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Synthesis of novel hierarchically porous Fe_3O_4@MgAl-LDH magnetic microspheres and its superb adsorption properties of dye from water

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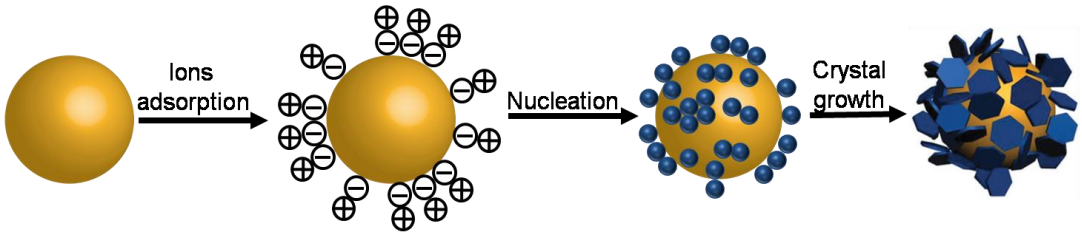
Graphical abstract



Abstract

Hierarchically porous Fe_3O_4@MgAl-LDH magnetic microspheres were reported as novel efficient adsorbent for the removal of anionic dye from water. The as-prepared microspheres had vertically/slantly/horizontally oriented platelets-coated morphology, and exhibited superb adsorption capacity of 813.0 mg/g for Congo red (CR), which was the highest reported value of magnetic adsorbents. The adsorption kinetics and isotherm of CR on microspheres followed the pseudo-second-order and Langmuir model, respectively, and the adsorption processes were spontaneous and endothermic in nature. The adsorbed samples could be regenerated by methanol, and easily magnetically separated from aqueous solution. The synthesized materials might act as excellent adsorbents for environmental processes.

Keywords: Fe3O4@MgAl-LDH; Magnetic microspheres; Adsorption; Dye; Electrostatic attraction; Anion exchange