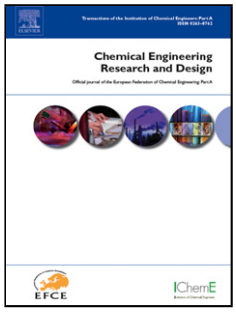

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Effect of Oxygen-Containing Functional Groups on the Adsorption of Cationic Dye by Magnetic Graphene Nanosheets

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Highlights

- Effects of OFGs on the cationic dyes adsorption were studied.
- Fe_3O_4@GNs presented a higher MB adsorption capacity and super-paramagnetic.
- The C=O functional groups disappeared after reduction treatment.
- The attenuation of OFGs on Fe_3O_4@GNs enhanced the hydrophobic and π-π interaction.
- Fe_3O_4 nanoparticles prevent the aggregation of GNs result in a larger surface area.

Abstract

Since its high stability, large specific surface area, honeycomb structure, high recovery and reproducibility, magnetic graphene has become a research hotspot in recent years. Batch equilibrium experiments of methylene blue (MB) were conducted on magnetic graphene nanosheets (Fe_3O_4@GNs) and magnetic graphene oxide (Fe_3O_4@GO) to probe effect of oxygen-containing functional groups (OFGs) on the potential active centers and adsorption mechanism of the cationic dyes. The microstructure and morphology of the magnetic graphene-based materials were characterized by X-ray diffraction spectra (XRD), Fourier transform infrared spectra (FTIR) and Scanning electron microscopy (SEM) technologies. Owing to the OFGs attenuation, Fe_3O_4@GNs presented a very high maximum monolayer MB adsorption capacity of 211.34 mg g^{-1} at 318 K and can be recycled easily by an external magnet. The kinetic results prove that the adsorption rate of MB mainly controlled by a chemical-sorption involving π-π force through sharing and electrons exchange between Fe_3O_4@GNs and MB molecular. It indicates that the