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1-Methyl-3-octylimidazolium tetrafluoroborate/AgO nano-particles composite membranes for facilitated gas transport

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AgO nano-particles (NPs) were generated in ionic liquid 1-methyl-3-octylimidazolium tetrafluoroborate (Moim+BF 4 -). The formation of Ag NPs was attributable to the favorable interaction between the surface of particles and counter-anions of ionic liquid. The generated AgO nano-particles in Moim+BF 4 - were confirmed by TEM and the average size was 40nm. Coordinative interactions of AgO NPs with Moim+BF 4 - were investigated by FT-Raman spectroscopy. The prepared Moim+BF 4 - /Ag NPs composites were utilized for CO_2 separation membrane and consequently, CO_2 separation performance for composite membranes was improved compared with neat Moim+BF 4 - . The ideal selectivity for CO_2/N_2 was 23.4 with a CO_2 permeance of 18.7GPU was observed, while the neat Moim+BF 4 - membrane showed a selectivity of 15.9 and a CO_2 permeance of 12.7GPU.

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High permeable zeolite W membranes for CO_2/CH_4 separation: Synthesis and characterization

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In this paper, high permeable zeolite W membranes were synthesized for separation of CO_2 from CH_4. The effects of synthesis parameters (temperature, time and coating repetition) on permeability and selectivity of synthesized membranes were investigated. Experiments were carried out at three levels of synthesis temperature: 165, 185 and 200°C; synthesis time: 6, 12 and 18 h and two levels of coating: 1 and 2 layers. The CO_2 and CH_4 permeabilities versus synthesis temperature first decreased with increasing synthesis temperature from 165°C up to 185°C, then increased with further increasing the values of synthesis temperature. These permeabilities decreased with increasing synthesis time from 6 h up to 12 h and continued decreasing up to 18 h. In the case of CO_2/CH_4 selectivity, reverse trends were observed. This behavior was attributed to the dual effect of increasing synthesis temperature and time on membrane permeability and selectivity. Repetition of zeolite layer coating strongly increased membrane selectivity and decreased permeability for CO_2/CH_4 mixture. Zeolite layers were thickened and larger crystals were formed at higher synthesis temperatures and times. Formation of larger crystals accelerated the rate of zeolite layer integration, which was responsible for gas separation, in one hand and reduced the density of deposited zeolite layer on the support, due to void increase, on the other hand. Gas permeances through the membranes were in the range of 10-8 to 10-7 (mol/m_2 s Pa) which showed high permeable zeolite membranes were synthesized. In terms of maximizing the CO_2/CH_4 selectivity (=20.1), medium synthesis temperature with high synthesis time (185°C and 18 h) and two layer coating were selected. High permeable zeolite W membranes with moderate selectivity were successfully synthesized in this work. Hence, it can be used for the separation of CO_2 from CH_4 in commercial applications.

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