

Article Abstract

Title:	A comparative study on Pb(II), Cd(II), Cu(II), Co(II) adsorption from single and binary aqueous solutions on additive assisted nano-structured goethite
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Abstract:	Development of low cost adsorbents for mitigation of toxic ions is one of the most important areas of research and development. Iron oxides especially in nano form have the potential for removing cations due to their structural properties. In the present work additive assisted nano structured goethite was synthesized at pH 3.0 and its cation adsorption behaviour was studied for Pb(II), Cd(II), Cu(II) and Co(II) from single and binary aqueous solutions. The contact time data for single cation adsorption followed pseudo second order kinetic model for all the four cations. The isothermic data was fitted to Langmuir and Freundlich models. The experimentally obtained maximum loading capacities were estimated as 109.2, 86.6, 29.15 and 37.25 mg/g of goethite for Pb(II), Co(II), Cd(II) and Cu(II) respectively from single cation containing solutions. Thermodynamic parameters were evaluated for the four metal ions. Adsorption behaviour from binary solutions was studied by keeping the concentration of Pb(II) at saturation concentration (500 mg/L) for its maximum uptake and varying the concentration of other metal ions (one at a time) in the range of 25 to 200 mg/L. The Pb(II) loading capacity increased in the presence of Cd(II) or Co(II) while it decreased in the presence of Cu(II) in the studied range of concentration variation. Maximum Pb(II) uptake was observed from Pb(II)-Cd(II) binary system (222 mg/L) with Pb(II) and Cd(II) concentration as 500 and 200 mg/L respectively. An increase in the combined uptake capacities for Pb(II)-Cd(II) and Pb(II)-Co(II) binary systems were observed whereas a decrease was observed for Pb(II)-Cu(II) binary system. The synthesized goethite can be used effectively for cation removal from single/binary cation containing aqueous solutions.
Keywords:	Nano goethite; TEM, adsorption; cations; binary; kinetics