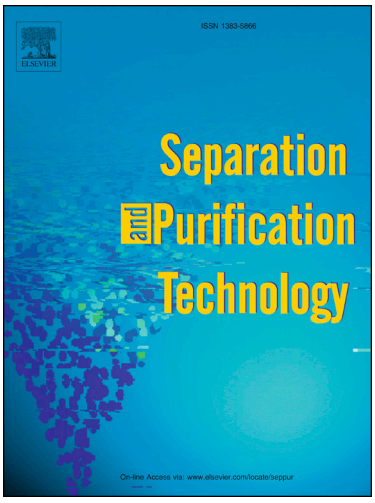

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One step co-sintering process for low-cost fly ash based ceramic microfiltration membrane in oil-in-water emulsion treatment

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Abstract

Ceramic membranes with higher chemical stabilities and organic solvent resistances are indispensable for water purification. The fabrication of low-cost ceramic membranes (lower sintering consumption and cheaper membrane materials) facilitates practical water treatment applications. In this study, a novel process for the fabrication of a low-cost fly ash based microfiltration (MF) membrane via a co-sintering process was proposed. In the novel process, the MF layer was sprayed on a "green" fly ash support and co-sintered. The mullite fibers with excellent heat resistance and stability were proposed to alleviate the shrinkage difference in the co-sintering process, and improve the porosity and bending strength of the support. The raw material cost, energy consumption, and preparation period of the ceramic membrane could be significantly reduced. The prepared ceramic MF membrane had an average pore size of 100 nm with a high permeability of 450 $Lm^{-2}h^{-1}bar^{-1}$. Moreover, it exhibited a high total organic carbon (TOC) removal efficiency (> 99%) for oil-in-water (O/W) emulsion, and a high stable permeability of 165 $Lm^{-2}h^{-1}bar^{-1}$ was maintained. This technique, combining low-cost materials and the co-sintering process, can serve as a cost-effective method for the production of high-performance ceramic membranes for water purification.

Key words: Ceramic membrane; Low-cost; Fly ash; Co-sintering technique; Water purification.