

Kinetic and equilibrium modeling for the biosorption of metal ion by Zeolite 13X-Algal-Alginate Beads (ZABs)

ABSTRACT

The potential application of Zeolite 13X-Algal-Alginate Beads (ZABs) for copper biosorption was evaluated and compared with Blank-Alginate Beads (BABs) and Chlorella-Alginate Beads (CABs). Different process parameters were investigated including contact time, pH and initial metallic ion concentration. The findings indicated that the maximum biosorption capacity of ZABs was 85.88 mg/g biosorbent achieved at 180 min, pH 5 and initial metallic ion concentration of 150 mg/l whereas the maximum capacity of 70.02 and 77.32 mg/g biosorbent was obtained for BABs and CABs, respectively. ZABs showed higher stability than BABs and CABs in biosorption-desorption cycles. The kinetic and equilibrium data were analyzed via reaction/diffusion and Langmuir/Freundlich models, respectively. Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDX) and Fourier transform infrared spectroscopy (FTIR) indicated bonded metal ion to the ABs. Hence, this study confirmed an improvement in stability and biosorption capacity of microalgal-alginate beads.

Keyword: Zeolite 13X; Chlorella; Alginate beads; Biosorption; Kinetic and equilibrium modeling