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A poly(vinylidene fluoride-co-hexafluoropropene) (PVDF-HFP)-based polymer inclusion membrane (PIM) containing LIX84I for the extraction and transport of Cu(II) from its ammonium sulfate/ammonia solutions

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Abstract

A comparison is made of the use of polymer inclusion membranes (PIMs) containing poly(vinyl chloride) (PVC), cellulose triacetate (CTA) or poly(vinylidene fluoride-co-hexafluoropropene) (PVDF-HFP) as the base-polymer, LIX84I as the carrier and 2-nitrophenyloctyl ether (NPOE) as the plasticizer for the extraction of Cu(II) from its ammonium sulfate/ammonia solutions at pH 8.5 and its transport within the membrane. The optimal PIM composition for each base-polymer was determined, and the results showed that the PIMs containing CTA or PVC had an oily surface after extraction unlike the PIMs with PVDF-HFP which were homogenous and with oil-free surfaces. This oily residue indicated to the loss of organic phase into the aqueous phase, as confirmed by Fourier transform infrared spectroscopy. Successive transport experiments were employed to study the stability of the PVDF-HFP-based PIM by evaluating the transport efficiency and the membrane mass change during each experiment. Relatively small membrane mass losses occurred during the extraction and back-extraction processes and the trace organic compounds lost from the PIM were identified using gas chromatography-mass spectrometry. The results obtained showed that the choice of base-polymer had a strong influence on the membrane stability, and that PVDF-HFP-based PIM exhibited superior stability and extraction rate compared to PIMs containing the other two base-polymers mentioned above.

Keywords: polymer inclusion membrane (PIM); LIX84I; poly(vinylidene fluoride-co-hexafluoropropene) (PVDF-HFP); Cu(II) extraction.

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