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Role of Cetyltrimethyl ammonium bromide on Enhanced Adsorption and Removal of Alizarin Red S using Amino-functionalized Graphene Oxide

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ABSTRACT

This research was aimed to study the adsorption capacity and removal of alizarin Red S (ARS) dye using amino-functionalized graphene oxide (NH_2-GO) as an adsorbent in the presence of CTAB. The optimum conditions were consisted of 100 mg/L initial concentration of ARS with 0.015 g adsorbent at solution pH 2.0. The adsorption equilibrium was completely reached within 60 min. at 28°C. The maximum adsorption capacity of NH_2-GO for ARS in the presence of CTAB (0.6 mM) was 135.1 mg/g, about three times higher than that of NH_2-GO (42.0 mg/g) in the absence of CTAB. The adsorption kinetics well fitted using a pseudo second-order kinetic model. The intra-particle diffusion model obtained clearly defined its rate-limiting step. Changes in free energy, enthalpy and entropy were also evaluated. The overall adsorption process was endothermic reaction. The adsorption isotherm for NH_2-GO in the presence of CTAB better fit with Langmuirn model. It is, therefore, evident that the synergic effect of CTAB enhances the adsorption capacity and removal of ARS via their electrostatic interactions among the three reacting components in the adsorption reaction system.

Keywords: Cetyltrimethyl ammonium bromide, Adsorption isotherm, Alizarin Red s, Amino-functionalized graphene oxide, Kinetics, Thermodynamics.

INTRODUCTION

Alizarin Red S (ARS) is one of the most durable anionic dye which is generally used as a staining agent in textile industries. It is also used to stain biological specimens such as mineralized bones in vertebrate groups and small invertebrate embryos.[1,2] Most of the treatments for such dye-laden effluents are largely inadequate.[3] Until now various adsorbents have been studied for the removal of ARS including multiwalled carbon nanotubes[4], cyanodon dactylon[5], menthe waste[6], *Citrullus lanatus* Peels[7], magnetic chitosan[8], alumina[9], activated clay modified by iron oxide[10], activated carbon and other carbon-based materials.[11-13] However, new adsorbents are recently developed to possess high capacity, larger specific surface area and high selectivity because