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A facile preparation of novel positively charged MOF/chitosan nanofiltration membranes

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Abstract

A novel positively charged nanofiltration (NF) membrane was fabricated by incorporating metal-organic frameworks (MOFs) into chitosan polymeric matrix for enhanced removal of multivalent cations. The synthesized MOFs, NH₂-MIL-101(Al) and NH₂-MIL-101(Cr), could be homogeneously dispersed in the chitosan polymeric matrix. The morphologies of MOFs had a significant influence on the permeability of NF membranes. NF membrane filled with NH₂-MIL-101(Al) with rod-like structure attained two times higher flux but similar rejection compared with that filled with NH₂-MIL-101(Cr) with grainy structure. The effect of MOF loadings (NH₂-MIL-101(Al)) on the membrane performance were evaluated by XRD, FTIR and SEM. These positively charged MOF/chitosan NF membranes were able to reject up to 93.0% of MgCl₂, and the salt rejection followed the order of MgCl₂ > CaCl₂ > NaCl > Na₂SO₄.

Keywords

positive charge; nanofiltration; metal-organic frameworks (MOFs); morphology; chitosan

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