



Decorating a metal–organic framework UiO-66 layer on ceramics substrate by the seed-assisted solvothermal method for high-performance desalination

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ABSTRACT

UiO-66 is one kind of zirconium-based metal-organic framework, and $Zr_6O_4(OH)_4$ clusters are the cornerstones of the three-dimensional framework. To obtain enough strength for desalination, a dense continuous UiO-66 membrane was synthesized by the seed-assisted solvothermal synthesis method on the alumina substrate. The thickness of the dense UiO-66 membrane on the alumina substrate could be reduced to 1 μm . The thin layer achieved a high permeate flux of $0.344 \text{ L m}^{-2} \text{ h}^{-1} \mu\text{m}^{-1}$ with the ion rejections of Ca^{2+} and Mg^{2+} respectively reaching 82.1% and 98.2%. Such excellent performances were much better than those of reverse osmosis and nanofiltration membranes. Na^+ and K^+ could also be rejected by the UiO-66 membrane based on the ligand effect, whose ion rejections were 49.8% and 45.8%, respectively. Due to the exceptional chemical stability of UiO-66, no degradation of membrane performance was observed by test up to 180 h toward the saline solution. These results show that the UiO-66 membrane on the alumina substrate gives a good promise in the desalination application.

Keywords: Metal–organic framework; Porous ceramic membrane; Desalination

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