A promising hydroxyapatite/graphene hybrid nanocomposite for methylene blue dye's removal in wastewater treatment

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A novel hydroxyapatite/graphene hybrid nanocomposite (HAp/G) was developed as a competent adsorbent for the removal of methylene blue (MB) dye in wastewater treatment. The adsorption was pursued in a batch process that followed pseudo-second-order kinetics. Several techniques including the high resolution transmission electron microscopy (HR-TEM), energy dispersive X-ray analysis (EDX), X-ray diffraction (XRD), Fourier transform infrared spectrophotometry (FTIR) and Zeta potential (Electrokinetic potential) measurements were employed to evaluate the topography, composition, crystal structure, functionality and stability of the developed sorbent. The equilibrium concentration of MB was estimated using UV-Vis spectrophotometry. The impact of MB's initial concentration, HAp/G's dosage and solution pH on the adsorption capacity of HAp/G was investigated. Interestingly, superior removal efficiencies (up to 99.9%) for MB were obtained using HAp/G. Typically, the maximum sorption capacity (q_m) of HAp/G to MB was 333.3 mg/g, which excelled several previously-reported achievements at other sorbents. The harmony of data fitting with the Langmuir isotherm was successful.

Keywords: Wastewater; Graphene composites; Adsorption; Dyes; Langmuir.

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