

Preparation of Composite Alginate/Perlite Beads for Pb (II) Removal in Aqueous Solution

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Abstract : Contamination of aqueous environment by heavy metal ions is a serious and complex problem, owing to their hazards to human being and ecological systems. The treatment methods utilized for removing metal ions from aqueous solution include membrane separation, ion exchange and chemical precipitation. However, these methods are limited by high operational cost. Recently, biobased beads are considered as promising biosorbent to remove heavy metal ions from water. The aim of present study was to characterize the alginate/perlite composite beads and to investigate the adsorption performance of obtained beads for removing Pb (II) from aqueous solution. Alginate beads were synthesized by ionic gelation methods and different amount of perlite (alginate:perlite=1, 2, 3, 4, 5 wt./wt.) was incorporated into alginate beads. Samples were characterized by means of X-ray diffraction (XRD), thermogravimetric analysis (TGA), scanning electron microscopy (SEM). The effects of perlite level, the initial concentration of Pb (II), initial pH value of Pb(II) solution and effect of contact time on the adsorption capacity of beads were investigated by using batch method. XRD analysis indicated that perlite includes silicon or silicon and aluminum bearing crystalline phase. The diffraction pattern of perlite containing beads is similar to that of perlite powder with reduced intensity. SEM analysis revealed that perlite was embedded into alginate polymer and SEM-EDX (Energy-Dispersive X-ray) showed that composite beads (alginate:perlite=1) composed of C (41.93 wt.%), O (43.64 wt.%), Na (10.20 wt.%), Al (0.74 wt.%), Si (2.72 wt.%) ve K (0.77 wt.%). According to TGA analysis, incorporation of perlite into beads significantly improved the thermal stability of the samples. Batch experiment indicated that optimum pH value for Pb (II) adsorption was found at pH=7 with 1 hour contact time. It was also found that the adsorption capacity of beads decreased with increases in perlite concentration. The results implied that alginate/perlite composite beads could be used as promising adsorbents for the removal of Pb (II) from wastewater. Acknowledgement: This study was supported by TUBITAK (Project No: 214Z146).

Keywords : alginate, adsorption, beads, perlite

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