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Abstract
The ionic functional polymer microsphere was prepared by using soap-free emulsion polymerization in this study. After the metal ions, Co2+ and Fe3+, were adsorbed on the polymer microsphere, the polymer with magnetic nano-particles shell were successfully prepared by in-situ chemical co-precipitation. The magnetic crystalline grain would be changed to 54.1nm from 8.5nm when the calcinations temperature was raised. Furthermore, silica was coated on the surface of the magnetic nanoparticles by sol-gel method. The morphology and magnetic properties of hollow spheres were examined by scanning electron microscope (SEM), transmission electron microscope (TEM) and vibrating sample magnetometer (VSM), respectively. The hollow cobalt ferrite-silica spheres possess superparamagnetic property. The result of BET measurement reveals these kinds of hollow sphere have largely amount of surface areas. Therefore, as the surface of the core-shell nanocomposite was modified by amino-silane to prepare the functional magnetic nanoparticles, they have much potential application on bio-separation, electromagnetic wave absorption, and adsorption of heavy metal ions, etc. In adsorption of heavy metal, the result shows that the amount of the metal ions absorption increased with adsorption times. That adsorption behavior is following the Langmuir isotherm. The absorption amount of single layer of saturation (qm) is 16.18 (mg/g) and Langmuir isotherm constant (KL) is 0.07 (l/mg). In the bovine serum albumin (BSA) immobilized onto the amino-silane modified magnetic nanoparticles, the maximum value of BSA immobilization capacity was obtained at pH 5.0. In microwave absorption application, the microwave loss of core-shell nanocomposite is located about -30~-35dB。
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