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Novel supported liquid membranes based on deep eutectic solvents for olefin-paraffin separation via facilitated transport

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Abstract

Deep eutectic solvents (DESs), as a new generation of designer solvents, were firstly employed to fabricate the supported liquid membranes (SLMs) for the olefin/paraffin separation via facilitated transport. The novel CuCl/DESs-SLMs were prepared by impregnating the mixture of choline chloride-glycerol based DESs and copper (I) chloride (CuCl) into the microporous nylon membranes. The results of FTIR, ^{1}HNMR and mass spectrometry (MS) confirmed the existence of various Cu (I)-containing anionic species and hydrogen-bond networks in the membrane liquid of CuCl/DESs. The CuCl/DESs-SLMs were characterized by scanning electron microscope (SEM), contact angle measurement and weight analysis, and their performances of CuCl/DESs-SLMs were evaluated by the C_2H_4/C_2H_6 separation experiments. The effects of DESs composition, CuCl concentration, operation pressure and temperature were investigated systemically. It was found that the activity and chemical stability of Cu (I)-containing anionic species were enhanced through the hydrogen-bond interactions between the anionic species and DESs, which significantly increased the permeability of C_2H_4 and selectivity of C_2H_4/C_2H_6. Compared with other studies, the CuCl/DESs-SLMs exhibited comparable permeability and higher selectivity up to 20 for C_2H_4/C_2H_6. In conclusion, the CuCl/DESs-SLMs provided a promising method for the C_2H_4/C_2H_6 separation.

Graphical abstract