SELF-PURIFICATION PROCESSES WITH RADICALS IN THE PRESENCE OF ANIONIC SURFACTANTS IN AQUATIC ENVIRONMENT

[1]PhD Student Silvia Racoviţă, [2]Acad. Gheorghe Duca, [1]Dr. Conf. Viorica Gladchi

[1]Moldova State University, Moldova
[2]Academy of Sciences of Moldova, Moldova

Surfactants are used to obtain detergents, soaps, in food industry, to obtain mineral dispersants, corrosion inhibitors, etc. Once in the water or soil, they decompose hard under the influence of microorganisms and become persistent. Thus, it is necessary to study the process of self-purification in the presence of radical anions example sodium lauryl sulphate.

Self-purification of water by indirect photolysis requires involvement in process of sensitizing of some particles or under action of free radicals •OH. In the case of our research has been modeled and studied the indirect photolysis of •OH radicals.

Development of self-purification processes with radicals was assessed using the acceptors competitors. As a scavenger of •OH radicals served 4-nitroso-N, N-dimethylaniline (PNDMA, ε = 3.4 · · 104 M-1 cm-1). Served as a source of hydrogen peroxide radicals, ultraviolet spectrum (UV) bactericidal lamp was provided with at wavelength 253.7 nm and the concentration of the dye PNDMA was watched and followed spectrophotometrically at wavelength λ = of 445 nm.

At the first stage was modeled STA - PNDMA - H2O2 system to which were added various amounts of surfactant. Research has shown that concentrations of anionic stand Odin (1-10) 10-6 M · an increase in the quantities • OH radicals in the system, resulting in concentration of •OH radicals increase to 1,84 $\cdot 10^{-16}$ M up to 94,07 $\cdot 10^{-16}$ M and inhibition capacity decreases from 3,56 · 10^6 s^{-1} up to 2,53 · 10^5 s^{-1} so this studied system is part of polluted waters.

To intensifying of self- purification processes with radicals we can use natural water components ions Fe (III) and Cu (II). In order to elucidate the influence of copper ions and iron ions in the self- purification processes with radicals has been studied kinetics reaction to PNDMA radical transformation in model systems that have been subjected to irradiation with ultraviolet rays. We studied PNDMA - Cu (II) - H_2O_2 systems and PNDMA - Fe (III) - H_2O_2, where it was observed that the photochemical oxidation rate PNDMA colourant in the presence of copper ions increases from 0,8 $\cdot 10^{-9}$ M/s up 3,83 $\cdot 10^{-9}$ M/s and in the presence of iron ions photochemical oxidation rate increases more slowly from 1,27 · 10^{-9} M/s up to 2,13 · 10^{-9} M/s. In consequence Cu (II) and Fe (III) generate additional amounts of • OH radicals.

To demonstrate the catalytic activity of transition metal ions (Cu (II) and Fe (III)) in the process of self-purification with radical it was modeled the systems: *STA - PNDMA – Cu (II) - H_2O_2 şi STA - PNDMA – Fe (III) - H_2O_2.* Comparing the values of the kinetic parameters arising in the systems indicated, we follow that in both cases the ability to inhibit decreases with increasing the concentration of STA in both systems is of the order of 10^6 s^{-1}, yielding the characteristic values of natural waters polluted. However, in the presence of Cu (II) occur supplementation quantities ● OH radicals, which is an increase from 1, 83 · 10^{-16} M till 8, 79 · 10^{-15} M. Ions Cu (II) leads to an increase in self- purification processes with radicals.

The results of research conducted on the self- purification processes with radicals of anionic STA (on the example of sodium lauryl sulphate), reveals that affects self-purification processes and are not included in the group who exhibit positive effects of pollutants in the process of self-purification. The presence in the environment of Cu(II) helping improve the situation because the generation of additional quantities •OH radicals.

References:

1. Bunduchi, E. *Transformările redox catalitice ale hidrochinonei şi acidului glioxalic* / Autoreferat al tezei de doctor în chimie. Chişinău, 2010.
2. Isac, V., Hurduc, N. *Chimie fizică. Cinetică chimică şi cataliză*. Chişinău: Ştiinţa, 1994, p.427. ISBN 5-376-01827-X.
3. Duca G., Gladchi V., Romanciuc L. Procese de poluare şi autoepurare a apelor naturale. Chişinău, 2002, USM.