Amine functionalized magnetic carbon nanotube: synthesis and binary system dye removal

Niyaz Mohammad Mahmoodi*, Farzaneh Bagherpour, Elham Nariyan

Department of Environmental Research, Institute for Color Science and Technology, Tehran, Iran, Tel. +98 021 22969771; Fax: +98 021 22947537; emails: mahmoodi@icrc.ac.ir, nm_mahmoodi@aut.ac.ir, nm_mahmoodi@yahoo.com (N.M. Mahmoodi); farzan.1362@yahoo.com (F. Bagherpour); elham_136415@yahoo.com (E. Nariyan)

Received 16 November 2013; Accepted 2 June 2014

ABSTRACT

In this paper, the amine functionalized magnetic carbon nanotube (AFMCNT) was synthesized and used to remove anionic dyes from single and binary systems. The characteristics of AFMCNT were investigated using Fourier transform infrared and scanning electron microscope. Acid Blue 92 (AB92), Acid Red 14 (AR14), and Direct Red 31 (DR31) were used as anionic dyes. The effect of operational parameters (AFMCNT dosage and pH) on dye removal was investigated. The adsorption isotherm and kinetics were studied. The isotherm data in single and binary systems followed Langmuir isotherm. The maximum adsorption capacity ($Q_0$) of AB92, AR14, and DR31 was 333, 370, and 323 mg/g, respectively. Dye adsorption kinetics in single and binary systems followed pseudo-second-order kinetics model. The results showed that AFMCNT was an effective adsorbent to remove cationic dyes from binary systems.

Keywords: Amine functionalization; Magnetic carbon nanotube; Synthesis; Binary system dye removal