THE DIMINISHING OF THE CONTENT OF TEXTILE DIRECT DYES AND AUXILIARY COMPOUNDS DURING THEIR CATALYTIC OXIDATION

Maria Gonta[a*], Gheorghe Duca[b], Vera Matveevici[a], Larisa Mocanu[a]

[a]*Moldova State University, 60, Alexei Mateevici str., Chisinau MD-2009, Republic of Moldova*
[b]*Academy of Sciences of Moldova, 1, Stefan cel Mare blvd., Chisinau MD-2001, Republic of Moldova*
**e-mail: mvgonta@yahoo.com; phone: (+373 22) 57 75 53; fax: (+373 22) 57 75 53*

Abstract. Advanced oxidation methods of organic compounds lead to their partial mineralization and increase of the adsorption process efficiency on the surface of oxidized activated carbon. We have studied the oxidation process using model solutions containing mixture of dye direct brown (DB), ethylene glycol (EGL) and sodium lauryl sulfate (SLS) under the action of Fenton reagent, in the presence and absence of UV irradiation or under the action of electric current (in the electrochemical cell). The same studies were performed by replacing the iron (II) ion with titanium dioxide. We have found that the degree of oxidation and mineralization increases by photocatalytic oxidation and decreases the concentration of organic compounds. Due to the oxidation of dye molecules and other auxiliary components, by strong oxidation ability of free OH* radicals, which evolve to the formation of carbon dioxide, water and low molecular organic compounds (alcohols, ketones, organic acids) are forming. The decrease of the concentration of mixture of organic compounds (for the values of COD-Cr) depends on the nature of catalysts and the presence of electric current. The degree of oxidation is greater in the presence of iron (II) ions than in the presence of titanium dioxide after oxidation of the mixture of organic compounds with hydrogen peroxide in model solutions. This is explained by the fact that UV irradiation increases the concentration of free OH* radicals as iron ions further decompose hydrogen peroxide, but in the presence of titanium dioxide, the leading band electrons are accepted by free OH* radicals, converting these radicals to ions, as shown in the mechanism by Garcia J., et al. This leads to a decrease of the concentration of OH* radicals in model solution and reducing the effect of oxidation, respectively. On the contrary, in the presence of electric current electrons are accepted by the electrode, and the OH* radicals concentration does not decrease, but increases, and this leads to the enhancement of the oxidation effect and mineralization of organic compounds.

Keywords: disperses dye, anionic surfactant, textile wastewater, chemical and electrochemical oxidation, adsorption, TiO_2, ZrO_2.