Adsorption of Ni(II) by a polyvinylidene fluoride-type chelating membrane bearing poly(aminophosphonic acid) groups

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ABSTRACT

A polyvinylidene fluoride (PVDF)-type chelating membrane bearing poly(aminophosphonic acid) groups was fabricated and employed for the removal of Ni(II) from the solution. Effects of pH, initial Ni(II) concentration, temperature and contact time on the Ni(II) adsorption by this membrane were evaluated; also, effects of the coexisting Ca(II), Fe(III), Cd(II), Pb(II), citrate, nitrilotriacetic acid (NTA) and ethylenediaminetetraacetic acid (EDTA) were discussed. The adsorption kinetics and the adsorption isotherms of the membrane toward Ni(II) at the presence of abovementioned seven coexisting specimens were investigated. In addition, the breakthrough curves of the membrane were measured. The presence of coexisting cations and complexing reagents mentioned above reduced the Ni(II) uptake of the membrane. The negative effect of the four cations was in the order of Pb(II) > Cd(II) > Fe(III) > Ca(II); the interference of the three complexing reagents followed the sequence: EDTA > NTA > citrate. The Langmuir and the Lagergren second-order models were excellently competent for the descriptions in adsorption isotherms and adsorption kinetics of the membrane toward Ni(II). The adsorption of Ni(II) by the membrane was a spontaneous and exothermic process.

Keywords: Polyvinylidene fluoride-type chelating membrane; Nickel ion; Adsorption; Coexisting cation; Complexing reagent

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