



Removal of cationic dyes from aqueous solutions using adsorbents based on GO/APTG nanocomposites

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ABSTRACT

In the present study, the cheap and naturally available one-dimensional modified attapulgite (APTG) with hexadecyl trimethyl ammonium bromide (CTAB) was introduced to synthesize graphene oxide (GO)/APTG composites and used as adsorbent to remove two cationic dyes, methylene blue (MB) and rhodamine B (RhB) from aqueous solution in single and binary dye systems. The structure and morphology of the GO/APTG composites were characterized by Zeta, Fourier-transform infrared spectroscopy, scanning electron microscopy and transmission electron microscopy and Brunauer–Emmett–Teller. The GO/APTG exhibits good adsorption performance for MB, RhB as well as the other cationic dyes in single systems, and has a significant improvement compared with APTG. However, in a binary dye system, the adsorption performance of MB was significantly better than that of RhB due to the rival adsorption. Removal mechanism suggests that electrostatic attractions and π - π stacking play essential roles. Additionally, the molecule structures of dyes exert a certain influence on the removal process. The adsorption kinetics and isotherm studies at different temperatures of GO/APTG in single as well as binary dye systems revealed that adsorption process was fitted well with the pseudo-second-order model and Langmuir adsorption isotherm showed the best compatibility with the experimental data in comparison with other isotherm models, the maximum adsorption capacity of MB and RhB can be 534.76 and 473.93 mg g⁻¹ in a single system; respectively, which were high adsorption performances. For its advantages of easy preparation, low cost and excellent adsorption performances, GO/APTG could be an eco-friendly and promising adsorbent for the removal of organic cationic dyes from wastewaters.

Keywords: Attapulgite; Graphene; Surface modification; Binary dye system; Cationic dye removal

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