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Optimization of ceramic membrane for oilwater separation

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ow cost flat ceramic membrane supports were prepared using kaolin as the major constituent with varying amounts of carbonates (calcium carbonate and sodium carbonate) and sintered at 900°C. The prepared supports were subjected to SEM, XRD, porosity tests and permeation analysis. The porosity of membranes was increased by increasing the amount of calcium carbonate. The supports prepared using calcium carbonate had wider pore size distribution on the surface than those prepared using sodium carbonate. Small amount (10%) of sodium carbonate acts as a pore modifier resulting in smaller mean pore size, while large amount (>20%) of sodium carbonate blocks the pores by forming a sodium silicate layer and results in nonporous support. The mean pore size and water permeability were in the range 0.3-0.8 µm and 78–1027 L/h.m².bar, respectively. Relatively higher porosity, permeability (due to large pores) and chemical stability were obtained for calcium carbonate membranes, whereas, higher pore density values (due to small pores) and mechanical strength were obtained for sodium carbonate membranes. Therefore, calcium carbonate should be preferred over sodium carbonate for preparing highly porous ceramic membranes. Results indicated that 20 wt% calcium carbonate and 10 wt% sodium carbonate are optimum in terms of porosity, mean pore-size and pore-density. A selected membrane was validated for microfiltration of oil-in-water emulsions. At a transmembrane pressure of 103 kPa, about 98% rejection of oil is achieved for the emulsion containing 200 mg/L of oil.

Biography

Harjot Kaur is working as Senior Research fellow and doing her PhD from Thapar University, India. She is working extensively in the field of membrane technology. Her area of specialization involves fabrication and characterization of low-cost ceramic membranes and polymer-ceramic composite membranes which can replace the need of the current nanofiltration and reverse osmosis technologies being used for treatment of wastewater. She has publications in international journals and have presented her research work in many national and international conferences.

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