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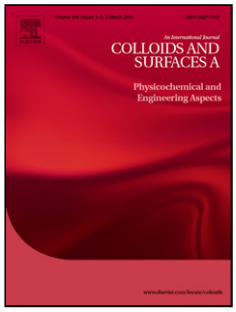

Title: The synthesis and characterization of $AlPO_4$ hollow microspheres of uniform size, and the sorption properties for Pb^{2+}, Cd^{2+}, Cu^{2+}, and Zn^{2+}

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The synthesis and characterization of $AlPO_4$ hollow microspheres of uniform size, and the sorption properties for Pb^{2+}, Cd^{2+}, Cu^{2+}, and Zn^{2+}

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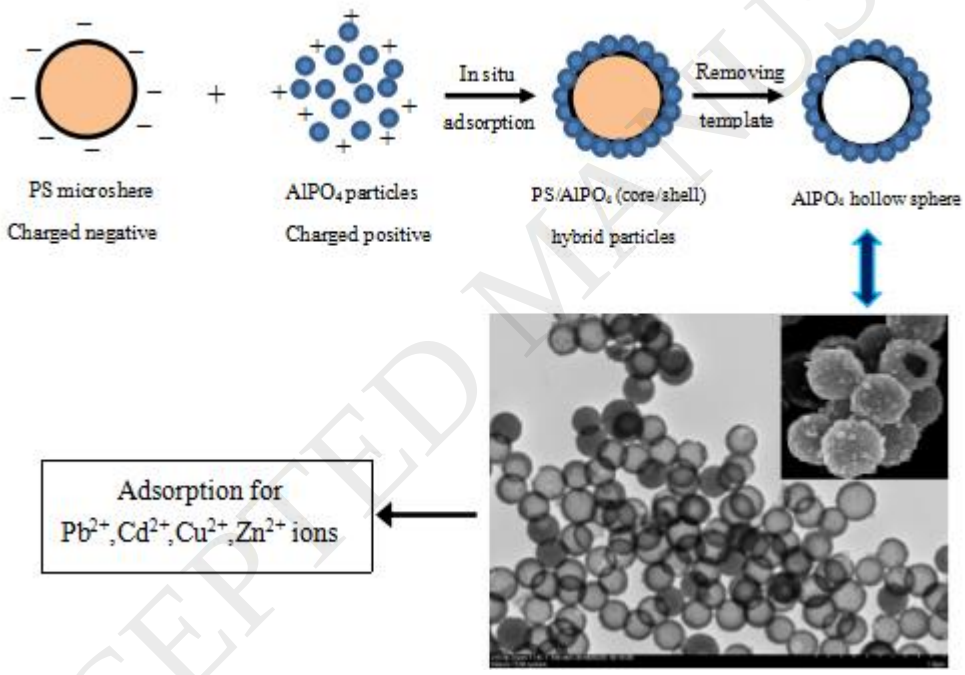
Graphical Abstract



ABSTRACT

Well-defined aluminum phosphate hollow microspheres ($AlPO_4$-HMs) of uniform size were synthesized via homogeneous precipitation using polystyrene (PS) as the template. The as-prepared $AlPO_4$-HMs were characterized by FESEM, TEM, XRD, FTIR and N_2 adsorption/desorption. The adsorption of $AlPO_4$-HMs towards Pb^{2+}, Cd^{2+}, Cu^{2+} and Zn^{2+} metal ions was also studied. The FESEM and TEM images show that the $AlPO_4$-HMs display a regular spherical hollow structure that is about 250 nm in size, and have a special and superior sorption performance for Pb^{2+} adsorption from aqueous solution compared with the Cd^{2+}, Cu^{2+}, Zn^{2+} metal ions. The adsorption of Pb^{2+} ions follows the Langmuir isotherm and the Pseudo-second-order kinetic equation as well as the intra-particle diffusion model.