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Study on the adsorption performance of Ni-Mo-S nanomaterials for Congo red in azo wastewater

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ABSTRACT

In this paper, Ni-Mo-S (NMS) nanomaterial was prepared by a simple hydrothermal method and used as a new adsorbent to remove Congo red (CR) from azo dye wastewater. The crystal phase, morphology and microstructure of the samples were characterized by scanning electron microscopy, energy-dispersive X-ray spectroscopy, X-ray diffraction, Brunauer–Emmett–Teller surface area and Fourier transform infrared spectroscopy. The adsorption isotherm, kinetics and thermodynamics, as well as the influence of different Ni-Mo molar ratios and pH values on the experiment were studied. The experimental results show that NMS (Ni-Mo molar ratio 1:2) has a good adsorption capacity for CR. According to the Langmuir isotherm model, the maximum adsorption capacity was 490.20 mg/g. The adsorption kinetics is in good agreement with the pseudo-second-order model, and the adsorption equilibrium can be reached within 30 min. Moreover, the maximum removal rate of CR reaches 93.07% at pH = 7 and pH_{pzc} = 7.64 according to zeta potential. Finally, the mechanism of adsorption of CR by NMS (Ni-Mo molar ratio 1:2) was discussed.

Keywords: Ni-Mo-S; Nanomaterial; Adsorption; Dye wastewater

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