CHEMICAL AUTOPURIFICATION OF ACTIVE BLUE DYE-POLLUTED NATURAL WATER

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This work reports the results on the catalytic-redox reactions of active blue dye textile in natural water-model system. Therefore, for this purpose, has been employed the system that reproduce the chemical composition of the dye-polluted natural water, [AA-O_2-H_2O_2-Cu^{II}] (AA = active blue dye textile). As at higher values the process does not occur, the measurements were performed at pH~5.5. The oxidation reaction was monitored spectrophotometrically by measuring the decrease in absorbance at 602 nm (λ_{AA} = 6, $2 \cdot 10^3$ $M^{-1} \cdot cm^{-1}$). The experimental data is showing that chemical oxidation rates of active blue dye in [AA-O_2-H_2O_2-Cu^{II}] system are directly proportional with oxidant and catalyst concentrations and inversely proportional with substrate concentration (see the equation below). The formation of free $OH^{\cdot}$ radicals have been proven also spectrophotometrically by consuming of radical-acceptor dye, 4-nitroso-N,N-dimethylaniline (PNDMA).

$$W = 9{,}37 \cdot 10^{-9} \cdot \frac{\left[H_2O_2\right]^{0,4} \cdot \left[Cu(II)\right]^{0,4}}{\left[AA\right]^{0,4}}$$

In order to reproduce the natural chemical composition of water autopurification, it was added to the experimental model, [AA-O_2-H_2O_2-Cu^{II}], different ammonium salts (NH_4X) and oxalic acid as a chelating compound. Their concentration was maintained similar to natural water systems. It was observed that these compounds have different influence on the blue dye oxidation rates. Therefore, ammonium ions are increasing the chemical oxidation rates 1,2 times while oxalate ions are decreasing the chemical oxidation rates 5,7 times. Anions of mineral acids (X^-) don't have any influence on the blue dye oxidation rates.