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
	DMF	air	<0.024	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 564 nm.	86F622
	DMF	air	<0.023	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
	2-PrOH	air	≤0.022	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
3.63	**Dibenz[*f,i,j*]isoquinoline-2,7-dione, 3-methyl-6-(phenylamino)-**					
	$CHCl_3$	air[a]	0.008	PL/LI-56	S′ = MPDEE; rel. to $\phi_\Delta(S') = 0.77$. $P_T^{O_2} = 1$.	82F631
	EtOH	air[a]	0.02	CP/Oc-43	S′ = MPDEE; A = H_2NCSNH_2; rel. to $\phi_\Delta(S') = 0.77$. Assumed $P_T^{O_2} = 1$, $P_S^{O_2} = 0$.	82F631
3.64	**Dibenzo[*def,mno*]chrysene-6,12-dione, 4,10-dibromo-**					
	CCl_4	air	0.75* 0.85	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.65	**2,3:7,8-Dibenzopyrene-1,6-dione**					
	$C_6H_4(CH_3)_2$	air[a]	0.77	PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	90F577
	CH_3CN	air[a]	0.70	PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	90F577

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.65	**2,3:7,8-Dibenzopyrene-1,6-dione**—Continued					
	CCl_4	air	0.7* 0.8	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
	EtOH	air[a]	0.63	PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90F577
	$EtOH/C_6H_6$	O_2	0.62	CP/Oc-27	A = Furan; $\lambda_{exc} = 365$ nm.	73F677
	D_2O	air[a]	~0.09	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm. Aggregates present.	90F577
	D_2O/EtOH (75:25)	air[a]	~0.1	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; $\lambda_{exc} = 337$ nm.	90F577
3.66	**2,3:7,8-Dibenzopyrene-1,6-dione, 4,9-dibromo-**					
	CCl_4	air	0.84* 0.95	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.67	**2,3:7,8-Dibenzopyrene-1,6-dione, 4,9-dichloro-**					
	$CDCl_3$	air	0.65	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.68	**Dibromo(1,10-phenanthroline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(phen)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.07$. Obs. P by esr.	88A276
3.69	**Dichloro(1,10-phenanthroline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(phen)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.19$. Obs. P by esr.	88A276
3.70	**Dicyano(1,10-phenanthroline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(phen)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.41$. Obs. P by esr.	88A276
3.71	**Dihematoporphyrin ester**					
	D_2O	O_2	0.4	PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.4$[b]; $\lambda_{exc} = 355$ nm.	86E061
	D_2O (mic)	O_2	0.6	PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.4$[b]; $\lambda_{exc} = 355$ nm. Soln. cont. 0.01 mol L^{-1} CTAB.	86E061
	D_2O (mic)	air[a]	0.29	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; meas. $\phi_T(S) = 0.90$; $\lambda_{exc} = 347$ nm. $P_T^{O_2} = 1$; CTAB micelles; detd. mol. wt. of DHE of = 4200.	86F541 87R188
	MeOD	air[a]	0.30	PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; $\lambda_{exc} = 347$ nm. Reported $\phi_\Delta = 0.25$, using $\phi_\Delta(S') = 0.53$; recalcd. using $\phi_\Delta(S')$ from [88Z155]; detd. mol. wt. of DHE of = 4200.	87R188
3.72	**Dihematoporphyrin ester chlorin**					
	D_2O (mic)	air[a]	0.23	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; meas. $\phi_T(S) = 1$; $\lambda_{exc} = 347$ nm. Soln. cont. 10^{-2} mol L^{-1} CTAB.	87R188 86F541
	MeOD	air[a]	0.30	PL/LI-56	S′ = HP; rel. to $\phi_\Delta(S') = 0.64$; meas. $\phi_T(S) = 0.85$; $\lambda_{exc} = 347$ nm. Reported $\phi_\Delta = 0.25$, using $\phi_\Delta(S') = 0.53$; recalcd. using $\phi_\Delta(S')$ from [88Z155]; assumed mol. wt. = 1200.	87R188 86F541
3.73	**Diiodo(1,10-phenanthroline)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(phen)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.04$. Obs. P by esr.	88A276
3.74	**3,4-Dimercaptotoluene(1,10-phenanthroline)palladium(II) Pd(phen)(DMT)**					
	DMF	O_2	~0.01	CP/Pa-43	S′ = Pt(phen)(BCAT); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = \sim 0.15$[b]. Obs. P by esr.	89F181

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.75	**Dinaphtho[2,3:*a*:2′,3′-*i*]]carbazole-4,9-diamine, *N*,*N*′-dibenzoyl-10,15,16,17-tetrahydro-5,10,15,17-tetraoxo-**					
	$CDCl_3$	air	0.2	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.76	**4,7-Diphenyl-1,10-phenanthroline(2,3-naphthalenediolato)platinium(II) Pt(4,7-Ph_2phen)(dnt)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.63$. Obs. P by esr	91F203
3.77	**Fulvic acids**					
	H_2O pH = 4.1-8.6	air	0.014-0.093	CP/Ac-14	A = 2,5-DMF; λ_{exc} = 366 nm. In various natural waters.	777245
	H_2O pH = 3.5-10.5	O_2	0.010-0.030	CP/Oc-14	A = FFA.	87F139
3.78	**Hematoporphyrin derivative (Photofrin I)**					
	D_2O	air[a]	0.25	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
	D_2O (mic)	air[a]	0.77	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm. Soln. contg. 2% Triton X-100.	89E729
	D_2O (mic)	O_2	0.35	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; λ_{exc} = 355 nm. Soln. cont. 10^{-2} mol L^{-1} CTAB.	88R204
	EtOH	air[a]	0.77	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
	EtOH	air[a]	0.75	CP/Ac-14	A = DPBF; λ_{exc} = 620 nm. Assumed $f_r^A = 2$.	76R193
	H_2O	air[a]	0.12	CP/Oc-14	A = FFA; λ_{exc} = 405 nm. Used $f_r^A = 1.23$; ϕ_Δ = 0.061, 0.037, 0.067 and 0.05 in soln. contg. 0.9% NaCl excited at 405, 436, 546, and 650 nm, resp.	85F332
	H_2O pH = 7.4	O_2	0.06	CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 546 nm. RNO as monitor of P.	85R008
	H_2O (mic) pH = 7.4	O_2	0.87	CP/Ac-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S')$ = 0.75; λ_{exc} = 546 nm. RNO as monitor of P; soln. cont. 0.23 mg/mL egg phosphatidylcholine.	85R008
	MeOH	air[a]	0.83	CP/Oc-14	A = FFA; λ_{exc} = 405 nm. Used $f_r^A = 1.52$.	85F332
3.79	**Hematoporphyrin dimers**					
	D_2O	air[a]	0.11	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
	D_2O (mic)	air[a]	0.52	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm. Soln. contg. 2% Triton X-100.	89E729
	EtOH	air[a]	0.60	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
	H_2O pH = 7.0	O_2	0.29	CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
3.80	**Hematoporphyrin monomer:dimer:oligomer 2:3:9**					
	H_2O pH = 7.0	O_2	0.14	CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
3.81	**Hematoporphyrin monomer:dimer:oligomer 4:2:1**					
	H_2O pH = 7.0	O_2	0.40	CP/Pa-43	S′ = RB; A = His; rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
3.82	**Hematoporphyrin monomer:dimer:oligomer 5:3:4**					
	H_2O pH = 7.0	O_2	0.28	CP/Pa-43	S′ = RB: A = His: rel. to $\phi_\Delta(S') = 0.75$. RNO as monitor of P.	89F580
3.83	**Hematoporphyrin oligomers**					
	D_2O	air[a]	0.06	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
	D_2O (mic)	air[a]	0.49	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm. Soln. contg. 2% Triton X-100.	89E729
	EtOH	air[a]	0.31	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	89E729
3.84	**Humic acids**					
	H_2O pH = 7.2-8.0, 13.0	O_2	0.005-0.026	CP/Ac-14	A = FFA; λ_{exc} = 366 nm.	84F269 87F139

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.85	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, cobalt(II) salt (Cobalt(II) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.006$.	88F568
3.86	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, cobalt(III) salt (Co(III) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.006$.	88F568
3.87	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, chromium(III) salt (Cr(III) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 14$.	88F568
3.88	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, copper(II) salt (Cu(II) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.04$.	88F568
3.89	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, iron(III) salt (Fe(III) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.4$.	88F568
3.90	**Imidazole, 4,5-diphenyl-2-[(2-carboxy-5-methylphenyl)azo]-, nickel(II) salt (Ni(II) Dye II)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye II; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.006$.	88F568
3.91	**Imidazole, 4,5-diphenyl-2-[(2-hydroxy-5-nitrophenyl)azo]-, cobalt(II) salt (Cobalt(II) Dye III)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye III; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.0012$.	88F568
3.92	**Imidazole, 4,5-diphenyl-2-[(2-hydroxy-5-nitrophenyl)azo]-, cobalt(III) salt (Co(III) Dye III)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye III; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.0012$.	88F568
3.93	**Imidazole, 4,5-diphenyl-2-[(2-hydroxy-5-nitrophenyl)azo]-, copper(II) salt (Cu(III) Dye III)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye III; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.0029$.	88F568
3.94	**Imidazole, 4,5-diphenyl-2-[(2-hydroxy-5-nitrophenyl)azo]-, nickel(II) salt (Ni(II) Dye III)**					
	DMF	air[a]		CP/Ac-43	S′ = Zn(II) Dye III; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.0012$.	88F568
3.95	**Indolium, 2-[7-(4-bromo-1,3,3-trimethyl-2-indol-2-ylidene)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.017	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.96	**Indolium, 2-[7-(4-chloro-1,3,3-trimethyl-2-indol-2-ylidene)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.012	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.97	**Indolium, 2-[7-(4-iodo-1,3,3-trimethyl-2-indol-2-ylidene)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, iodide**					
	Propylene carbonate	O_2	0.024	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.98	**Indolium, 2-[7-(4-iodo-1,3,3-trimethyl-2-indol-2-ylidene)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.02	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.99	**Indolium, 2-[7-(1,3,3-trimethyl-2-indol-2-ylidene)-1-[4-(2,2-dimethoxyethyl)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.011	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.100	**Indolium, 2-[7-(1,3,3-trimethyl-2-indol-2-ylidene)-1-[4-(1-piperidinio)-1,3,5-heptatrienyl]-1,3,3-trimethyl-, bis(tetrafluoroborate)**					
	Propylene carbonate	O_2	0.022	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.101	**Indolium, 2-[7-(1,3,3-trimethyl-2-indol-2-ylidene)-1-[4-[3-(1,3,3-trimethyl-2-indolylidene)-2-propenyl]-1,3,5-heptatrienyl]-1,3,3-trimethyl-, tetrafluoroborate**					
	Propylene carbonate	O_2	0.008	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.102	**Indol-3-one, 5-bromo-2-(9-chloro-3-oxonaphtho[1,2-*b*]thien-2-ylidene)-4-methyl-1,2-dihydro-**					
	$CDCl_3$	air	0.025	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.103	**Malachite Green cation**					
	MeOH	O_2	<0.002	CP/Ac-43	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$[b]; $\lambda_{exc} = 546$ nm. Measured $P_T^{O_2} = 1$.	80F304
3.104	**Mesoporphyrin bound to poly(styrene-co-divinylbenzene)**					
	CH_2Cl_2	O_2	0.34	CP/Ac-43	S′ = MPDME; A = BRH_2; rel. to $\phi_\Delta(S') = 0.57$.	89F267

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.105	**Mesoporphyrin di[4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] ester bound to poly(styrene-co-divinylbenzene)**					
	CH_2Cl_2	O_2	0.02-0.03	CP/Ac-43	S′ = MPDME; A = BRH_2; rel. to $\phi_\Delta(S') = 0.57$. (0.29 or 0.10) × 10^{-3} mol MP/g resin	89F267
3.106	**Mesoporphyrin di[4-(diphenylmethylaminocarbonylphenylmethyl] ester bound to poly(styrene-co-divinylbenzene)**					
	CH_2Cl_2	O_2	0.07	CP/Ac-43	S′ = MPDME; A = BRH_2; rel. to $\phi_\Delta(S') = 0.57$.	89F267
3.107	**Methanaminium, *N*-[4-[[4-(dimethylamino)phenyl][4-(phenylamino)-1-naphthalenyl]methylene]-2,5-cyclohexadien-1-ylidene]-*N*-methyl-, chloride**					
	MeOH	O_2	0.006	CP/Ac-43	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$[b]; λ_{exc} = 546 nm. Measured $P_T^{O_2} = 1$.	80F304
3.108	**2-Naphthacenecarboxamide, 4-(dimethylamino)-1,4,4a,5,5a,6,11,12a-octahydro-3,6,10,12,12a-pentahydroxy-6-methyl-1,11-dioxo-(Tetracycline)**					
	D_2O pD = 7	air	0.026	PL/LI-56	S′ = RF; rel. to $\phi_\Delta(S') = 0.30$; λ_{exc} = 337 nm.	87F290
3.109	**5,12-Naphthacenedione, 8-acetyl-10[(3-amino-2,3,6-trideoxy-hexopyranosyloxy]-tetrahydro-6,8,11-trihydroxy-1-methoxy-(Daunomycin)**					
	D_2O pH = 7.4	O_2	0.02	PL/LI-56,42	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$. f_Δ^T = ~0.1-1 depending on $\phi_T(S)$.	89B024
3.110	**5,12-Naphthacenedione, 8-acetyl-7,8,9,10-tetrahydro-6,8,10,11-tetrahydroxy-1-methoxy- (*S*-cis) (Daunomycinone)**					
	C_6H_6	O_2	0.03	PL/LI-56,42	S′ = PPDME; rel. to $\phi_\Delta(S') = 0.55$. f_Δ^T = ~0.1 using meas. $\phi_T(S)$ = 0.038.	89B024
3.111	**5,12-Naphthacenedione, 10-[(3-amino-2,3,6-trideoxy-α-L-*lyxo*-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-8-(hydroxyacetyl)-1-methoxy- (Adriamycin)**					
	D_2O pH = 7.4	O_2	0.02	PL/LI-56,42	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$. f_Δ^T = ~0.1-1 depending on $\phi_T(S)$.	89B024
3.112	**12-Naphthaceneone, 8-acetyl-10[(3-amino-2,3,6-trideoxyhexopyranosyloxy]-tetrahydro-6,7,11-trihydroxy-5-imino-1-methoxy-(5-Iminodaunomycin)**					
	D_2O pH = 7.4	O_2	0.02	PL/LI-56,42	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$. f_Δ^T = ~0.1-1 depending on $\phi_T(S)$.	89B024
3.113	**2-Naphthaleneacetic acid, 6-methoxy-α-methyl- (Naproxen)**					
	H_2O pH = 2, 7	air	~0.2	CP/Oc-43	S′ = BXP; A = 2,5-DMF; rel. to $\phi_\Delta(S') = 0.18$.	88R012
3.114	**2-Naphthalenecarboxamide, 4-[[4-(aminocarbonyl)phenyl]azo]-3-hydroxy-*N*-(2-methoxyphenyl)-**					
	DMF	air	<0.0014	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 564 nm.	86F622
	DMF	air	<0.0056	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
3.115	**2-Naphthalenecarboxamide, 3-hydroxy-4-[(4-methylphenyl)azo]-*N*-phenyl-**					
	DMF	air	<0.0012	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 564 nm.	86F622
	DMF	air	<0.011	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; λ_{exc} = 435 nm.	86F622
3.116	**2,7-Naphthalenedisulfonic acid, 5-[[4-chloro-6-(phenylamino)-1,3,5-triazin-2-yl]amino]-4-hydroxy-3-[(2-sulfophenyl)azo]-, trisodium salt**					
	2-PrOH/ H_2O (10:1)	air	0.0054	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; λ_{exc} = 546 nm.	79F662
3.117	**1-Naphthalenesulfonic acid, 3-[[[4-chloro-6-(4-methyl-2-sulfophenyl)amino]-1,3,5-triazen-2-yl]amino-3-(5-sulfophenyl)]azo]-, trisodium salt**					
	2-PrOH/ H_2O (10:1)	air	0.0058	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; λ_{exc} = 546 nm.	79F662
3.118	**1-Naphthalenesulfonic acid, 5-hydroxy-6-[[2-methoxy-5-[[2-(sulfooxy)ethyl]sulfonyl]phenyl]azo]-, disodium salt**					
	2-PrOH/ H_2O (10:1)	air	0.0048	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; λ_{exc} = 546 nm.	79F662
3.119	**6-Naphthalenesulfonate ion, 1,1′-methylenebis-**					
	D_2O	air[a]	~0.4	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.70$; λ_{exc} = 337 nm.	90F577
3.120	**1-Naphthol, 5-[[3-(aminosulfonyl)phenyl]sulfonylamino]-4-[2-(methylsulfonyl)-4-nitrophenylazo]-, conjugate base**					
	DMF	air	0.0037	CP/Ac-14,A18	A = DPBF.	79F412
	H_2O	air	0.00013	CP/Ac-14,A18	A = 2,5-DMF.	79F412

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.120	**1-Naphthol, 5-[[3-(aminosulfonyl)phenyl]sulfonylamino]-4-[2-(methylsulfonyl)-4-nitrophenylazo]-, conjugate base**—Continued					
	MeOH	air	0.0016	CP/Ac-14,A18	A = DPBF.	79F412
3.121	**1-Naphthol, 5-methoxy-4-[2-(methylsulfonyl)-4-nitrophenyl]azo-, conjugate base**					
	DMF	air	0.00027	CP/Ac-14,A18	A = DPBF.	79F412
3.122	**2-Naphthol, 1-(2-hydroxyphenylazo)-, aluminum(III) salt (Al(III) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 370$.	88F568
3.123	**2-Naphthol, 1-(2-hydroxyphenylazo)-, chromium(III) salt (Cr(III) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 16$.	88F568
3.124	**2-Naphthol, 1-(2-hydroxyphenylazo)-, cobalt(II) salt (Co(II) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.07$.	88F568
3.125	**2-Naphthol, 1-(2-hydroxyphenylazo)-, cobalt(III) salt (Co(III) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.07$.	88F568
3.126	**2-Naphthol, 1-(2-hydroxyphenylazo)-, copper(II) salt (Cu(II) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.07$.	88F568
3.127	**2-Naphthol, 1-(2-hydroxyphenylazo)-, iron(III) salt (Fe(III) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 2.6$.	88F568
3.128	**2-Naphthol, 1-(2-hydroxyphenylazo)-, nickel(II) salt (Ni(II) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = <0.07$.	88F568
3.129	**2-Naphthol, 1-(2-hydroxyphenylazo)-, zinc(II) salt (Zn(II) Dye I)**					
	DMF	air[a]		CP/Ac-43	S′ = Cd(II) Dye I; A = DPBF; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.84$.	88F568
3.130	**2-Naphthol, 1-(4-methyl-2-nitrophenylazo)-**					
	DMAA	air	<0.0031	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
	DMF	air	<0.0056	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 564$ nm.	86F622
	DMF	air	<0.013	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
	2-PrOH	air	<0.0019	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
3.131	**2-Naphthol, 1-(4-nitrophenylazo)-**					
	DMAA	air	<0.0046	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
	DMF	air	<0.0077	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
	DMF	air	<0.0051	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 564$ nm.	86F622
	2-PrOH	air	≤0.0012	CP/Ac-43	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 1$; $\lambda_{exc} = 435$ nm.	86F622
3.132	**Naphtho[1,8-*bc*]thiopyran-3-one, 2-(1-oxonaphtho[2,1-*b*]thiophen-2-ylidine)-, (*E*)**					
	$CDCl_3$	air	0.6	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.133	**1,8-Naphthyridine-3-carboxylic acid, 1,4-dihydro-1-ethyl-7-methyl-4-oxo- (Nalidixic acid)**					
	D_2O pH = 4.4	air[a]	0.24	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; $\lambda_{exc} = 347$ nm. $pK_a = 6.1$; ϕ_Δ decreases to 0.09 on addn. of eumelanin.	88R070
3.134	**1,8-Naphthyridine-3-carboxylic acid, 1,4-dihydro-1-ethyl-7-methyl-4-oxo-, anion**					
	D_2O pH = 8.9	air[a]	0.15	PL/LI-56	S′ = H_2TPPS^{4-}; rel. to $\phi_\Delta(S') = 0.67$; $\lambda_{exc} = 347$ nm.	88R070
3.135	**2,2′-Oxatricarbocyanine, 3,3′-diethyl-, iodide**					
	Propylene carbonate	O_2	0.015	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; $\lambda_{exc} = 633$ nm.	87E690
3.136	**(1,10-Phenanthroline)bis(thiocyanato)platinum(II)**					
	DMF	O_2		CP/Pa-43	S′ = Pt(phen)$(N_3)_2$; A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.15$. Obs. P by esr.	88A276

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.137	**1,10-Phenanthroline(2,3-naphthalenediolato)palladium(II) Pd(phen)(dnt)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.02$. Obs. P by esr	91F203
3.138	**1,10-Phenanthroline(2,3-naphthalenediolato)platinum(II) Pt(phen)(dnt)**					
	DMF	O_2		CP/Pa-43	S′ = Pd(4,7-Ph_2phen)(dhn); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; meas. $\phi_\Delta(S)/\phi_\Delta(S') = 0.13$. Obs. P by esr	91F203
3.139	**1,10-Phenanthroline(thiosalicylato)palladium(II) Pd(phen)(TSA)**					
	DMF	O_2	~0.03	CP/Pa-43	S′ = Pt(phen)(BCAT); A = TEMP-4-OH; P = 4-Hydroxy-2,2,6,6-tetramethylpiperidine *N*-oxyl; rel. to $\phi_\Delta(S') = ~0.15$[b]. Obs. P by esr.	89F181
3.140	**1,10-Phenanthrolinetris(1-thienyl-4,4,4-trifluoro-1,3-butanedionato)europium(III) Eu(phen)(tta)$_3$**					
	CCl_4	$\rightarrow \infty$	0.45	PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$; λ_{exc} = 347 nm.	91E314
3.141	**Phenothiazine, 10-(1-azabicyclo[2.2.2]oct-3-ylmethyl)- (Mequitazine)**					
	C_6H_6	air	0.34* 0.28	PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; λ_{exc} = 308 nm.	91F273
3.142	**Phenothiazine, 2-chloro-10-dimethylaminopropyl- (Chlorpromazine)**					
	C_6H_6	air	0.33* 0.27	PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; λ_{exc} = 308 nm.	91F273
3.143	**12-(10′-Phenothiazinyl)dodecyl-1-sulfonate ion**					
	H_2O (mic)	O_2	0.095	CP/Oc-14	A = S; P = 12-(10'-Phenothiazinyl)dodecyl-1-sulfonate ion 9-sulfoxide.	85Z063
3.144	**Photofrin II**					
	H_2O pH = 7.4	O_2	0.01	PL/Ac-14	A = TrpH; λ_{exc} = 630 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	0.04	CP/Pa-43	S′ = RB; A = Im; P = Imidazole endoperoxide; rel. to $\phi_\Delta(S') = 0.75$; λ_{exc} = 540 nm. RNO as monitor for P.	88N170
	H_2O pH = 7.4	O_2	0.13	CP/Oc-14	A = Im; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
	H_2O pH = 7.4	O_2	0.09	CP/Ac-14	A = TrpH; λ_{exc} = 540 nm. Soln. cont. 1.6% NaCl in phosphate buffer.	88N170
3.145	**Poly(sodium styrenesulfonate-co-2-vinylnaphthalene)**					
	H_2O	O_2	0.25	CP/Ac-14	A = $C_6H_5CH{=}CH_2$.	91F015
3.146	**Pyran, 4-(dicyanomethylene)-6-(4-dimethylaminostyryl)-2-methyl-**					
	CCl_4	air[a]	0.0015	PL/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	90F568
3.147	**8,16-Pyranthrenedione**					
	$CDCl_3$	air	0.8	MP/LI-56	S′ = TPP; rel. to $\phi_\Delta(S') = 0.7$.	85E863
3.148	**Pyrazole-3-selone, 4-(aminomethylene)-2,4-dihydro-5-methyl-2-phenyl-, (Z)-**					
	1-BuOH	air	0.16	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	c-C_6H_{12}	air	0.11	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	CCl_4	air	0.31	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	$CDCl_3$	air	0.16	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	CH_3CN	air	0.16	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	$CHCl_3$	air	0.14	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	EtOH	air	0.096	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	MeOH	air	0.13	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646
	MeOH-d_3	air	0.13	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2} = 1$.	85F646

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.148	**Pyrazole-3-selone, 4-(aminomethylene)-2,4-dihydro-5-methyl-2-phenyl-, (Z)—Continued**					
	2-PrOH	air	0.12	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	diox	air	0.14	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
3.149	**Pyrazole-3-thione, 4-(aminomethylene)-2,4-dihydro-5-methyl-2-phenyl-**					
	1-BuOH	air	0.037	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	c-C_6H_{12}	air	0.033	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	CCl_4	air	0.15	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	$CDCl_3$	air	0.062	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	CH_3CN	air	0.055	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	$CHCl_3$	air	0.059	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	EtOH	air	0.037	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	MeOH	air	0.033	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	MeOH-d_3	air	0.038	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	2-PrOH	air	0.030	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
	diox	air	0.071	CP/Ac-14	A = S; λ_{exc} = 366 nm. $P_T^{O_2}$ = 1.	85F646
3.150	**Pyrazol-3-one, 2-(4-bromophenyl)-4-(4-diethylamino-2-methylphenyl)-2,4-dihydro-imino-5-methylcarbamyl-**					
	CCl_4	O_2	0.0040	CP/Ac-14	A = 2M2P.	87F542
3.151	**Pyrazol-3-one, 2-(4-chlorophenyl)-4-(4-diethylamino-2-methylphenyl)-2,4-dihydro-imino-5-methylcarbamyl-**					
	CCl_4	O_2	0.0012	CP/Ac-14	A = 2M2P.	87F542
3.152	**Pyrazol-3-one, 4-(4-diethylamino-2-methylphenyl)imino-2,4-dihydro-5-methylcarbamyl-2-(3-methoxyphenyl)-**					
	CCl_4	O_2	0.0012	CP/Ac-14	A = 2M2P.	87F542
3.153	**Pyrazol-3-one, 4-(4-diethylamino-2-methylphenyl)imino-2,4-dihydro-5-methylcarbamyl-2-(3-methylphenyl)-**					
	CCl_4	O_2	0.0008	CP/Ac-14	A = 2M2P.	87F542
3.154	**Pyrazol-3-one, 4-[[4-(diethylamino)-2-methylphenyl]imino]-2,4-dihydro-5-methyl-2-phenyl-**					
	CCl_4	O_2	0.0026	CP/Ac-14	A = 2M2P.	87F542
3.155	**Pyrazol-3-one, 4-(4-diethylamino-2-methylphenyl)imino-5-methylcarbamyl-2,4-dihydro-2-(2,4,6-trichlorophenyl)-**					
	CCl_4	O_2	0.0016	CP/Ac-14	A = 2M2P.	87F542
3.156	**Pyrazol-3-one, 4-[[4-(diethylamino)phenyl]imino]-2,4-dihydro-5-methyl-2-phenyl-**					
	CCl_4	O_2	0.0027	CP/Ac-14	A = 2M2P.	87F542
3.157	**Pyrazol-3-one, 4-[[4-(dimethylamino)phenyl]imino]-2,4-dihydro-5-methyl-2-phenyl-**					
	CCl_4	O_2	0.0021	CP/Ac-14	A = 2M2P.	87F542
3.158	**Pyrazolo[1′,2′:2,3][1,2,3]triazolo[4,5-*a*]phenazin-4-ium, 1,3-dimethyl-**					
	c-C_6H_{12}	air	0.21	CP/Ac-27	A = DPBF; λ_{exc} = 543 nm.	80F548
	$CHCl_3$	air	0.037	CP/Ac-27	A = DPBF; λ_{exc} = 543 nm.	80F548
	$CHCl_3$/MeOH (8:2)	air	0.053	CP/Ac-27	A = DPBF; λ_{exc} = 543 nm.	80F548
3.159	**Pyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenapyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.004	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157 90R069 88A269
3.160	**Pyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.05	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157 90R069 88A269

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.161	**Pyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)thiapyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.0006	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.50$.	90R069
3.162	**Pyrylium, 4,4′-(1,3-propenyl)bis[2,6-di(1,1-dimethylethyl)-**					
	MeOH	air	0.0004	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.50$.	90F157 90R069 88A269
3.163	**4-Quinazolinone, 6-amino-2-(fluoromethyl)-3-(2-methylphenyl)- (Afloqualone)**					
	C_6H_6	air	0.17* 0.14	PL/LI-56	S′ = BP; rel. to $\phi_\Delta(S') = 0.29$; $\lambda_{exc} = 308$ nm.	91F273
3.164	**Remazol Brilliant Red 5B**					
	2-PrOH/ H_2O (10:1)	air	0.0068	CP/Ac-45	S′ = RB; A = DMA; rel. to $\phi_\Delta(S') = 0.5$; $\lambda_{exc} = 546$ nm.	79F662
3.165	**Rhodamine B cation**					
	MeOH	O_2	0.016	CP/Ac-43	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$[b]; $\lambda_{exc} = 546$ nm. Measured $P_T^{O_2} = 1$.	80F304
3.166	**Rhodamine 6G cation**					
	C_5H_5N	O_2	0.12	CP/Oc-14	A = H_2NCSNH_2. Assumed $f_r^A = 2$.	737347 74E522
3.167	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene)**					
	CH_2Cl_2	O_2	0.76- 0.91	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol; amount of bound dye varied, 9-284 mg RB/g polymer.	86P106
3.168	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), ammonium salt**					
	CH_2Cl_2	O_2	0.27	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.169	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), *sec*-butylammonium salt**					
	CH_2Cl_2	O_2	0.55	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.170	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), *tert*-butylammonium salt**					
	CH_2Cl_2	O_2	0.64	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.171	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), diethylammonium salt**					
	CH_2Cl_2	O_2	0.86	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.172	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), isobutylammonium salt**					
	CH_2Cl_2	O_2	0.50	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.173	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), piperidinium salt**					
	CH_2Cl_2	O_2	0.74	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.174	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), pyridinium salt**					
	CH_2Cl_2	O_2	0.35	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.175	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), tributylammonium salt**					
	CH_2Cl_2	O_2	0.66	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.176	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), triethylammonium salt**					
	CH_2Cl_2	O_2	0.78	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.177	**Rose Bengal bound to chloromethylated poly(styrene-co-divinylbenzene), trimethylammonium salt**					
	CH_2Cl_2	O_2	0.46	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.178	**Rose Bengal bound to poly(styrene-co-vinylbenzyl chloride)**					
	CH_2Cl_2	O_2	0.16-0.36	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 566$ nm. Rel. to S′ in methanol; bound dye varied 51-610 mg RB/1.07 g polymer.	85F171 85F436
	MeOH (dis)	O_2	0.04-0.41	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 566$ nm. Rel. to S′ in methanol; bound dye varied 51-610 mg RB/1.07 g polymer.	85F436
3.179	**Rose Bengal bound to poly(styrene-co-vinylbenzyl chloride), pyridinium salt**					
	CH_2Cl_2	O_2	0.41	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.180	**Rose Bengal bound to poly(styrene-co-vinylbenzyl chloride), triethylammonium salt**					
	CH_2Cl_2	O_2	0.61	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 556$ nm. Rel. to S′ in methanol.	86P106
3.181	**Rose Bengal on Sephadex A resin**					
	MeOH	O_2	0.55	CP/Ac or Oc-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; rel. to $\phi_\Delta(S') = 0.76$.	86F510
3.182	**Rose Bengal polyglycol**					
	$C_6H_5CH_3$	air[a]	0.30	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 559$ nm. Rel. to S′ in methanol.	86F463
	C_6H_6	air[a]	0.40	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 559$ nm. Rel. to S′ in methanol.	86F463
	CH_2Br_2	air[a]	0.81	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 559$ nm. Rel. to S′ in methanol.	86F463
	CH_2Cl_2	air[a]	0.76	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 559$ nm. Rel. to S′ in methanol.	86F463
	EtOH	air[a]	0.75	CP/Pa-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; P = 1,2-Ethanediol dibenzoate; rel. to $\phi_\Delta(S') = 0.76$; $\lambda_{exc} = 559$ nm. Rel. to S′ in methanol.	86F463
3.183	**Safranine cation**					
	MeOH	O_2	0.14	CP/Ac-43	S′ = RB; A = Bu_2S; rel. to $\phi_\Delta(S') = 0.80$[b]; $\lambda_{exc} = 546$ nm. Measured $P_T^{O_2} = 1$.	80F304
3.184	**Selenopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)-1,1-dihydroxytelluropyran-4-ylidene]-3-propenyl]-**					
	H_2O/CH_3OH (9:1)	air	≤0.004	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.50$.	90F157

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.185	**Selenopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[2-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-4-(2-butenyl)]-**					
	MeOH	air	0.004	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157
3.186	**Selenopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[2-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-4-(2-pentenyl)]-**					
	MeOH	air	0.001	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157
3.187	**Selenopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.013	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50. ϕ_Δ same in air- or oxygen-satd. methanol.	90F157 90R069
3.188	**Selenopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.09	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50. f_Δ^T = 0.75 using ϕ_T(S) = 0.12 but $P_S^{O_2} < 1$.	90F157 90R069 88A269
3.189	**Sensitox HP resin**					
	MeOH	O_2	0.25	CP/Oc-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; rel. to ϕ_Δ(S′) = 0.76.	86F510
3.190	**Sensitox P resin**					
	MeOH	O_2	0.23 0.22	CP/Ac-43; CP/Oc-43	S′ = RB; A = 2,3-Diphenyl-1,4-dioxene; rel. to ϕ_Δ(S′) = 0.76.	86F510
3.191	**Telluropyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]ethyl]**					
	MeOH	air	0.006	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157
3.192	**Telluropyrylium, 2,6-bis(1,1-dimethylethyl)-4-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]methyl-**					
	MeOH	air	0.07	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157
3.193	**Telluropyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.12	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50. f_Δ^T = 0.67 using ϕ_T(S) = 0.18 but $P_S^{O_2} < 1$.	90F157 90R069 88A269
3.194	**2,2′-Thiatricarbocyanine, 3,3′-diethyl-, iodide**					
	Propylene carbonate	O_2	0.025	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.195	**Thiopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.007	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157 90R069
3.196	**Thiopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]**					
	MeOH	air	0.07	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157 90R069
3.197	**Thiopyrylium, 2,6-bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)thiopyran-4-ylidene]-3-propenyl]-**					
	MeOH	air	0.0006	CP/Ac-43 or 14	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.50.	90F157 90R069
3.198	**Tricarbocyanine, 5,5′-dichloro-1,1′,3,3,3′,3′-hexamethyl-, iodide**					
	Propylene carbonate	O_2	0.02	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.199	**Tricarbocyanine, 5,5′-difluoro-1,1′,3,3,3′,3′-hexamethyl-, iodide**					
	Propylene carbonate	O_2	0.014	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.200	**Tricarbocyanine, 5,5′-dimethoxy-1,1′,3,3,3′,3′-hexamethyl-, iodide**					
	Propylene carbonate	O_2	0.004	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690
3.201	**Tricarbocyanine, 1,1′,3,3,3′,3′-hexamethyl-, fluoride**					
	Propylene carbonate	O_2	0.013	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to ϕ_Δ(S′) = 0.35; λ_{exc} = 633 nm.	87E690

Table 3, Quantum yields of photosensitized production of singlet oxygen, from drugs, dyes, polymers, etc.—Continued

No.	Solvent	$[O_2]$	ϕ_Δ	Method	Comment	Ref.
3.202	**Tricarbocyanine, 1,1′,3,3,3′,3′-hexamethyl-, iodide**					
	Propylene carbonate	O_2	0.015	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; λ_{exc} = 633 nm.	87E690
3.203	**Tricarbocyanine, 1,1′,3,3,3′,3′-hexamethyl-, perchlorate**					
	Propylene carbonate	O_2	0.015	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; λ_{exc} = 633 nm.	87E690
3.204	**Tricarbocyanine, 1,1′,3,3,3′,3′,5,5′-octamethyl-, iodide**					
	Propylene carbonate	O_2	0.015	CL/Ac-47	S′ = MB^+; A = DPBF; rel. to $\phi_\Delta(S') = 0.35$; λ_{exc} = 633 nm.	87E690
3.205	**Tris(2,2′-bipyridine)ruthenium(II) ion bound to Dowex 50W-X1 resin**					
	MeOH	O_2	0.90	CL/Pa-14	A = TME; λ_{exc} = 488 nm.	83N166
3.206	**Tris(1,10-phenanthroline)ruthenium(II) ion bound to Dowex 50W-X1 resin**					
	MeOH	O_2	0.68	CL/Pa-14	A = TME; λ_{exc} = 488 nm.	83N166
3.207	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-2,4,5,7-tetraiodo-, dianion, bound as copoly(styrene-*p*-vinylbenzyl ester)**					
	DMF	air[a]	0.34	CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	88F618
3.208	**Xanthen-3-one, 9-(2-carboxyethyl)-6-hydroxy-2,4,5-triiodo-, dianion, bound as copoly(styrene-*p*-vinylbenzyl ester)**					
	DMF	air[a]	0.33	CP/Ac-43	S′ = RB; A = DPBF; rel. to $\phi_\Delta(S') = 0.76$.	88F618

[a] Oxygen concentration not given; assumed to be air saturated.
[b] Value of $\phi_\Delta(S')$ used in this work to calculate $\phi_\Delta(S)$ from authors' reported $\phi_\Delta(S)/\phi_\Delta(S')$.
* Values recalculated using $\phi_\Delta(S')$ or $f_\Delta^T(S')$ from Table 4 or from the quoted reference.

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10. Molecular Formula Index

$C_{12}H_8N_4PtS_2$ (2,2′-Bipyridine)bis(thiocyanato)platinum(II) *3.38*

$C_{12}H_8N_8Pd$ Bis(azido)(1,10-phenanthroline)palladium(II) *3.48*

$C_{12}H_8N_8Pt$ Bis(azido)(1,10-phenanthroline)platinum(II) *3.49*

$C_{12}H_8OS_2$ 2,5-Di(2-thienyl)furan *1.192*

$C_{12}H_8O_3$ 4-Methylangelicin *1.203*
5-Methylangelicin *1.204*
5′-Methylangelicin *1.205*
4′-Methylangelicin *1.206*

$C_{12}H_8O_4$ 5-Methoxypsoralen *1.258*
8-Methoxypsoralen *1.260*

$C_{12}H_8S_3$ α-Terthienyl *1.285*

$C_{12}H_9NS$ Phenothiazine *1.240*

$C_{12}H_{10}$ Biphenyl *1.115*

$C_{12}H_{10}N_3S^+$ Thionine cation *1.246*

$C_{12}H_{10}N_8Pd$ Bis(azido)(2,2′-bipyridine)palladium(II) *3.45*

$C_{12}H_{10}O$ 2′-Acetonaphthone *1.1*

$C_{12}H_{11}N_2O_3^-$ Nalidixic acid, anion *3.134*

$C_{12}H_{12}N_2O_3$ Nalidixic acid *3.133*

$C_{12}H_{12}S$ 1,1-Dimethyl-2-naphthalenethione *1.224*

$C_{12}H_{16}OS$ 4′-Methoxypivalothiophenone *1.250*

$C_{12}H_{20}S$ 1,3,3,7,7-Pentamethylbicyclo[2.2.1]heptane-2-thione *1.112*

$C_{13}H_7NS_3$ 2-Cyano-α-terthienyl *1.287*

$C_{13}H_8F_3NS$ 2-(Trifluoromethyl)phenothiazine *1.244*

$C_{13}H_8O$ 9-Fluorenone *1.153*
Phenalen-1-one *1.235*

$C_{13}H_8O_2$ Xanthone *1.316*

$C_{13}H_8O_2S_3$ 2,2′:5′,2″-Terthiophene-5-carboxylic acid *1.290*

$C_{13}H_8O_4$ 3-Acetoallopsoralen *1.193*
3-Acetoangelicin *1.197*
3-Acetoisopseudopsoralen *1.209*
3-Acetopseudoisopsoralen *1.212*

$C_{13}H_9FO$ 4-Fluorobenzophenone *1.91*

$C_{13}H_9N$ Acridine *1.7*

$C_{13}H_9NO$ 6-Aminophenalenone *1.236*

$C_{13}H_9NS_2$ 2,6-Bis(2-thienyl)pyridine *1.266*

$C_{13}H_{10}$ Fluorene *1.151*

$C_{13}H_{10}O$ Benzophenone *1.88*

$C_{13}H_{10}O_3$ 4,7-Dimethylallopsoralen *1.194*
6,4-Dimethylangelicin *1.198*
4,5′-Dimethylangelicin *1.199*
4,4′-Dimethylangelicin *1.200*
4′,5-Dimethylangelicin *1.201*
6,4′-Dimethylangelicin *1.202*

$C_{13}H_{10}O_5$ 5,8-Dimethoxypsoralen *1.257*

$C_{13}H_{10}S_3$ 2-Methyl-α-terthienyl *1.289*

$C_{13}H_{11}NOS$ 2-Methoxyphenothiazine *1.242*

$C_{13}H_{11}NS$ 10-Methylphenothiazine *1.243*

$C_{13}H_{11}N_3$ 3,6-Diaminoacridine *1.9*

$C_{13}H_{14}S$ 1,1,3-Trimethyl-2-naphthalenethione *1.225*

$C_{13}H_{20}O$ β-Ionone *1.218*

$C_{14}H_7ClO_2$ 1-Chloroanthraquinone *1.47*
2-Chloroanthraquinone *1.48*

$C_{14}H_8Br_2$ 9,10-Dibromoanthracene *1.17*

$C_{14}H_8Cl_2$ 9,10-Dichloroanthracene *1.18*

$C_{14}H_8Cl_2O_2$ 4,4′-Dichlorobenzil *1.84*

$C_{14}H_8N_4Pt$ Dicyano(1,10-phenanthroline)platinum(II) *3.70*

$C_{14}H_8N_4PtS_2$ (1,10-Phenanthroline)bis(thiocyanato)platinum(II) *3.136*

$C_{14}H_8O_2$ 9,10-Anthraquinone *1.39*

$C_{14}H_8O_3$ 1-Hydroxyanthraquinone *1.63*
2-Hydroxyanthraquinone *1.64*

$C_{14}H_8O_4$ 1,2-Dihydroxyanthraquinone *1.61*
1,8-Dihydroxyanthraquinone *1.62*

$C_{14}H_8O_6$ 1,4,5,8-Tetrahydroxyanthraquinone *1.66*

$C_{14}H_9BrN_2O_4$ 1,5-Diamino-2-bromo-4,8-dihydroxyanthraquinone *1.54*

$C_{14}H_9Cl$ 1-Chloroanthracene *1.14*
9-Chloroanthracene *1.15*

$C_{14}H_9F_3O$ 4-(Trifluoromethyl)benzophenone *1.92*

$C_{14}H_9NO_2$ 1-Aminoanthraquinone *1.40*
2-Aminoanthraquinone *1.41*

$C_{14}H_9NO_3$ 1-Amino-2-hydroxyanthraquinone *1.42*
1-Amino-4-hydroxyanthraquinone *1.43*

$C_{14}H_9O_3^-$ 1,8-Dihydroxy-9-anthrone, conjugate base *1.69*

$C_{14}H_9O_3S^-$ 1-Anthracenesulfonate ion *1.35*
2-Anthracenesulfonate ion *1.36*

$C_{14}H_{10}$ Anthracene *1.13*
Phenanthrene *1.237*

$C_{16}H_{17}NO_2$ 2,3,6,7-Tetrahydro-9-methyl[1]benzopyran[6,7,8-*ij*]quinolizin-11-one *1.99*

$C_{16}H_{18}N_3S^+$ Methylene Blue cation *1.245*

$C_{17}H_{10}O$ 1-Pyrenecarboxaldehyde *1.265*

$C_{17}H_{13}N_3O_3$ 1-(4-Methyl-2-nitrophenylazo)-2-naphthol *3.130*

$C_{17}H_{14}$ (*E*)-2-(1-Propenyl)anthracene *1.32*

$C_{17}H_{15}N_5$ 1,3-Dimethylpyrazolo[1′,2′:2,3][1,2,3]-triazolo[4,5-*a*]phenazin-4-ium *3.158*

$C_{17}H_{17}N_3O_2$ 1-(4-Methylphenylazo)-1-(phenylaminocarbonyl)-2-propanone *3.61*

$C_{17}H_{19}ClN_2S$
Chlorpromazine *3.142*

$C_{17}H_{20}N_2O$ 4,4′-Bis(dimethylamino)benzophenone *1.89*

$C_{17}H_{20}N_4O_6$ Riboflavine *1.274*

$C_{17}H_{21}N_4O_9P$
Flavine mononucleotide *1.275*

$C_{17}H_{24}O$ (*E,E,E*)-5-Methyl-7-(2,6,6-trimethyl-1-cyclohexen-1-yl)-2,4,6-heptatrienal *1.214*

$C_{18}H_6N_4$ 2,6,9,10-Tetracyanoanthracene *1.33*

$C_{18}H_{11}Br$ 2-Bromochrysene *1.125*

$C_{18}H_{11}Cl$ 2-Chlorochrysene *1.126*

$C_{18}H_{12}$ Benz[*a*]anthracene *1.72*
Chrysene *1.124*
Tetracene *1.291*
Triphenylene *1.304*

$C_{18}H_{12}N_2O_2Pd$
Catechol(1,10-phenanthroline)palladium(II) *3.53*

$C_{18}H_{12}N_2O_2Pt$
Catechol(1,10-phenanthroline)platinum(II) *3.54*

$C_{18}H_{12}N_8Pd$ Bis(azido)(2,2′-biquinoline)palladium(II) *3.43*

$C_{18}H_{12}N_8Pt$ Bis(azido)(2,2′-biquinoline)platinum(II) *3.44*

$C_{18}H_{12}O_2$ 2,6-Diphenyl-1,4-benzoquinone *1.100*
2,6-Diphenyl-1,4-benzoquinone/Triphenylamine *1.101*

$C_{18}H_{14}$ *p*-Terphenyl *1.284*

$C_{18}H_{14}Br_2N_3O^+$
5-Amino-6,8-dibromo-9-ethylaminobenzo[*a*]phenoxazinium *3.16*

$C_{18}H_{14}I_2N_3O^+$
5-Amino-9-ethylamino-6,8-diiodobenzo[*a*]phenoxazinium *3.19*

$C_{18}H_{14}N_3O_6S^-$
5-Methoxy-4-[2-(methylsulfonyl)-4-nitrophenyl]azo-1-naphthoxide ion *3.121*

$C_{18}H_{16}$ 1,6-Diphenyl-1,3,5-hexatriene *1.216*

$C_{18}H_{18}$ 9-*tert*-Butylanthracene *1.24*

$C_{18}H_{18}N_4O$ 4-(4′-Dimethylaminophenyl)imino-3-methyl-1-phenyl-2-pyrazolin-5-one *3.157*

$C_{19}H_7Cl_4I_4O_5^-$
9-(2,3,4,5-Tetrachlorophenyl)-6-hydroxy-2,4,5,7,-tetraiodoxanthen-3-one, anion *1.315*

$C_{19}H_{12}N_2O_2PdS$
1,10-Phenanthroline(thiosalicylato)palladium(II) *3.139*

$C_{19}H_{13}O_2S^-$ 9-(Phenylsulfonyl)fluorene anion *1.152*

$C_{19}H_{14}N_2PdS_2$
3,4-Dimercaptotoluene(1,10-phenanthroline)palladium(II) *3.74*

$C_{19}H_{14}S$ 4-Phenylthiobenzophenone *1.294*

$C_{19}H_{17}N_3O$ 4-(Dicyanomethylene)-2-methyl-6-(*p*-dimethylaminostyryl)pyran *3.146*

$C_{19}H_{18}N_2O_{11}S_3.2Na$
Remazol Red B *3.118*

$C_{19}H_{18}N_4O_{11}.2Na$
Active Yellow 2KT *3.9*

$C_{19}H_{18}O_8$ Daunomycinone *3.110*

$C_{20}H_2Br_4Cl_4O_5^{2-}$
Tetrachloroeosin dianion *1.166*

$C_{20}H_2Cl_4I_4O_5^{2-}$
Rose Bengal dianion *1.169*

$C_{20}H_4Cl_4I_4O_5$
Rose Bengal lactone *1.168*

$C_{20}H_6Br_2N_2O_9^{2-}$
Eosin B dianion *1.156*

$C_{20}H_6Br_4O_5^{2-}$
Eosin dianion *1.161*

$C_{20}H_6Cl_4O_5^{2-}$
2′,4′,5′,7′-Tetrachlorofluorescein dianion *1.167*

$C_{20}H_6I_4O_5^{2-}$ Erythrosin dianion *1.190*

$C_{20}H_7Br_3O_5^{2-}$
Tribromofluorescein dianion *1.191*

$C_{20}H_8Br_2HgNa_2O_6$
Mercurochrome *1.157*

$C_{20}H_8Br_2O_5^{2-}$
Dibromofluorescein dianion *1.155*

$C_{20}H_8Cl_2O_5^{2-}$
2′,7′-Dichlorofluorescein dianion *1.158*
4′,5′-Dichlorofluorescein dianion *1.159*

$C_{20}H_8I_2O_5^{2-}$ Diiodofluorescein dianion *1.160*

$C_{20}H_9BrClNO_2S$
5-Bromo-2-(9-chloro-3-oxonaphtho- [1,2-*b*]thien-2-ylidene)-4-methyl- 1,2-dihydroindol-3-one *3.102*

$C_{20}H_{10}O_5^{2-}$ Fluorescein dianion *1.154*

$C_{20}H_{12}$ Perylene *1.233*

$C_{20}H_{12}D_2N_4$ Porphine-21,23-d_2 *2.47*

$C_{20}H_{13}NO_4$ 1-Amino-4-hydroxy-2-phenoxyanthraquinone *1.44*

$C_{20}H_{14}$ 9-Phenylanthracene *1.29*

$C_{20}H_{14}N_2O_2Pd$
2,2′-Bipyridine(2,3-naphthalenediolato)palladium(II) *3.39*

$C_{20}H_{14}N_2O_2Pt$
2,2′-Bipyridine(2,3-naphthalenediolato)platinium(II) *3.40*

$C_{20}H_{14}N_4$ Porphine *2.46*
Porphycene *2.211*

$C_{20}H_{14}O$ 1,3-Diphenylisobenzofuran *1.219*

$C_{20}H_{16}$ 9,10-Dimethylbenz[*a*]anthracene *1.73*

$C_{20}H_{18}$ 1,8-Diphenyl-1,3,5,7-octatetraene *1.227*

$C_{20}H_{18}I_2N_3O^+$
5-Amino-9-diethylamino-2,6-diiodobenzo[*a*]phenoxazinium *3.18*

$C_{20}H_{19}BrN_3O^+$
5-Amino-6-bromo-9-diethylaminobenzo[*a*]phenoxazinium *3.15*

$C_{20}H_{19}IN_3O^+$
5-Amino-9-diethylamino-2-iodobenzo[*a*]phenoxazinium *3.20*
5-Amino-9-diethylamino-6-iodobenzo[*a*]phenoxazinium *3.21*

$C_{20}H_{19}IN_3S^+$
5-Amino-9-diethylamino-6-iodobenzo[*a*]phenothiazinium *3.13*

$C_{20}H_{19}N_4^+$ Safranine cation *3.183*

$C_{20}H_{20}$ (*E*)-2-(3,3-Dimethyl-1-butenyl)anthracene *1.22*
(*Z*)-2-(3,3-Dimethyl-1-butenyl)anthracene *1.23*

$C_{20}H_{20}BrN_7O_7$
N-[2-[(2-Bromo-4,6-dinitrophenyl)azo]- 5-[(2-cyanoethyl)(2-hydroxyethyl)amino]-4-methoxyphenyl]acetamide *3.58*

$C_{20}H_{20}ClN_7O_7$
N-[2-[(2-Chloro-4,6-dinitrophenyl)azo]- 5-[(2-cyanoethyl)(2-hydroxyethyl)amino]-4-methoxyphenyl]acetamide *3.59*

$C_{20}H_{20}N_3O^+$ 5-Amino-9-diethylaminobenzo[*a*]phenoxazinium *3.17*

$C_{20}H_{20}N_3S^+$ 5-Amino-9-diethylaminobenzo[*a*]phenothiazinium *3.12*

$C_{20}H_{21}N_7O_7$ *N*-[5-[(2-Cyanoethyl)(2-hydroxyethyl)amino]-2-[(2,4-dinitrophenyl)azo]-4-methoxyphenyl]acetamide *3.60*

$C_{20}H_{22}N_2S$ Mequitazine *3.141*

$C_{20}H_{22}N_4O$ 4-(4′-Diethylaminophenyl)imino-3-methyl-1-phenyl-2-pyrazolin-5-one *3.156*

$C_{20}H_{22}O_2$ 2,2′,4,4′,6,6′-Hexamethylbenzil *1.86*

$C_{20}H_{28}O$ 13-(*Z*)-Retinal *1.271*
(*all-E*)-Retinal *1.272*

$C_{20}H_{30}O$ (*all-E*)-Retinol *1.273*

$C_{21}H_5Cl_4I_4O_5^-$
Rose Bengal monoanion, methyl ester *1.188*

$C_{21}H_6Cl_4I_4O_5$
Rose Bengal, methyl ester *1.187*

$C_{21}H_9Br_4O_5^-$
Eosin monoanion, methyl ester *1.165*

$C_{21}H_{10}Br_4O_5$
Eosin, methyl ester *1.164*

$C_{21}H_{13}CoN_5O_3$
Cobalt(II) 2-(4,5-diphenylimidazol-2-yl)azo-4-nitrophenolate *3.91*
Cobalt(III) 2-(4,5-diphenylimidazol-2-yl)azo-4-nitrophenolate *3.92*

$C_{21}H_{13}CuN_5O_3$
Copper(II) 2-(4,5-diphenylimidazol-2-yl)azo-4-nitrophenolate *3.93*

$C_{21}H_{13}N_5NiO_3$
Nickel(II) 2-(4,5-diphenylimidazol-2-yl)azo-4-nitrophenolate *3.94*

$C_{21}H_{14}O_2$ 2,3-Diphenylchromone *1.96*

$C_{21}H_{14}O_6S_2^{2-}$
1,1′-Methylenebis(6-naphthalenesulfonate ion) *3.119*

$C_{21}H_{15}BrN_2O_5S.Na$
Acid Pure Sky Blue *3.7*

$C_{21}H_{20}BrN_7O_5$
N-[2-[(2-Bromo-6-cyano-4-nitrophenyl)azo]-5-[(2-cyanoethyl)(2-hydroxyethyl)amino]-4-methoxyphenyl]acetamide *3.57*

$C_{21}H_{24}N_4O$ 4-(4′-Diethylamino-2′-methylphenyl)imino-3-methyl-1-phenyl-2-pyrazolin-5-one *3.154*

$C_{22}H_8Cl_4I_4O_5$
Rose Bengal, ethyl ester *1.182*
O-Methyl Rose Bengal methyl ester *1.186*

$C_{22}H_{12}$ Dibenzo[*def,mno*]chrysene *1.138*

$C_{22}H_{14}$ Dibenz[*a,h*]anthracene *1.137*

$C_{22}H_{14}N_2O_2Pd$
1,10-Phenanthroline(2,3-naphthalenediolato)platinum(II) *3.137*

$C_{22}H_{14}N_2O_2Pt$
1,10-Phenanthroline(2,3-naphthalenediolato)platinum(II) *3.138*

$C_{22}H_{16}$ (*Z*)-2-(2-Phenylethenyl)anthracene *1.30*
(*E*)-2-(2-Phenylethenyl)anthracene *1.31*

$C_{22}H_{16}N_2O_{11}S_3$
Remazol Brilliant Blue R *3.6*

$C_{22}H_{16}N_6Ru$ Bis(2,2′-bipyridine)bis(cyano)ruthenium(II) *1.116*

$C_{22}H_{20}N_2O_2Pd$
4-*tert*-Butylcatechol(1,10-phenanthroline)palladium(II) *3.50*

$C_{22}H_{22}Cl_3N_5O_2$
2,4-Dihydro-4-(4-diethylamino-2-methylphenyl)imino-5-methylcarbamyl-2-(2,4,6-trichlorophenyl)pyrazol-3-one *3.155*

$C_{22}H_{24}BrN_5O_2$
2,4-Dihydro-2-(4-bromophenyl)- 4-(4-diethylamino-2-methylphenyl)imino- 5-methylcarbamylpyrazol-3-one *3.150*

$C_{22}H_{24}ClN_5O_2$
2,4-Dihydro-2-(4-chlorophenyl)- 4-(4-diethylamino-2-methylphenyl)imino- 5-methylcarbamylpyrazol-3-one *3.151*

$C_{22}H_{24}N_2O_8$ Tetracycline *3.108*

$C_{22}H_{30}O$ β-*apo*-14′-Carotenal *1.122*

$C_{23}H_{16}N_2O_2$ 3-Methyl-6-(phenylamino)dibenz[*f,i,j*]isoquinoline-2,7-dione *3.63*

$C_{23}H_{18}CoN_4O_2$
Cobalt(II) 2-(4,5-diphenylimidazol-2-yl)azo-5-methylbenzoate *3.85*
Cobalt(III) 2-(4,5-diphenylimidazol-2-yl)azo-5-methylbenzoate *3.86*

$C_{23}H_{18}CrN_4O_2$
Chromium(III) 2-(4,5-diphenylimidazol-2-yl)azo-5-methylbenzoate *3.87*

$C_{23}H_{18}CuN_4O_2$
Copper(II) 2-(4,5-diphenylimidazol-2-yl)azo-5-methylbenzoate *3.88*

$C_{23}H_{18}H_5O_9S_3^-$
N-[5-Hydroxy-8-[[2-(methylsulfonyl)-4-nitrophenyl]azo]-1-naphthalenyl-1,3-benzenedisulfonamide, conjugate base *3.120*

$C_{23}H_{25}N_2^+$ Malachite Green cation *3.103*

$C_{23}H_{27}N_5O_2$ 2,4-Dihydro-4-(4-diethylamino-2-methylphenyl)imino-5-methylcarbamyl-2-(3-methylphenyl)pyrazol-3-one *3.153*

$C_{23}H_{27}N_5O_3$ 2,4-Dihydro-4-(4-diethylamino-2-methylphenyl)imino-5-methylcarbamyl-2-(3-methoxyphenyl)pyrazol-3-one *3.152*

$C_{24}H_{10}Br_2O_2$
4,9-Dibromo-2,3:7,8-dibenzopyrene-1,6-dione *3.66*

$C_{24}H_{10}Cl_2O_2$
4,9-Dichloro-2,3:7,8-dibenzopyrene-1,6-dione *3.67*

$C_{24}H_{10}Cl_4I_4O_6$
6-*O*-Acetyl Rose Bengal ethyl ester *1.170*

$C_{24}H_{12}$ Coronene *1.127*

$C_{24}H_{12}Br_2O_2$
4,10-Dibromoanthanthrone *3.64*

$C_{24}H_{12}O_2$ 2,3:7,8-Dibenzopyrene-1,6-dione *3.65*

$C_{24}H_{12}O_2S_2$ (*E*)-Perinaphthothioindigo *3.132*

$C_{24}H_{12}S$ Diacenaphtho[1,2-*b*:2′,1′-*d*]thiophene *1.135*

$C_{24}H_{16}N_8Pd$ Bis(azido)(4,7-diphenyl-1,10-phenanthroline)palladium(II) *3.46*

$C_{24}H_{16}N_8Pt$ Bis(azido)(4,7-diphenyl-1,10-phenanthroline)platinum(II) *3.47*

$C_{24}H_{18}$ 1,3,5-Triphenylbenzene *1.75*

$C_{24}H_{19}N_3O_2$ 1-(4-Methylphenylazo)-3-(phenylaminocarbonyl)-2-naphthol *3.115*

$C_{24}H_{32}NO_3S_2^-$
12-(10′-Phenothiazinyl)dodecyl-1-sulfonate ion *3.143*

$C_{25}H_{14}N_2O_2$ 4-Benzoylbenzimidazo[2,10*a*]benz[*de*]isoquinolin-7-one *3.10*

$C_{25}H_{18}ClN_7O_{10}S_3.3Na$
Procion Red H-3B *3.116*

$C_{25}H_{20}N_4O_4$ 1-(4-Aminocarbonylphenylazo)-3-(2-methoxyphenylaminocarbonyl)-2-naphthol *3.114*

$C_{25}H_{25}IN_2$ 1,1′-Diethyl-4,4′-carbocyanine iodide *3.52*

$C_{25}H_{25}IN_2O_2$
3,3′-Diethyl-2,2′-oxatricarbocyanine iodide *3.135*

$C_{25}H_{25}IN_2S_2$
3,3′-Diethyl-2,2′-thiatricarbocyanine iodide *3.194*

$C_{25}H_{28}N_4O_{10}$
Riboflavin-2′,3′,4′,5′-tetraacetate *1.276*

$C_{26}H_{14}$ Rubicene *1.277*

$C_{26}H_{14}O_2$ Anthra[1,9-*bc*:4,10-*b′c′*]dichromene *1.37*
Benzo[1,2,3-*kl*:4,5,6-*k′l′*]dixanthene *1.87*

$C_{29}H_{32}BClF_4N_2$ 2-[7-(4-Chloro-1,3,3-trimethyl-2-indol- 2-ylidene)-1,3,5-heptatrienyl]- 1,3,3-trimethylindolium, tetrafluoroborate *3.96*

$C_{29}H_{32}BF_4IN_2$ 2-[7-(4-Iodo-1,3,3-trimethyl-2-indol- 2-ylidene)-1,3,5-heptatrienyl]- 1,3,3-trimethylindolium, tetrafluoroborate *3.98*

$C_{29}H_{32}I_2N_2$ 2-[7-(4-Iodo-1,3,3-trimethyl-2-indol- 2-ylidene)-1,3,5-heptatrienyl]- 1,3,3-trimethylindolium, iodide *3.97*

$C_{29}H_{33}ClN_2O_4$ 1,1′,3,3,3′,3′-Hexamethyltricarbocyanine, perchlorate *3.203*

$C_{29}H_{33}FN_2$ 1,1′,3,3,3′,3′-Hexamethyltricarbocyanine, fluoride *3.201*

$C_{29}H_{33}IN_2$ 1,1′,3,3,3′,3′-Hexamethyltricarbocyanine, iodide *3.202*

$C_{29}H_{43}OS^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)thiapyran-4-ylidene]-3-propenyl]pyrylium *3.161*

$C_{29}H_{43}OSe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenapyran-4-ylidene]-3-propenyl]pyrylium *3.159*

$C_{29}H_{43}OTe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]pyrylium *3.160*

$C_{29}H_{43}O_2^+$ 4,4′-(1,3-Propenyl)bis[2,6-di(1,1-dimethylethyl)pyrylium *3.162*

$C_{29}H_{43}SSe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-3-propenyl]thiopyrylium *3.195*

$C_{29}H_{43}STe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]thiopyrylium *3.196*

$C_{29}H_{43}S_2^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)thiopyran-4-ylidene]-3-propenyl]thiopyrylium *3.197*

$C_{29}H_{43}SeTe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]selenopyrylium *3.188*

$C_{29}H_{43}Se_2^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-3-propenyl]selenopyrylium *3.187*

$C_{29}H_{43}Te_2^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1-[2,6-bis(1,1-dimethylethyl)telluropyran-4-ylidene]-3-propenyl]telluropyrylium *3.193*

$C_{29}H_{45}O_2SeTe^+$ 2,6-Bis(1,1-dimethylethyl)-4-[1- [2,6-bis(1,1-dimethylethyl)-1,1-dihydroxy-telluropyran-4-ylidene]-3-propenyl]-selenopyrylium *3.184*

$C_{30}H_{15}Cl_4I_4O_5^-$ Rose Bengal monoanion, *p*-isopropylbenzyl ester *1.185*

$C_{30}H_{16}$ Pyranthrene *1.262*

$C_{30}H_{16}Cl_4I_4O_5$ Rose Bengal, *p*-isopropylbenzyl ester *1.184*

$C_{30}H_{16}O_8$ Hypericin *1.238*

$C_{30}H_{19}Br_4O_5^-$ Eosin monoanion, *p*-isopropylbenzyl ester *1.163*

$C_{30}H_{20}O_3$ 11,12-Dibenzoyl-9,10-dihydro-9-hydroxy-9,10-ethenoanthracene *1.145*

$C_{30}H_{24}IrN_6^{3+}$ Tris(2,2′-bipyridine)iridium(III) ion *1.305*

$C_{30}H_{24}N_6Ru^{2+}$ Tris(2,2′-bipyridine)ruthenium(II) ion *1.306*

$C_{30}H_{30}N_4O_4$ Deuteroporphyrin IX *2.197*

$C_{30}H_{45}Se_2^+$ 2,6-Bis(1,1-dimethylethyl)-4-[2-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-4-(2-butenyl)]selenopyrylium *3.185*

$C_{31}H_{19}NO_2$ 11,12-Dibenzoyl-9,10-dihydro-9,10-ethenoanthracene-9-carbonitrile *1.148*

$C_{31}H_{20}O_3$ 11,12-Dibenzoyl-9,10-dihydro-9,10-ethenoanthracene-9-carboxaldehyde *1.149*

$C_{31}H_{22}O_3$ 11,12-Dibenzoyl-9,10-dihydro-9-methoxy-9,10-ethenoanthracene *1.146*

$C_{31}H_{28}N_4O_3$ Deuteroverdin methyl ester *2.228*

$C_{31}H_{37}IN_2$ 1,1′,3,3,3′,3′,5,5′-Octamethyltricarbocyanine, iodide *3.204*

$C_{31}H_{37}IN_2O_2$ 5,5′-Dimethoxy-1,1′,3,3,3′,3′-hexamethyltricarbocyanine, iodide *3.200*

$C_{31}H_{47}Se_2^+$ 2,6-Bis(1,1-dimethylethyl)-4-[2-[2,6-bis(1,1-dimethylethyl)selenopyran-4-ylidene]-4-(2-pentenyl)]selenopyrylium *3.186*

$C_{32}H_{12}AlClN_8O_9S_3$ Chloroaluminum(III) sulfophthalocyanine *2.29*

$C_{32}H_{12}AlN_8O_9S_3$ Aluminum(III) sulfophthalocyanine *2.30*

$C_{32}H_{12}ClGaN_8O_9S_3$ Chlorogallium(III) sulfophthalocyanine *2.36*

$C_{34}H_{36}MnN_4O_6$
Manganese(III) hematoporphyrin *2.159*

$C_{34}H_{36}N_4NiO_6$
Nickel(II) hematoporphyrin IX *2.160*

$C_{34}H_{36}N_4O_5$ Monohydroxyethyl vinyl deuteroporphyrin *2.195*

$C_{34}H_{36}N_4O_6$ Chlorin a_6 *2.200*

$C_{34}H_{36}N_4O_6Pd$
Palladium(II) hematoporphyrin IX *2.161*

$C_{34}H_{36}N_4O_6Pt$
Platinum(II) hematoporphyrin IX *2.162*

$C_{34}H_{38}N_4O_6$ Hematoporphyrin IX *2.154*
Isohematoporphyrin *2.163*

$C_{34}H_{40}EuN_5O_2$
Europium(III) dimethyltexaphyrin dihydroxide *2.221*

$C_{34}H_{40}N_5O_2Sm$
Samarium(II) dimethyltexaphyrin dihydroxide *2.223*

$C_{34}H_{42}B_2F_8N_3$
2-[7-(1,3,3-Trimethyl-2-indol-2-ylidene)- 1-[4-(1-piperidinio)-1,3,5-heptatrienyl]-1,3,3-trimethylindolium, bis(tetrafluoroborate) *3.100*

$C_{35}H_{32}MgN_4O_5$
Protochlorophyllide *2.20*

$C_{35}H_{36}N_4O_5$ Pheophorbide *a* *2.22*
7(12)-Formyl-12(7)-vinyldeuteroporphyrin IX dimethyl ester *2.194*

$C_{35}H_{42}N_4O_6$ Phycocyanobilin dimethyl ester *3.33*

$C_{36}H_{16}CuN_8O_8$
Copper(II) tetracarboxyphthalocyanine *2.40*

$C_{36}H_{18}Br_2O_4$
Dibromo-16,17-dimethoxyviolanthrone *3.2*

$C_{36}H_{20}EuF_9N_2O_6S_3$
1,10-Phenanthrolinetris(1-thienyl-4,4,4-trifluoro-1,3-butanedionato)europium(III) *3.140*

$C_{36}H_{20}N_4Zn$ Tetrabenzoporphinatozinc(II) *2.214*

$C_{36}H_{23}BrN_6Ru^{2+}$
5-Bromo-1,10-phenanthrolinebis(1,10-phenanthroline)ruthenium(II) ion *1.119*

$C_{36}H_{23}ClN_6Ru^{2+}$
5-Chloro-1,10-phenanthrolinebis(1,10-phenanthroline)ruthenium(II) ion *1.123*

$C_{36}H_{24}IrN_6^{3+}$
Tris(1,10-phenanthroline)iridium(III) ion *1.307*

$C_{36}H_{24}N_6Os^{2+}$
Tris(1,10-phenanthroline)osmium(II) ion *1.308*

$C_{36}H_{24}N_6Ru^{2+}$
Tris(1,10-phenanthroline)ruthenium(II) ion *1.309*

$C_{36}H_{36}D_2N_4O_4$
Protoporphyrin IX-d_2, dimethyl ester *2.167*

$C_{36}H_{36}MgN_4O_4$
Magnesium(II) protoporphyrin, dimethyl ester *2.168*

$C_{36}H_{36}N_4O_3$ Mesoverdin methyl ester *2.227*

$C_{36}H_{36}N_4O_4Pd$
Palladium(II) protoporphyrin dimethyl ester *2.171*

$C_{36}H_{36}N_4O_4Zn$
Zinc(II) protoporphyrin, dimethyl ester *2.169*

$C_{36}H_{38}N_4O_4$ Protoporphyrin IX, dimethyl ester *2.166*

$C_{36}H_{38}N_4O_6$ Photoprotoporphyrin IX dimethyl ester *2.196*

$C_{36}H_{38}N_4O_8$ Coproporphyrin I *2.204*
Coproporphyrin III *2.205*

$C_{36}H_{40}CdN_4O_4$
Cadmium(II) mesoporphyrin IX, dimethyl ester *2.179*

$C_{36}H_{40}CuN_4O_4$
Copper(II) mesoporphyrin IX, dimethyl ester *2.180*

$C_{36}H_{40}D_2N_4O_4$
Mesoporphyrin IX-d_2, dimethyl ester *2.178*

$C_{36}H_{40}HgN_4O_4$
Mercury(II) mesoporphyrin IX, dimethyl ester *2.182*

$C_{36}H_{40}MgN_4O_4$
Magnesium(II) mesoporphyrin IX, dimethyl ester *2.181*

$C_{36}H_{40}N_4O_4Pd$
Palladium(II) mesoporphyrin IX, dimethyl ester *2.183*

$C_{36}H_{40}N_4O_4Zn$
Zinc(II) mesoporphyrin IX, dimethyl ester *2.185*

$C_{36}H_{40}N_4O_5V$
Vanadium(IV) (oxo)mesoporphyrin IX, dimethyl ester *2.184*

$C_{36}H_{40}N_4O_6^{2-}$
2,4-Di(α-methoxyethyl)deuteroporphyrin dianion *2.164*

$C_{36}H_{42}N_4O_4$ Mesoporphyrin IX, dimethyl ester *2.177*

$C_{36}H_{42}N_4O_6$ Hematoporphyrin dimethyl ester *2.158*

$C_{36}H_{44}CdN_4$ 2,3,7,8,12,13,17,18-Octaethylporphinatocadmium(II) *2.74*

$C_{36}H_{44}Cl_2N_4Sn$
2,3,7,8,12,13,17,18-Octaethylporphinatotin(IV) dichloride *2.82*

$C_{36}H_{44}CuN_4$ 2,3,7,8,12,13,17,18-Octaethylporphinatocopper(II) *2.75*

$C_{36}H_{44}D_2N_4$ 21,23-Dideutero-2,3,7,8,12,13,17,18-octaethylporphine *2.54*

$C_{36}H_{44}InN_4$ Octaethylporphinatoindium(II) *2.77*

$C_{36}H_{44}N_4OTi$
Octaethylporphinatooxotitanium(IV) *2.78*

$C_{36}H_{44}N_4OV$
Octaethylporphinatooxovanadium(IV) *2.79*

$C_{36}H_{44}N_4Pb$ 2,3,7,8,12,13,17,18-Octaethylporphinatolead(II) *2.76*

$C_{36}H_{44}N_4Pd$ 2,3,7,8,12,13,17,18-Octaethylporphinatopalladium(II) *2.80*

$C_{36}H_{44}N_4Sc^+$
Octaethylporphinatoscandium(III) *2.81*

$C_{36}H_{44}N_4Zn$ 2,3,7,8,12,13,17,18-Octaethylporphinatozinc(II) *2.83*

$C_{36}H_{46}D_2N_4$ Octaethylchlorin-d_2 *2.55*

$C_{36}H_{46}N_4$ 2,3,7,8,12,13,17,18-Octaethylporphine *2.73*

$C_{36}H_{48}N_4$ Octaethylchlorin *2.84*

$C_{37}H_{39}N_4O_7$ Coproverdin II trimethyl ester *2.229*

$C_{37}H_{42}N_4O_2$ Zinc(II) etiopurpurin ethyl ester *2.17*

$C_{37}H_{43}D_2N_4O$
5-Formyloctaethylporphyrin-d_2 *2.149*

$C_{37}H_{45}N_4O$ 5-Formyloctaethylporphyrin *2.150*

$C_{37}H_{46}CuN_4$ 2,3,7,8,12,13,17,18-Octaethyl-5-methylporphinatocopper(II) *2.86*

$C_{37}H_{46}D_2N_4$ *meso*-Methyloctaethylporphine-d_2 *2.56*
N-Methyloctaethylporphyrin-d_2 *2.57*

$C_{37}H_{46}N_4Zn$ 2,3,7,8,12,13,17,18-Octaethyl-5-methylporphinatozinc(II) *2.87*

$C_{37}H_{48}N_4$ *meso*-Methyloctaethylporphine *2.85*
N-Methyloctaethylporphyrin *2.88*

$C_{38}H_{45}N_5O_5$ (*Z*)-Dimethyl 7-[2-(dimethylamino)- 2-oxoethyl]-8-ethylidene-7,8-dihydro-3,7,12,17-tetramethylporphine-2,18-dipropionate *2.190*

$C_{38}H_{46}N_4O_4$ Mesoporphyrin IX, diethyl ester *2.176*

$C_{38}H_{46}N_4O_8$ Hematoporphyrin diacetate *2.157*

$C_{38}H_{47}N_5O_5$ (*Z*)-Dimethyl 7-[2-(dimethylamino)- 2-oxoethyl]-8-ethyl-7,8-dihydro- 3,7,12,17-tetramethylporphine-2,18-dipropionate *2.189*

$C_{38}H_{52}CoN_6.2CH_4O_3S$
Cobalt(II) 1,3,5,8-tetramethyl-2,4-diethyl-6,7-di(3-dimethylaminopropyl)porphyrin, dimethanesulfonate *2.50*

$C_{38}H_{52}MnN_6.2CH_4O_3S$
Manganese(II) 1,3,5,8-tetramethyl-2,4-diethyl-6,7-di(3-dimethylaminopropyl)porphyrin, dimethanesulfonate *2.51*

$C_{38}H_{52}N_6.2CH_4O_3S$
1,3,5,8-Tetramethyl-2,4-diethyl-6,7-di(3-dimethylaminopropyl)porphyrin, dimethanesulfonate *2.49*

$C_{38}H_{52}N_6Zn.2CH_4O_3S$
Zinc(II) 1,3,5,8-tetramethyl-2,4-diethyl-6,7-di(3-dimethylaminopropyl)porphyrin, dimethanesulfonate *2.52*

$C_{39}H_{20}Cl_4I_5O_5$
Rose Bengal, benzyl ester, diphenyliodonium salt *1.174*

$C_{39}H_{34}Cl_3N_3O_4S_2$
IR 140 *3.25*

$C_{40}H_{24}$ Mesodiphenylhelianthrene *1.139*

$C_{40}H_{38}N_4O_{16}$
Uroporphyrin I *2.203*

$C_{40}H_{40}Cl_4I_4O_{11}$
Rose Bengal complexed with dicyclohexyl-18-crown-8 *1.181*

$C_{40}H_{46}N_4O_8$ Coproporphyrin III, tetramethyl ester *2.206*

$C_{40}H_{46}N_6O_8S_2Zn$
Zinc(II) porphyrin c *2.153*

$C_{40}H_{47}Cl_4I_4NO_5$
Rose Bengal, octyl ester, tributylammonium salt *1.189*

$C_{40}H_{48}N_6O_8S_2$
Porphyrin c *2.152*

$C_{40}H_{52}N_5^{2+}$ 3,8,12,13,17,22-Hexaethyl-2,7,18,23-tetramethylsapphyrin, diprotonated *2.213*

$C_{41}H_{50}N_4O_2$ 2,3,7,8,12,13,17,18-Octaethyl-5-porphinepropenoic acid ethyl ester *2.201*

$C_{41}H_{52}Cl_2N_4O_2Sn$
Tin(IV) dichloro[octaethyldihydropurpurin ethyl ester] *2.15*

$C_{41}H_{52}N_4O_2$ Octaethylpurpurin ethyl ester *2.16*

$C_{41}H_{54}N_4O_2$ Octaethyldihydropurpurin ethyl ester *2.14*

$C_{42}H_{23}N_3O_6$ 4,5′-Dibenzoylaminoanthrimide *3.75*

$C_{42}H_{26}N_{10}Zn$
Zinc(II) phthalocyaninebis(pyridine) *2.25*

$C_{42}H_{28}$ Rubrene *1.278*

$C_{42}H_{48}D_2N_4$ 2,3,7,8,12,13,17,18-Octaethyl-5-phenylporphine-d_2 *2.58*

$C_{42}H_{50}N_4$ 2,3,7,8,12,13,17,18-Octaethyl-5-phenylporphine *2.89*

$C_{43}H_{58}N_4O_4$ Methyl acetal of oxidized octaethylpurpurin ethyl ester *2.7*

$C_{55}H_{72}MgN_4O_6$ Bacteriochlorophyll *b* *2.2*

$C_{55}H_{72}N_4O_5$ Protopheophytin *2.21*

$C_{55}H_{72}N_4O_6$ Pheophytin *b* *2.13*

$C_{55}H_{74}MgN_4O_6$ Bacteriochlorophyll *a* *2.1*

$C_{55}H_{74}N_4O_5$ Pheophytin *a* *2.12*

$C_{55}H_{74}N_4O_6$ Bacteriopheophytin *b* *2.19*

$C_{55}H_{76}N_4O_6$ Bacteriopheophytin *a* *2.18*

$C_{56}H_{55}N_6O_7$ Mesoporphyrin [4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] methyl ester *2.186*

$C_{56}H_{62}N_8^{4+}$ 5,10,15,20-Tetrakis(4-trimethylammoniophenyl)porphine *2.134*

$C_{56}H_{68}Cl_4CuN_{16}S_4$ Alcian Blue *2.45*

C_{60} Carbon sixty-atom molecule *1.120*

$C_{60}H_{48}ClN_7O$ *N*-[4-[(7-Chloro-4-quinolyl)amino]butyl]-5,10,15,20-tetraphenylporphine-2-propionamide *2.202*

$C_{64}H_{56}AlClN_8$ Aluminum(III) chloro[2,11,20,29-tetra-*tert*-butylnaphthalocyanine] *2.9*

$C_{64}H_{56}CuN_8$ Copper(II) 2,11,20,29-tetra-*tert*-butylnaphthalocyanine *2.10*

$C_{64}H_{58}N_8$ 2,11,20,29-Tetra-*tert*-butylnaphthalocyanine *2.8*

$C_{64}H_{80}N_8O_8Zn$ Zinc(II) 1,4,8,11,15,18,22,25-octabutoxyphthalocyanine *2.26*

$C_{69}H_{72}N_8O_{12}$ 1,3-Propanediylbis[3,8,12,17-tetramethyl-2,7,18-tris(2-carboxyethyl)porphine *2.208*

C_{70} Carbon seventy-atom molecule *1.121*

$C_{70}H_{47}Cl_4I_4O_5P_2$ Rose Bengal, bis(benzyltriphenylphosphonium) salt *1.178*

$C_{72}H_{78}N_8O_{12}$ 1,6-Hexanediylbis[3,8,12,17-tetramethyl-2,7,18-tris(2-carboxyethyl)porphine *2.207*

$C_{74}H_{90}CuN_8Zn$ Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, copper(II)zinc(II) *2.70*

$C_{74}H_{90}N_8Zn_2$ Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, biszinc(II) *2.71*

$C_{74}H_{92}CuN_8$ Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethyl-, copper(II) *2.69*

$C_{74}H_{94}N_8$ Ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octaethylporphine)] *2.68*

$C_{76}H_{70}N_8O_{10}$ Mesoporphyrin di[4-(diphenylmethylaminocarbonyl-2-nitrophenylmethyl] ester *2.174*

$C_{76}H_{72}N_6O_6$ Mesoporphyrin di[4-(diphenylmethylaminocarbonylphenylmethyl] ester *2.175*

$C_{77}H_{88}N_8O_{12}$ 1,11-Undecanediylbis[3,8,12,17-tetramethyl-2,7,18-tris(2-carboxyethyl)porphine *2.209*

$C_{82}H_{106}Cu_2N_8$ Porphine, ethanediylbis[5,5′-(2,3,7,8,12,13,17,18-octapropyl-, biscopper(II) *2.72*

$C_{84}H_{102}N_8O_2Si_3$ Bis(tri-*n*-hexyloxysiloxy)-2,3-naphthalocyaninatosilicon *2.11*

$C_{92}H_{85}N_{15}O_3^{6+}$ Bis-porphyrin *2.148*

11. Chemical Name Index

12. Appendix 1. Reverse Energy Transfer and Geminate Reactions

12.1. Reverse Energy Transfer

The treatment given in the main article does not consider reverse energy transfer to and from singlet oxygen from the sensitizers. This would only be expected to be important when the energy of the sensitizer triplet is close to that of singlet oxygen. In order to see the effect of reverse energy transfer we treat first Scheme 1 without reverse energy transfer.

12.1.1. Derivation of ϕ_Δ according to Scheme 1, i.e. without energy transfer for self-sensitized photo-oxidation.

Applying the steady-state treatment to S_1, T_1 and $^1O_2^*$ gives

$$\frac{d[S_1]}{dt} = 0 = I_a - (k_{SD} + k_{SQ}^{O_2}[O_2])[S_1],$$

therefore

$$\frac{[S_1]}{I_a} = \frac{1}{(k_{SD} + k_{SQ}^{O_2}[O_2])} = \frac{(1 - P_S^{O_2})}{k_{SD}}. \qquad (A.1)$$

$$\frac{d[T_1]}{dt} = 0 = (f_T^{O_2} k_{SQ}^{O_2}[O_2] + k_{isc})[S_1] - (k_{TD} + k_{TQ}^{O_2}[O_2])[T_1],$$

therefore

$$\frac{[T_1]}{I_a} = \frac{f_T^{O_2} k_{SQ}^{O_2}[O_2] + k_{isc}}{(k_{SD} + k_{SQ}^{O_2}[O_2])(k_{TD} + k_{TQ}^{O_2}[O_2])} = \frac{f_T^{O_2} P_S^{O_2} + \phi_T(1 - P_S^{O_2})}{k_{TD} + k_{TQ}^{O_2}[O_2]} \qquad (A.2)$$

and in the presence of a reactive substrate i.e. with M = A we obtain

$$\frac{d[^1O_2^*]}{dt} = 0 = f_\Delta^S k_{SQ}^{O_2}[O_2][S_1] + f_\Delta^T k_{TQ}^{O_2}[O_2][T_1] - (k_\Delta + k_A[A])[^1O_2^*].$$

Substitution of Eqs. (A.1) and (A.2) gives

$$\frac{[^1O_2^*]}{I_a} = \frac{f_\Delta^S P_S^{O_2} + f_\Delta^T P_T^{O_2} f_T^{O_2} P_S^{O_2} + f_\Delta^T P_T^{O_2} \phi_T(1 - P_S^{O_2})}{(k_\Delta + k_A[A])}. \qquad (A.3)$$

The quantum yield of photo-oxidation of A by singlet oxygen is

$$\phi_{ox} = \frac{k_r^A[A][^1O_2^*]}{I_a} = \frac{k_r^A[A]}{(k_\Delta + k_A[A])}\phi_\Delta \qquad (A.4)$$

and from (A.3) and (A.4)

$$\phi_\Delta = f_\Delta^S P_S^{O_2} + f_\Delta^T P_T^{O_2} f_T^{O_2} P_S^{O_2} + f_\Delta^T P_T^{O_2} \phi_T(1 - P_S^{O_2}). \qquad (A.5)$$

N.B. (A.4) and (A.5) are Eqs. (14) and (1) respectively in the main text.

12.1.2. Derivation of ϕ_Δ in the presence of back energy transfer

Application of the steady-state approximation to S_1, T_1 and $^1O_2^*$ according to Scheme 1, including back energy transfer i.e. step *11* written as

11 $\qquad T_1 + O_2 \rightleftarrows S_0 + {}^1O_2^*$

where $k_{11} = k_{T\Delta}^{O_2}$ and $k_{-11} = k_{\Delta T}$.

Equation (A.1) is unaffected, however now

$$\frac{d[T_1]}{dt} = 0 = (f_T^{O_2} k_{SQ}^{O_2}[O_2] + k_{isc})[S_1] + k_{\Delta T}[A][^1O_2^*] - (k_{TD} + k_{TQ}^{O_2}[O_2])[T_1]$$

and

$$\frac{d[^1O_2^*]}{dt} = 0 = f_\Delta^S k_{SQ}^{O_2}[O_2][S_1] + f_\Delta^T k_{TQ}^{O_2}[O_2][T_1] - (k_\Delta + k_A[A] + k_{\Delta T}[A])[^1O_2^*].$$

If we define

$$\alpha = \frac{k_{\Delta T}[A]}{k_\Delta + k_A[A] + k_{\Delta T}[A]}, \qquad (A.6)$$

$$\frac{[T_1]}{I_a} = \frac{f_T^{O_2} P_S^{O_2} + \phi_T(1 - P_S^{O_2}) + f_\Delta^S P_S^{O_2}\alpha}{k_{TD} + k_{TQ}^{O_2}[O_2] - f_\Delta^T k_{TQ}^{O_2}[O_2]\alpha} \qquad (A.7)$$

and

$$\frac{[^1O_2^*]}{I_a} = \frac{f_\Delta^S P_S^{O_2} + f_\Delta^T P_T^{O_2}\{f_T^{O_2} P_S^{O_2} + \phi_T(1 - P_S^{O_2})\}}{k_\Delta + k_A[A] + k_{\Delta T}[A](1 - f_\Delta^T P_T^{O_2})}. \qquad (A.8)$$

Thus with back transfer

$$\phi_{ox} = \frac{[f_\Delta^S P_S^{O_2} + f_\Delta^T P_T^{O_2} f_T^{O_2} P_S^{O_2} + f_\Delta^T P_T^{O_2}\phi_T(1 - P_S^{O_2})]}{k_\Delta + k_A[A] + k_{\Delta T}[A](1 - f_\Delta^T P_T^{O_2})} k_r^A[A]. \qquad (A.9)$$

Equation (A.9) may be considered in two equivalent ways[1], firstly, where ϕ_Δ remains unchanged and back transfer increases the physical quenching of singlet oxygen. However, secondly, if reverse energy transfer occurs and one uses Eq. (14) or (A.4) derived without considering it i.e. by putting

$$\phi_{ox} = \frac{\phi_\Delta^b k_r^A[A]}{k_\Delta + k_A[A]}, \qquad (A.10)$$

then the reverse energy transfer would be considered as reducing the quantum yield of singlet oxygen production and thus from Eqs. (A.9) and (A.10)

$$\phi_\Delta^b = \frac{\phi_\Delta(k_\Delta + k_A[A])}{k_\Delta + k_A[A] + k_{\Delta T}[A](1 - f_\Delta^T P_T^{O_2})}, \qquad (A.11)$$

and

$$\phi_\Delta^b = \frac{\phi_\Delta(1-\alpha)}{1-\alpha f_\Delta^T P_T^{O_2}} . \quad (A.12)$$

We recommend that when reverse energy transfer is expected it be taken into account and the quantum yield of singlet oxygen production taken as unchanged as in Eq. (A.9).

12.2. Geminate Reaction

Wilson[2] reported that the direct, i.e. self-sensitized, photo-oxidation of DPBF could be inhibited by the addition of TME but that inhibition was never total and a residual rate of self-oxidation remains at high concentration of TME. Stevens *et al.*[3], Drews *et al.*[4] and Merkel and Kearns[5] have discussed various aspects of this problem which pertain to the question of the reactions of correlated pairs of molecules. Thus for example in the case of self-sensitized photo-oxidation the triplet state of the substrate, A = S, is quenched by O_2, thus we can write in place of reactions *11*, *12*, and *13* in Scheme 1

11a $T_1 + O_2 \underset{k_{-d}}{\overset{k_{dif}}{\rightleftarrows}} (T_1..O_2) \underset{k_b}{\overset{k_f}{\rightleftarrows}} {}^1(S_0..{}^1O_2^*) \xrightarrow{k_{-d}} S_0 + {}^1O_2^*$

12a $T_1 + O_2 \underset{k_{-d}}{\overset{k_{dif}}{\rightleftarrows}} (T_1..O_2) \underset{k_b}{\overset{k_f}{\rightleftarrows}} (S_0..{}^1O_2^*) \xrightarrow{k_q^g} S_0 + {}^3O_2$

13a $T_1 + O_2 \underset{k_{-d}}{\overset{k_{dif}}{\rightleftarrows}} (T_1..O_2) \underset{k_b}{\overset{k_f}{\rightleftarrows}} (S_0..{}^1O_2^*) \xrightarrow{k_r^g}$ Products

where k_q^g and k_r^g are geminate reaction probabilities of the encounter complex $(S_0...{}^1O_2^*)$ i.e. prior to achievement of what may be considered to be a random or homogeneous separation which can be reached with a probability k_{-d}. Thus k_q^g and k_r^g include any orbital or symmetry restrictions and any re-encounters of this correlated pair. When k_b is very small i.e. when no reverse energy transfer occurs e.g. when $E_{T_1} \gg E_\Delta$ the quantum yield of geminate recombination is

$$\phi_{ox}^g = \phi_\Delta f_r^g = \frac{\phi_\Delta k_r^g}{k_{-d} + k_r^g + k_q^g} \quad (A.13)$$

where f_r^g is the fraction of coordinated pairs which are formed which undergo geminate reaction. Note that ϕ_{ox}^g is independent of [A] and τ_Δ and can be measured from studies of very low values of [A] as a residual quantum yield observed independent of [A][1]. Homogeneous self-photo-oxidation also occurs and will obviously be the same as when $^1O_2^*$ is produced from another sensitizer. This can be written including encounter complexes with the following reactions in place of reactions *16* and *17* in Scheme 1

16a $^1O_2^* + A(S_0) \underset{k_{-d}}{\overset{k_{dif}}{\rightleftarrows}} (S_0..{}^1O_2^*) \xrightarrow{k_r^g}$ Products

17a $^1O_2^* + A(S_0) \underset{k_{-d}}{\overset{k_{dif}}{\rightleftarrows}} (S_0..{}^1O_2^*) \xrightarrow{k_q^g} {}^1A(S_0) + {}^3O_2$

N.B. In the absence of any differences in orbital symmetry restrictions k_r^g and k_q^g in reactions *16a* and *17a* are the same as in reactions *12a* and *13a*. Applying the steady-state approximation to $(S_0...{}^1O_2^*)$ which requires $k_{-d} \gg k_r^g + k_q^g$ gives

$$\frac{d[\text{Products}]_h}{dt} = \frac{-d[A]_h}{dt} = \frac{k_{dif}k_r^g}{k_{-d}}[{}^1O_2^*][A] = k_r^A[{}^1O_2^*][A] \quad (A.14)$$

i.e.

$$k_r^A = \frac{k_{dif}}{k_{-d}} k_r^g . \quad (A.15)$$

The overall yield of photo-oxidation is the sum of geminate and homogeneous quantum yield i.e.

$$\phi_{ox} = \phi_{ox}^g + \phi_{ox}^h , \quad (A.16)$$

where the superscript h indicates homogeneous reaction. From Eqs. (A.13) and (A.15) it follows that when $k_{-d} \gg k_r^g + k_q^g$

$$f_r^g = \frac{k_r^A}{k_{dif}} . \quad (A.17)$$

Substitution of Eqs. (A.13) and (A.17) in Eq. (A.16) gives

$$\phi_{ox} = \frac{\phi_\Delta k_r^A}{k_{dif}} + (1-f_r^g)\phi_\Delta \frac{k_r^A[A]}{(k_d + (k_r^A + k_q^A)[A])} \quad (A.18)$$

or

$$\frac{1}{\phi_{ox} - \phi_{ox}^g} = \frac{1}{(1-f_r^g)\phi_\Delta}\left[\left(1 + \frac{k_q^A}{k_r^A}\right) + \frac{k_d}{k_r^A[A]}\right] . \quad (A.19)$$

This equation is analogous to Eq. (14) since a plot of $(\phi_{ox} - \phi_{ox}^g)^{-1}$ vs. $[A]^{-1}$ gives slope/intercept = β_A.

13. References to Appendix 1

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14. Appendix 2: Self-consistent Averages of ϕ_Δ and f_Δ^T

The overall data set contains 1444 ϕ_Δ's and 357 f_Δ^T's, from which 12 values were excluded for such reasons as their being early estimates for which later, more precise, data are available, suspected solvent impurities, etc. Consistency is to be obtained by selecting a reference value for each sensitizer (S) under each set of conditions. Self-consistent averages are indicated by a bar over the quantity symbol; e.g. $\bar{f}_\Delta^T(S)$ for f_Δ^T and $\bar{\phi}_\Delta(S)$ for ϕ_Δ. As many values of $\bar{\phi}_\Delta(S)$ and $\bar{f}_\Delta^T(S)$ as possible are obtained by averaging appropriate values.

The intention of selecting a value by averaging immediately limits the selections to those cases for which there are two or more values to be averaged (50 cases for f_Δ^T and 60 for ϕ_Δ). Two further restrictions were used in the selection, first that the values agree with each other, second that they should be independent. The requirement for agreement was implemented as a requirement that the standard deviation of the average be no more than 40% of the average. For two values this requires little better than a factor of two agreement. Independence of the values was taken as a requirement that more than one paper contribute to the average.

The conditions for which averages are taken require separate averages for different sensitizers and for different solvents. Further, for ϕ_Δ values the oxygen concentrations must match, except for sensitizers identified as type T (see Sec. 4). For type T sensitizers, ϕ_Δ values of a particular sensitizer and solvent are averaged for all oxygen concentrations. For other sensitizers there are separate averages for air-saturated and for oxygen-saturated solutions, with other oxygen concentrations excluded from the averaging. f_Δ^T should be independent of oxygen concentration; thus measurements at all oxygen concentrations are included in one average for the same sensitizer and solvent.

In the overall data set 1005 values of ϕ_Δ and 67 values of f_Δ^T are given as ratios, $R_f(S,S') = f_\Delta^T(S)/f_\Delta^T(S')$ and $R_\phi(S,S') = \phi_\Delta(S)/\phi_\Delta(S')$. Absolute values can be derived by multiplying by a reference value for S'. When the author states the value of the ratio, or we can calculate the ratio from the given value and the stated reference value used, we use the ratio for our average values. We take each ratio to be as much a measure of S' relative to S as it is a measure of S relative to S'. This is important for sensitizers that are usually used as references, but for which few data are directly listed in Tables 1–3 (such as phenazine). For those values which are not directly relative, or for which we can not obtain a ratio, the value reported is used in the average.

The basic average of n measurements, for each set of conditions, comes from summing three types of terms. First the values for S that are not relative, second those that are reported as relative to S' and third those for which S'' is reported as relative to S. A separate sum occurs for each distinct pair of sensitizer and solvent when averaging f_Δ^T.

$$n\bar{f}_\Delta^T(S) = \Sigma f_\Delta^T(S) + \Sigma' R_f(S,S')\bar{f}_\Delta^T(S') + \Sigma''[R_f(S'',S)]^{-1}\bar{f}_\Delta^T(S'') \qquad \text{(A.2.1)}$$

Equation (A.2.1) gives an average ($\bar{f}_\Delta^T(S)$) in terms of similar averages for S' and S''. We started by calculating a set of $\bar{f}_\Delta^T$ values from the first term and ratios with guessed values used for the $\bar{f}_\Delta^T$ (0.5 if nothing else was available.) Thereafter each set of $\bar{f}_\Delta^T$ values was calculated using the previous set in the right hand side of Eq. (A.2.1). After the first iteration measurements for which there was no $\bar{f}_\Delta^T(S')$ or $\bar{f}_\Delta^T(S'')$ average were dropped from the second or third sum. The calculations were iterated until no changes resulted with the $\bar{f}_\Delta^T$ values retained to three decimal places. A similar set of $\bar{\phi}_\Delta$ values was calculated for the ϕ_Δ values and their ratios, with separate values for air-saturated and oxygen-saturated (except for type T sensitizers) solvent for each sensitizer.

When the $\bar{f}_\Delta^T$'s and the $\bar{\phi}_\Delta$'s were derived separately, values for several sensitizers departed from their experimental relationships as expressed in Eq. (42) for type T sensitizers. Further, several f_Δ^T averaged to values larger than one. Thus the set of averages was calculated in which $\bar{\phi}_\Delta$ was used in the calculation of $\bar{f}_\Delta^T$ and vice versa. Specifically in the first term of Eq. (A.2.1) for type T sensitizers $f_\Delta^T(S)$ terms were replaced by $\bar{\phi}_\Delta(S)/\phi_T$ if ϕ_T was also reported. The corresponding substitution for $\phi_\Delta(S)$ was $\bar{f}_\Delta^T(S)\phi_T$ when calculating $\bar{\phi}_\Delta$. Also the restriction that all $f_\Delta^T \leq 1.0$ was placed on the averaging procedure.

The resulting $\bar{f}_\Delta^T$ and $\bar{\phi}_\Delta$ values, each with the number of measurements and standard deviation of the average, are shown in Table A.2.1.

Table A.2.1. Average values for ϕ_Δ and f_Δ^T.

No.[a]	S	Solvent	$[O_2]$	Meas.[b]	$\overline{\phi}_\Delta$	standard deviation	Meas.[c]	$\overline{f}_\Delta^T$	standard deviation
1.1	2-ACN	C_6H_6		4	0.71	0.04	4	0.81	0.07
1.2	AP	C_6H_6		5	0.36	0.007	5	0.36	0.04
1.7	Ac	C_6H_6		3	0.83	0.06	5	0.99	0.02
1.13	An	C_6H_6	air	3	0.66	0.07	2	0.79	0.13
1.13	An	C_6H_6	O_2	2	0.68	0.007			
1.88	BP	C_6H_6		9	0.36	0.02	18	0.35	0.03
1.88	BP	C_6D_6					2	0.29	0.003
1.115	Biph	C_6H_6					2	0.55	0.07
1.142	ES	C_6H_6					2	0.96	0.05
1.153	Fluorenone	C_6H_6		4	0.82	0.04	3	0.85	0.05
1.161	Eos	H_2O		3	0.61	0.02			
1.161	Eos	EtOH					2	0.78	0.20
1.169	RB	MeOH		6	0.80	0.02			
1.169	RB	H_2O		3	0.76	0.02			
1.190	Ery	H_2O		2	0.69	0.03			
1.214	C_{17}aldehyde	MeOH		2	0.41	0.00	2	1.0	0.0
1.214	C_{17}aldehyde	c-C_6H_{12}		2	0.66	0.00	2	1.0	0.0
1.220	Np	C_6H_6					9	0.62	0.06
1.220	Np	C_6D_6					2	0.49	0.005
1.233	Per	C_6H_6					2	0.93	0.09
1.239	Pz	C_6H_6		14	0.88	0.07	2	1.00	0.00
1.245	MB^+	MeOH		4	0.51	0.01			
1.245	MB^+	H_2O		4	0.55	0.03			
1.245	MB^+	EtOH					2	1.00	0.0
1.263	Py	MeOH	O_2	4	0.65	0.08			
1.272	Ret	MeOH		2	0.12	0.00	2	1.00	0.0
1.272	Ret	c-C_6H_{12}					2	1.00	0.0
1.277	Rubi	C_6H_6	air	2	0.27	0.05			
1.278	Rub	n-C_6H_{14}	O_2	2	1.17	0.05			
1.291	Tetr	C_6H_6	air	2	0.69	0.01			
1.301	Thiouridine	CH_3CN					4	0.81	0.15
1.306	$Ru(bpy)_3^{2+}$	MeOH		4	0.90	0.0	4	0.95	0.0
1.310	VD_3	C_6H_6					2	0.29	0.01
1.316	Xanthone	C_6H_6		3	0.27	0.02	3	0.29	0.03
2.12	Ph a	CCl_4	air	2	0.74	0.04			
2.136	TPP	C_6H_6	air	5	0.66	0.08			
2.136	TPP	CCl_4	air	4	0.62	0.07			
2.146	ZnTPP	C_6H_6		4	0.72	0.08			
2.154	HP	H_2O					2	0.58	0.10
2.154	HP	D_2O (mic)					2	0.32	0.00
2.166	PPDME	C_6D_6					3	0.68	0.00
2.166	PPDME	C_5H_5N	O_2	2	0.90	0.28			

[a]Entry numbers in Tables 1 and 2.
[b]Number of measurements of ϕ_Δ in $\overline{\phi}_\Delta$.
[c]Number of measurements of f_Δ^T in $\overline{f}_\Delta^T$.