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A novel alginate-based composite adsorbent for the removal of anionic pollutants

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Anionic pollutants, such as chromate, fluoride, phosphate, arsenate and arsenite, commonly exist in wastewater, which cannot be removed by simple precipitation method. Long-term excessive uptake of low levels of fluoride, chromate, arsenate and arsenite has adverse effects on the human health. In this study, chemical modifications of the sodium alginate were carried out to synthesize composite adsorbents for the efficient removal of anionic pollutants including fluoride, phosphate, chromate, arsenate and arsenite from aqueous solutions. The alginate was first cross-linked with five different metal cations Ca(II), Ce(III), Ce(IV), Sn(IV) and Zr(IV), and then doped with amino-functionalized silica. The introduction of the fungal biomass, *Mucor rouxii* (MR), could improve the ability of the metal-alginate to remove anionic pollutants. The anionic pollutants could bind onto: (1) The polyvalent ions in the alginate gel; (2) the MR surface; and (3) the ethylenediamine groups on the silica. The composite adsorbents (Silica doped Metal-Alginate/MR and Metal-alginate/MR) were tested and compared for their ability to remove fluoride, chromate, phosphate, arsenate and arsenite in batch system. Among the different synthesized adsorbents, the Zr(IV)-alginate/MR showed the highest adsorption capacities for fluoride, arsenate and arsenite, whereas silica doped Zr(IV)-alginate/MR exhibited the highest adsorption capacities for chromate and phosphate. The results suggest that Zr(IV)-alginate/MR and silica doped Zr(IV)-alginate/MR would be a promising adsorbent for the enhanced removal of anionic pollutants such as fluoride, chromate, arsenate, arsenite and phosphate from aqueous solution.

Biography

Kwok-Pan Ho is a PhD student from the Department of Applied Biotechnology and Chemical Technology of the Hong Kong Polytechnic University. His research focus on the removal of heavy metals from wastewater using various adsorbents such as silica-doped calcium alginate immobilized fungal material, hydrothermal carbonized fungal biomass and functionalized magnetic mesoporous silica nanoparticles.

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