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GREEN ULTRAFILTRATION MEMBRANES

Medina-Gonzalez Y., Remigy J. C.*

Laboratoire de Génie Chimique, Université Paul Sabatier, 118 Route de Narbonne, 31062

Toulouse Cedex

remigy@chimie.ups-tlse.fr

Abstract

As it is generally accepted, utilization of membranes have several advantages, nevertheless, fabrication of membranes is a process that is not as clean as it could be. In fact, polymeric membranes are currently fabricated by wet phase inversion. In this method, a solution of a polymer and a porogen is cast on a glass plate. The glass plate is then immersed into a coagulation bath. This coagulation bath consists in a non-solvent of the polymer; this non-solvent must be miscible with the polymer solvent. A polymeric porous membrane is then obtained. Depending on the polymer, solvents like NMP, DMF, DMSO acetone, cyclohexane, chloroform, etc are used. On this method, the solvent is currently lost during the manufacturing process: it is mixed with the non-solvent and sent directly to the wastewater treatment plant.

The aim of this work was the utilization of solvents derived from renewable resources, biodegradable and non VOCs to obtain membranes by a green way. Methyl-(s)-lactate has been used as solvent for cellulose acetate. LiCl and CaCl₂ were used as porogens and water was used as coagulation bath. These two salts are naturally present into sea or brackish waters and they have been used in this work as green porogens.

The membranes obtained were characterized using SEM (Scanning Electronic Microscope). Water permeability and molecular cut off were determined too. Different sizes of PEG (4,600-200,000 of Mw, Aldrich, France) were used for tests of molecular cut off [1].

CaCl₂ used as porogen, produced membranes with a “sponge like” structure; this structure is very appropriate to obtain pressure resistant membranes as our tests demonstrated, this membrane supported up to 5 bars, a smooth surface without defects was revealed on MEB observations. Membranes fabricated with LiCl as porogen presented vacuoles and probably some defects at the membrane surface. The obtained MWCO was from 15 to 35 kDa that lies on the ultrafiltration domain.

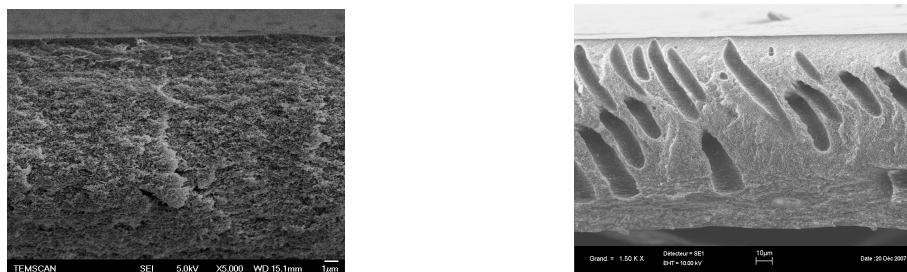


Fig 1 Membranes obtained by using (a) CaCl₂ and (b) LiCl as porogens

[1] C. Causserand, S. Rouaix, A. Akbari, P. Aimar, *J. Membr. Sci.* 238 (2004) 177–190.