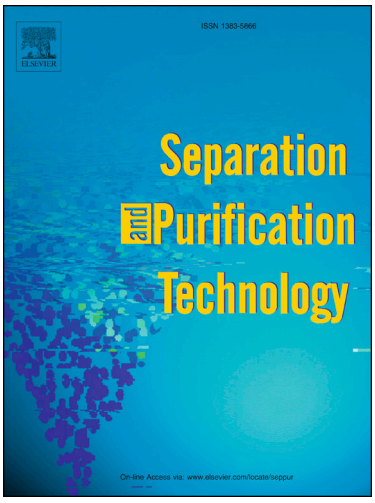

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Effect of cold plasma surface treatment on the properties of supported ionic liquid membranes

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Abstract

The aim of the work is to study the impact of the cold plasma treatment on the elaboration and stability of the supported ionic liquid membranes (SILMs). The porous support was prepared from Matrimid® 5218 by the water vapor induced phase inversion. The porous structure characterized by SEM showed a spongy, interconnected and relatively symmetrical structure with macropores ranging between 10 to 15 µm. A porous Matrimid® membrane was treated with either hydrophobic (CF_4) or hydrophilic (N_2 or O_2) plasma using a radio frequency discharge according to the optimum plasma parameters for each gas. The porous membrane was then impregnated with $[C_4C_1im][BF_4]$ and $[C_4C_1im][PF_6]$ using the direct immersion method. An acceleration of the room temperature ionic liquid (RTIL) impregnation in the case of N_2 and O_2 plasma treatments was observed due to both the grafted polar functions on the surface and the increase of surface roughness. On the other hand, the nonpolar surface functionalization after the CF_4 plasma treatment slowed and delayed the RTIL impregnation. The SILMs were composed of ~ 60 % of the RTIL phase, and no effect of the plasma treatments on the RTIL uptake mass was found. The bubble point method was used to evaluate the SILM stability. Although the bubble point pressure was independent of the plasma treatments, the retention of the RTIL phase inside the membrane was found to be improved.

Keywords: supported ionic liquid membrane, ionic liquid, cold plasma, surface treatment, bubble point method.

1. Introduction