



Effect of membrane surface charge on filtration of heavy metal ions in the presence and absence of polyethylenimine

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ABSTRACT

Polymer enhanced ultrafiltration (PEUF) was used to study the retention and flux of aqueous solutions of heavy metals. The metal ions investigated were: Cu^{2+} , Zn^{2+} , Ni^{2+} , Cr^{6+} , Co^{2+} and Cd^{2+} . For each metal solution, stirred dead-end ultrafiltration experiments were performed in the presence and absence of polyethylenimine (PEI) at different pHs. Addition of PEI significantly affected both the retention of the metal ions and the flux of the filtration process. In the absence of PEI, significant rejection of metals only occurred at higher pH values. This can be attributed to the formation of insoluble metal compounds (hydroxides) at pH 6 or greater. In the presence of PEI the retention was greater than the retention without PEI due to the formation of metal/polymer complexes. This retention was also sensitive to pH with higher values of retention at near neutral or slightly acidic conditions. Although a reduction of flux due to the addition of PEI was anticipated (the flux was reduced by about 50% when compared to the reference solution) the addition of small quantities of metals to the reference solution also significantly affected the flux. Membrane charge properties also play a significant role in the rejection and flux of the metal ion/polymer solutions.

Keywords: Polymer enhanced ultrafiltration; Metal retention; Flux; Membrane charge

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