

Polymer inclusion membranes with dinonylnaphthalene sulfonic acid as ion carrier for Co(II) transport from model solutions

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Received 12 April 2018; Accepted 7 December 2018

ABSTRACT

In this study, recovery of Co(II) from aqueous solution by polymer inclusion membrane (PIM) composed of dinonylnaphthalene sulfonic acid (DNNSA) as the ion carrier, plasticized with four different plasticizers, and cellulose triacetate as the polymeric base was investigated. The membrane composition and aqueous phase parameters were considered, respectively. Carrier concentration as an important parameter in the recovery efficiency was investigated and the membrane composed of 15%wt. of DNNSA was found as most efficient membrane forextraction of Co(II) ions. The study also included the effects of nature and concentration of plasticizers. Extraction across membranes plasticized with dioctyl adipate (DOA), dioctyl phthalate, triethyl phosphate, and tributyl phosphate were evaluated and the membrane plasticized with DOA (62%wt.) showed the maximum flux and extraction. Also, the aqueous phase parameters including the rate of mixing, initial ion concentration, pH of source phase, kind of receiving phase, receiving phase acid concentration were evaluated after studying membrane composition parameters. Then, extraction of cobalt across PIM was considered in a long life experiment to extract all content of heavy metal. The reproducibility of cobalt extraction was investigated by 10 replicate measurements. Finally, presence of nanoparticles in the PIM structure was considered as a new technique to modify the membrane extraction capacity. The results showed that SiO₂ and TiO₂ enhance the ion extraction 5.4% and 3.3%, respectively.

Keywords: Polymer inclusion membrane; Cobalt(II) separation; Dinonylnaphthalene sulfonic acid; Aqueous solutions; Nanoparticles

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