



Selective transport of Cu(II), Co(II), Cd(II) and Ni(II) ions through polymer inclusion membranes (PIMs) based on some amide derivatives of 4-amino-1,5-dimethyl-2-phenylpyrazolidin-3-one

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ABSTRACT

A new polymer inclusion membranes (PIMs) doped with amide derivatives of 4-amino-1,5-dimethyl-2-phenylpyrazolidin-3-one [*N*-(1,5-dimethyl-3-oxo-2-phenylpyrazolidin-4-yl)dodecanamide (*N*-PYDA), *N*-(1,5-dimethyl-3-oxo-2-phenylpyrazolidin-4-yl)tetradecanamide (*N*-PYTA), *N*-(1,5-dimethyl-3-oxo-2-phenylpyrazolidin-4-yl)palmitamide (*N*-PYPA) and *N*-(1,5-dimethyl-3-oxo-2-phenylpyrazolidin-4-yl)stearamide (*N*-PYSA)] as fixed carriers, cellulose triacetate (CTA) as base polymer and dioctyl phthalate as a plasticizer have been prepared. The studied carriers were prepared by the reaction of fatty acids (stearic, palmitic, myristic and lauric acid) with 4-amino-1,5-dimethyl-2-phenylpyrazolidin-3-one in the presence of *N,N'*-dicyclohexylcarbodiimide as dehydrating agent. The chemical structure of the prepared carriers was confirmed by Fourier transform infrared (FTIR) and nuclear magnetic resonance (¹H NMR), while the prepared membranes were characterized using different techniques such as FTIR, X-ray diffraction and scanning electron microscopy. The selective transport of Cu(II), Co(II), Cd(II) and Ni(II) ions through PIM was investigated and optimized as a function of transport time, pH, membrane composition, type of receiving phase and its concentration. Results showed that the alkyl chain length has an effect on the transport rate of Cu(II), Co(II), Cd(II) and Ni(II) ions through the CTA membranes. The obtained results show that around 90% of Cu(II) was transported from the source phase containing equimolar mixture of all metal ions at pH 5.2 through PIM after 7 h into 3.0 M HCl using carrier (*N*-PYSA). The best results of normalized initial flux and recovery are obtained for membranes containing 40% of all carriers.

Keywords: Polymer inclusion membrane; Dioctyl phthalate; Cellulose triacetate; *N,N'*-dicyclohexylcarbodiimide; Amide derivatives of pyrazolidin-3-one

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