SYNTHESIS AND CHARACTERISATION OF MULTILAYER POLYMER INCLUSION MEMBRANES: EFFECT OF THE CHEMICAL NATURE OF POLYMERS

Youcef Sedkaoui[1], Naima Abdellaoui[1], Omar AROUS[1], Hakim Lounici[1], and Anthony Szymczyk[1]

[1]Affiliation not available

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Abstract

The transport phenomena across polymeric membrane may be enhanced by applying various strengths inside or outside the system. Recently, polymer inclusion membrane (PIM) has been considered one of the most popular methods that acts as a sink for the contaminant and immobilizes it. In literature, there is no report about to achieve the synthesis of multi-layer PIMs. In this paper, an improvement of a novel category of membrane without carrier for performing ions separation was reported. Different membranes were elaborated from binary mixtures of polymers, cellulose triacetate (CTA), polymethyl methacrylate (PMMA) and polyvinyl chloride (PVC) using 2-Nitrophenyl octyle-ether (NPOE) as a plasticizer in order to increase specific interactions between the different polymers. The membranes (Polymer 1– Plasticizer – Polymer 2) were synthesized by phase inversion method modified by changing the procedure of a plasticizer addition and characterized by FTIR, XRD, TGA, SEM, zeta potential and contact angle. The CTA-based membranes exhibited well-defined pores completely filled with the second polymer and plasticizer (NPOE). Surfaces of all synthesized membranes were found to be smooth. The systems constituted by the mixture of (polymer 1 + plasticizer + polymer 2) did not give any diffraction. Overall, our results showed that the addition of the plasticizer resulted in homogeneous membranes with modified physical properties, such as thickness, and hydrophobicity. A study of transport of Pb(II) in (CTA+NPOE+PMMA), (CTA+NPOE+PVC) and (PMMA+NPOE+PVC) membranes was studied. Dialysis experiments of lead ions across a polymer inclusion membrane has shown that (CTA+NPOE+PMMA) and (PMMA+NPOE+PVC) membranes proved a good performance by fixing 12.15% and 25.31% of lead, respectively. These results confirm the affinity between a basic polymer (poly-methyl methacrylate) and the metallic ion (Pb2+).

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