THE INFLUENCE OF BENZOIC ACID ON THE RADICAL SELF-PURIFICATION PROCESSES IN NATURAL MEDIUM

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The processes of formation and destruction of hydrogen peroxide hold a very important place in the system of self-purification in the aquatic medium. One of the intermediate products of reduction of hydrogen peroxide are the OH radicals having pronounced oxidizing properties. The composition of OH radicals in the aquatic medium can be determined by means of p-nitrosodimethylaniline colorant (PNDMA) applied in radiation chemistry as specific acceptor of OH-radical. By measuring the PNDMA discolorations rate at H_2O_2 photolysis in distilled water and in the presence of various naturally occurred additives there can be determined the inhibiting capacity of the water environment with regard to radical self-purification processes with the participation of OH radicals ($\sum k_i[S_i]$). The variation of the inhibiting capacity parameter can be demonstrated. At $\sum k_i[S_i] \geq 10^6$ s^{-1} water is strongly polluted, at $\sum k_i[S_i] \geq 10^4$ s^{-1} it is regarded as rather clean. Normally, for most natural waters the value is $\sum k_i[S_i] \geq 10^5$ s^{-1}.

The study of the influence of benzoic acid (BA) on radical self-purification processes of the aquatic medium demonstrates its negative influence. The inhibiting capacity of the medium in the presence of BA lies in the limits of $(2{,}40 – 5{,}13)\cdot 10^6$ s^{-1}, which is characteristic for strongly polluted waters. The permanent concentration of OH radicals in the system studied decreases together with the increase of BA concentration and lies in the limits of $(1{,}11 – 2{,}34)\cdot 10^{-17}$M. Moreover, there was studied the influence of simultaneous presence of BA and the ions of Cu(II), Fe(III) and EDTA. It was proven that there exists a certain pattern for the rise of the capture constant of OH radicals in the studied systems:

$$K_{BA\text{-}Cu(II)} < K_{BA\text{-}Fe(III)} < K_{BA} < K_{BA\text{-}EDTA\text{-}Fe(III)} < K_{BA\text{-}EDTA\text{-}Cu(II)}.$$

The results obtained can be used to forecast the processes, which can take place in natural waters in the presence of different substances of natural, and anthropogenic origin.