



Preparation of low-cost ceramic membranes using Persian natural clay and their application for dye clarification

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ABSTRACT

Low-cost disk-shaped microfiltration membranes were fabricated through uniaxial dry compaction of Iranian natural clays under low pressing pressures (25–150 bar). Water flux, permeability and retention experiments were conducted using a dead-end setup at a low transverse pressure (0.1 bar) via controlling the fluid height above the membrane. Acid yellow 49, basic violet 16 and disperse red 167 dyes were considered for filtration as anionic, cationic and nonionic dyes, respectively. Filtration experiments showed that VI, VIII and IX membranes have the highest flux rate. Membrane IX pressed under 50 bar with 27% porosity and 2491.4 L·m⁻²·h⁻¹·bar⁻¹ permeability represented the highest retention; 98% anionic and 93% nonionic and no significant (~20%) cationic dye retention. Zeta potential analysis illustrated the negative membrane charge in dye solutions. Scanning electron microscopy (SEM) micrographs confirmed that the as-prepared porous crack-free membranes is suitable candidate for microfiltration applications. Moreover, the as-prepared membrane showed higher flux and lower shrinkage compared with the membrane fabricated using commercial montmorillonite (MMT). Based on the results, the low-pressure membranes fabricated using natural clays can be used for dye fractionation with almost no energy consumption.

Keywords: Microfiltration; Natural clay; Dye removal; Low pressure membrane

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