Electron phototransfer reactions and electron paramagnetic resonance method in study and analysis of water's

Boris F. Alekseev[1], Raissa F. Demyanenko[1], Petro O. Demyanenko[2].

[1]Industrial-economical college of National Aviation University, Metrobudivska str. 5-A, Kyiv, 03126, Ukraine. [2]National Technical University of Ukraine "KPI", Peremogy str. 37, build 17, Kyiv, 03256, Ukraine. E-mail: dpa@tesis.kiev.ua

The problem of practical usage of electron phototransfer and electron paramagnetic resonance (EPR) method are considering in order both to detect alternative valence diamagnetic ions, oil product and organic colour impurities in water and to control isotopic content of water as well.

By ultra-violet (UV) irradiation of the acidicices with aromatic combination or alternative valence diamagnetic ions addition form [1] in consequence of electron phototransfer reaction's atomic protium and deuterium, stable at 77 K and lightly detected and identificated by EPR methods. Earlier [2 – 5] point out on possibility usage of the same method for photooxidize impurities detection (for example oilproducts) and maintenance of deuterium in natural waters determine.

In our experiments mixtures of H_2O, D_2O and one of the following acids H_2SO_4, H_3PO_4, $HClO_4$, HCl, H_3BO_4, H_3AsO_3, HNO_3, with additions of photooxidizing agents, were frozen and irradiated with the unfiltered light of a 1000 W xenon lamp at 77 K. Benzene, hydroquinone, Mohr's salt, ferric sulphate and metallic chromium were used as electron donors. All measurements of EPR spectra were made on an EPR spectrometer of X band with a cavity-stabilized Gunn oscillator. The sensitivity of the spectrometer was $5 \cdot 10^{10}$ spin/Gs, the resolution being 30 mGs. The complete EPR spectrum consists of an atomic protium doublet with splitting between lines of 505 Gs and a deuterium triplet with splitting of 78 Gs. Two satellite pairs belonging to one- and two-proton electron-nucleus forbidden transitions appear at 5 and 10 Gs intervals from the line centre in the vicinity of any line of H and D multiplets. The maximum photoyield of hydrogen atoms $(5 – 10) \cdot 10^{17}$ sm^{-3} was observed for H_2SO_4 and H_3PO_4 at 0.2 and 0.3 mole fraction concentrations, respectively. The EPR signal of atomic hydrogen was not detected in matrices with Br^-, Cl^-, Co^{+2}, Mn^{+2}, Ni^{+2} ions. In detail were study the kinetics of isotope separation and decay [1].

Evidently, that this method is effective in study and analysis of natural waters. It assumes the usage of a simple EPR spectrometers [5] and inexpensive, accessible chemical reactivs.

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