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Efficient removal of Pb^{2+} from water using Fe_3O_4@UiO-66-NH_2 core/shell nanocomposite

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ABSTRACT

Using solvothermal method to combine Amino-functionalized metal–organic frameworks (MOFs) with magnetite (Fe_3O_4 NPS), and the generated magnetic nanocomposite dispersed in MOFs precursor in a row, generating two assembly cycles Fe_3O_4@UiO-66-NH_2 core/shell nanocomposite for efficient removal of Pb^{2+} from aqueous solution. The nanocomposite was characterized by X-ray diffraction (XRD), fourier transform infrared spectra (FT-IR), scanning electron microscopy (SEM), transmission electron microscopy (TEM), nitrogen adsorption-desorption and vibrating sample magnetometer (VSM). Compare the adsorption performance of primary and secondary growth. Batch experiments show that the secondary magnetization of Fe_3O_4@UiO-66-NH_2-2 core/shell nanocomposite has a good removal effect on Pb^{2+}. The prepared Fe_3O_4@UiO-66-NH_2-2 core/shell nanocomposite showed excellent efficient removal of Pb^{2+} with high adsorption capacity (q_e: 19.8 mg·g^{-1}, c_0: 5 mg·L^{-1}) and rapid separation from water by an external magnetic field because of the efficient combination of the advantages of UiO-66-NH_2 and the Fe_3O_4 NPS. The adsorption mechanism is mainly confirmed by the coordination interaction between amino (-NH_2) and Pb^{2+}. These results proved that the preparation of Fe_3O_4@UiO-66-NH_2-2 core/shell nanocomposite can be used as an efficient, separable adsorbent to adsorb Pb^{2+} contaminants in water.

Keywords: UiO-66-NH_2; Fe_3O_4 NPS; Adsorption; Lead ion; Magnetic separation

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