Organic–inorganic hybrid membrane with anodized aluminum oxide support layer for improving membrane performance in forward osmosis

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A B S T R A C T

In the development of thin-film composite membranes for forward osmosis, the support layer is believed to have a fundamental role, which affects the membrane performance. However, the development of the support layer containing a high surface porosity, straight morphology of pores, and hydrophilic surface has been limited. Here, we report an organic–inorganic hybrid membrane fabricated with an anodized aluminum oxide (AAO) filter as a support layer, which has a high surface porosity, straight pores (tortuosity ~1), and hydrophilic surface. The organic–inorganic hybrid membrane was fabricated by attaching a polyamide thin-selective layer on an AAO filter, which was coated with poly(dopamine). The polyamide thin-selective layer was separated from the polyamide–polysulfone traditional membrane by selectively melting the polysulfone support layer. The membrane performance of the fabricated hybrid membrane was significantly enhanced compared with that of the polyamide–polysulfone membrane because of the diminished salt resistivity by the high surface porosity, unity tortuosity, and surface chemistry of the support layer.

Keywords: Forward osmosis; Anodized aluminum oxide; Hybrid membrane

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