# Sonochemistry of aqueous surfactant solutions: An EPR spin trapping study

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The surfactant properties of solutes play an important role in the sonochemistry and sonoluminescence of aqueous solutions. Recently, it has been shown, for relatively low molecular weight surfactants, that these effects can be correlated with the Gibbs surface excess of the solutes [1,2]. In the present study we investigate whether this correlation is valid for relatively high molecular weight surfactants. Sonolysis of argon saturated solutions of non-volatile surfactants [n-alkane sulfonates, n-alkyl sulfates, and n-alkyl ammoniopropanesulfonates (APS)] was investigated by EPR and spin trapping with 3,5-Dibromo-4-nitrosobenzenesulfonate. Secondary carbon radicals ($-^{\bullet}CH-$), formed by abstraction reactions, were observed following sonolysis of all surfactants. The yield of ($-^{\bullet}CH-$) radicals was measured following sonolysis of various n-alkyl anionic surfactants (carbon chain length of between 5 to 12). In the low concentration range (0-0.3 mM) the ($-^{\bullet}CH-$) yield increased in the order $C_{12} \approx C_8 < C_5$. At higher concentrations, a plateau in the maximum ($-^{\bullet}CH-$) radical yield is reached for each surfactant, which follows the order $C_5 > C_8 > C_{12}$, i.e., the radical scavenging efficiency increases with decreasing chain length. A similar trend was observed for the methyl radical yield, formed by pyrolysis reactions, following sonolysis of a homologous series of n-alkyl APS surfactants. The results show that the Gibbs surface excess of certain non-volatile surfactants does not correlate with the extent of decomposition following sonolysis in aqueous solutions. Instead, the decomposition depends on their ability to equilibrate between the bulk solution and the gas/solution interface of cavitation bubbles [3].

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