Smart design of self-assembled mesoporous α-FeOOH nanoparticle: High-surface-area sorbent for Hg2+ from waste water

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Self-assemble mesoporous α-FeOOH nanoparticles with high surface area and controlled self-assemble structure have been synthesized through simple and an environmentally friendly method. The formation mechanisms of self-assemble mesoporous structures, as well as the effect of pH on structure of the materials is carefully discussed. The self-assemble mesoporous α-FeOOH nanoparticle has been characterized by small-angle X-ray scattering (SAXS) analysis, powder X-ray diffraction (XRD), field-emission scanning electron microscopy (FESEM), high-resolution transmission electron microscopy (HRTEM), N2 sorption, X-ray photoelectron spectroscopic (XPS) studies. N2 sorption analysis revealed high surface areas (74-152 m2 g-1) and narrow pore size distributions (2.5 nm) for different samples. The XPS analysis revealed that the materials contain large amount of surface Fe-OH group which are the active suite for Hg2+ adsorption. The adsorption process has been discussed using Langmuir and Freundlich models. These self-assemble mesoporous α-FeOOH nanoparticles can act as a very efficient and reusable adsorbent for Hg2+ from polluted water.