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ABSTRACT OF THE DISSERTATION

„Investigation and modeling of the electro-Fenton process.”

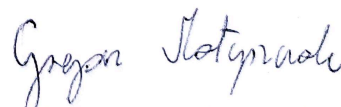
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The development of civilization causes increasing pollution of the natural environment with municipal and industry wastes. These wastes generally contain chemical compounds that have wide and negative effect on nature and humans. It is very important to develop methods of wastewater treatment. Among many investigated methods of degradation of pollutants present in water the electro-Fenton process may be distinguished, which is the main concern in this doctoral thesis.

In the thesis an activity of five different catalysts of the electro-Fenton process in the degradation of two distinct organic dyes – Methanil Yellow and Bromocresole Green – was compared. The investigated catalysts were Fe^{2+} , Ni^{2+} , Ce^{3+} , Mn^{2+} , and Co^{2+} cations. Additionally, a two new catalysts were proposed which are designed to change their oxidation state in the duration of electro-Fenton process by two units, thus they were called two-electron in contrast to listed previously one-electron catalysts. They were Sn^{2+} and Bi^{3+} cations.

The next step in the doctoral thesis was to construct a kinetic model of the electro-Fenton process basing on the literature data and rate-limiting step assumption. The constructed model was fitted then to obtained experimental data for two distinct dyes what allowed the estimation of values of its parameters and confirmation of its universality. A expansion of the original model was also considered. It consisted of complexation reactions between catalysts and molecules of degraded dyes. The extended model was even better fitted to the experimental data, both qualitatively and quantitatively.

As another part of the doctoral thesis a possibility of obtaining of materials modifying cathodes for the electro-Fenton process was investigated. The synthesized materials were tin sulphides: SnS and SnS_2 . The synthesis were performed using sonochemical method. A variability of properties of obtained materials was determined and two of them were chosen for modifications of copper cathodes of the electro-Fenton process.



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