Development of ceramic membranes from low-cost clays for the separation of oil–water emulsion

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ABSTRACT

This work addresses the fabrication of ceramic microfiltration membranes by uniaxial dry compaction method. Four membranes, namely SP1, SP2, SP3, and SP4 were prepared with various compositions of fly ash and titanium dioxide (TiO2) followed by sintering at 1,100˚C. The raw materials and the prepared membranes were characterized by particle size distribution, X-ray diffraction and field emission scanning electron microscope, porosity, pore size, and chemical and mechanical stabilities. As the TiO2 content increases in the precursor formulations, the porosity and mechanical stability of the membranes also increase while the average pore size reduces from 2.97 to 1.32 μm. The chemical stability of all the membranes demonstrates to be better in both acidic and basic medium. The performance of the membrane (SP4) is examined for the separation of oil–water emulsion and the membrane exhibits a maximum oil rejection of 99.2%.

Keywords: Fly ash; TiO2; Ceramic membrane; Oil–water emulsion

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