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SYNTHESIS OF NANOCRYSTALLINE $ZnFe_2O_4$ AND ITS USE FOR THE REMOVAL OF CONGO RED FROM AQUEOUS SOLUTIONS

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Abstract

The paper describes the synthesis of nanocrystalline zinc ferrite starting from 1,4-butanediol and a mixture of zinc and iron nitrates. During the heating of the obtained solution, a redox reaction takes place with emission of brown nitrogen oxides and formation of a solid powder. This powder was characterized by thermal analysis and FT-IR spectrometry, techniques that confirmed the formation of a mixture of zinc and iron carboxylates. This mixture was further used as precursor for zinc ferrite. By thermal decomposition at 350 °C and annealing at different temperatures, nanocrystalline zinc ferrite powders have been obtained, as evidenced by X-ray diffractometry. The adsorption performance of nanocrystalline zinc ferrite was examined in the process of Congo red removal from aqueous solutions. The influence of various experimental parameters like the amount of adsorbent, initial concentration and contact time was evaluated in batch experiments. The equilibrium adsorption data were analyzed using the Langmuir and Freundlich isotherm equations. The experimental data were well described by the Langmuir model. The maximum adsorption capacity of the material was of 97.6 mg Congo red/g. The experimental data were fitted to conventional kinetic models: the pseudo-first-order model and the pseudo-second-order model. The kinetics of the adsorption process was best described by the pseudo-second-order kinetic equation.

Key words: adsorption, Congo red, isotherm, kinetic, nanocrystalline zinc ferrite, organic precursor

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