Preparation and characterization of membrane supports for microfiltration and ultrafiltration using kaolin (DD2) and CaCO₃

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ABSTRACT

The ceramic products are extremely interesting in the field of the membrane supports because of their mechanical resistance, chemical inertia, long working life, and thermal stability. This work is mainly focussed on ceramic supports rather than its deposited membranes because it constitutes about 99% of the filter mass. Therefore, replacing the more expensive starting materials (Al₂O₃) by other low cost raw materials (kaolin and calcite) for supports fabrication is significantly important. Consequently, the supports for microfiltration (MF), ultrafiltration, and nanofiltration were prepared with local kaolin (DD2) and calcite mixtures. The choice of these raw materials is based on their natural abundance (low price). These supports were made by extrusion technique order to obtain tubular supports which were afterward sintered at 1,150°C for 2 h. It has been found that supports had interesting characteristics; an average pore size of about 4 μm, a porosity ratio around 50.5%, and a three-point flexural strength ≈28 MPa. Moreover, the pore size distribution was almost mono-modal type. The surface and the cross-section morphologies observed through a scanning electron microscope were also homogeneous and do not present any possible macro defects (cracks, etc.) These supports were selected to be substrates for the membrane layers used in MF.

Keywords: Kaolin; Calcite; Supports; Membranes; Microfiltration