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REMOVAL OF CONGO RED BY A SYNTHESIZED LAYERED DOUBLE HYDROXIDE ZN-AL-SO₄

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ABSTRACT

The colored wastewaters from the textile industries may show toxic or carcinogenic effects on the organism, when discharged into the rivers and lakes, which are changing their biological life. Therefore, in this study, the removal of Congo red by Zn-Al-SO₄ layered double hydroxide has been achieved. Zn-Al-SO₄ material was prepared by a facile co-precipitation method at constant pH, resulting in a suitable material for the adsorption of Congo red dye. The structure and morphology of the Zn-Al-SO₄ adsorbent were investigated using XRD, FT-IR, and BET and MEB techniques. Layered double hydroxides (LDHs) have been widely investigated in a wide range of applications in health, in the pharmaceutical industry and in the material of biotechnology industries. In this work the synthesis of Zn/Al double layered hydroxides by chemical co-precipitation method (molar ration 3). The samples were characterized and confirmed by X-ray diffraction (XRD), BET analysis, and infrared spectroscopy. A series of experiments was then carried out to study the influence on the adsorption capacity of certain parameters such as the amount of the adsorbent, the pH, the contact time, the initial dye concentration, the ionic strength effect and temperature. All the results obtained show that the adsorption kinetics of the dye on our material is well described by the second order model. The adsorption isotherms of the adsorbent / adsorbate systems studied are satisfactorily described by the Langmuir mathematical model. The intra-particle scattering model confirms the physisorption phenomenon. Negative values of free energy prove that the phenomenon is physisorption. On the other hand, the thermodynamic study revealed that the adsorption is spontaneous and exothermic. The recovery of the material and reuse shows that the property of being able to regenerate is remarkable.

Key words: LDH, Congo red, Adsorption, Regeneration.