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Ceramic tubular nanofiltration membranes with tunable performances by atomic layer deposition and calcination

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Abstract

Ceramic nanofiltration (NF) membranes are of particular significance for molecular separations under harsh conditions. However, they are usually manufactured by the sol-gel process which frequently suffers from low efficiency and poor control in the membrane properties. Herein we demonstrate an efficient and more controllable strategy to produce ceramic tubular NF membranes based on atomic layer deposition (ALD). Tubular ceramic membranes with pore size of ~5 nm are used as the substrates, on which titanium alkoxide (titanicone) is ALD-deposited. Subsequent calcination in air degrades the organic moieties in titanicone, thus converting the dense layer of titanicone into a microporous layer of TiO₂. This microporous TiO₂ layer serves as a thin separation layer delivering the NF size-sieving function.

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