Synthesis and adsorption performance of Mg(OH)(2) hexagonal nanosheet-graphene oxide composites

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APPLIED SURFACE SCIENCE
Volume: 332 **Pages:** 121-129
DOI: 10.1016/j.apsusc.2015.01.121
Published: MAR 30 2015
View Journal Impact

Abstract

A series of Mg(OH)(2) hexagonal nanosheet-graphene oxide (GO) composites were synthesized through a simple hydrothermal method using magnesium nitrate and GO as precursors, sodium nitrate and sodium oxalate as additives, and sodium hydroxide and ammonia as precipitants. The as-prepared samples were characterized by X-ray diffraction, nitrogen adsorption-desorption isotherms, Raman spectroscopy, zeta potential analysis, and scanning electron microscopy (SEM). The adsorption affinity of the as-prepared samples toward congo red (CR) in water was analyzed and investigated. Results indicated that GO addition influenced the thickness, morphology, and adsorption performance of Mg(OH)(2) hexagonal nanosheets. As GO concentration increased, the thickness decreased. Especially at high GO concentration (1 wt%), Mg(OH)(2) hexagonal nanosheets changed into aggregated flower-like spheres. Addition of small amounts of GO also increased the adsorption capacity of Mg(OH)(2). The equilibrium adsorption data of CR on the composite were further investigated by Langmuir and Freundlich models, indicating that the Langmuir model was much more suitable for the experimental data. The sample prepared with 0.5 wt% GO showed the highest adsorption capacity with 118 mg g (1). The experimental data were then fitted using pseudo-second order kinetics, suggesting that pseudo-second order kinetics could well describe the adsorption of CR on composites. Adsorption thermodynamics analysis showed that the adsorption activation energy was 29.2 kJ mol(-1), suggesting that the adsorption of CR onto the samples was physical adsorption. Adsorption between the samples and CR was mainly due to the strong electrostatic attraction between them because they had opposite charges. These findings indicated that Mg(OH)(2)-GO composite was an effective adsorbent for the removal of CR in water.

Keywords

Author Keywords: Mg(OH)(2) nanosheet; Graphene oxide; Composite; Congo red; Adsorption
KeyWords Plus: LAYERED DOUBLE HYDROXIDES; CONGO RED; REMOVAL; WATER; DYE; NANOPARTICLES; ISOTHERMS; KINETICS; THERMODYNAMICS; NANO-MG(OH)(2)

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Funding

Funding Agency	Grant Number
863 Program	2012AA062701
NSFC	21177100 51320105001 21433007 51272199
Fundamental Research Funds for the Central Universities	WUT: 2014-VII-010
Self-determined and Innovative Research Funds of SKLWUT of China	2013-ZD-1
Deanship of Scientific Research (DSR) of King Abdulaziz University of Saudi Arabia	90-130-35-HiCi
Early Career Scheme from the Research Grant Council	ECS 809813
Hong Kong SAR Government	
Dean's Research Fund-Early Career Researchers	04022
Research Equipment Grant	REG-2

View funding text

Publisher

ELSEVIER SCIENCE BV, PO BOX 211, 1000 AE AMSTERDAM, NETHERLANDS

Categories / Classification

Research Areas: Chemistry; Materials Science; Physics

Web of Science Categories: Chemistry, Physical; Materials Science, Coatings & Films; Physics, Applied; Physics, Condensed Matter

Document Information

Document Type: Article

Language: English

Accession Number: WOS:000350373300016

ISSN: 0169-4332

eISSN: 1873-5584

Journal Information

Table of Contents: Current Contents Connect

Impact Factor: Journal Citation Reports

Other Information

IDS Number: CC5BV

Cited References in Web of Science Core Collection: 43

Times Cited in Web of Science Core Collection: 34