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The hydrodynamic effect of microparticles on membrane resistance

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ABSTRACT

The membrane technique of microfiltration (MF) was used to investigate the degree of reduction of the membrane resistance. The application of dolly-particles seems very beneficial for some MF processes with conventional equipment. A pile of Bakelite enhanced the local shear near the membrane surface. This phenomenon depends greatly on the components and properties of the feed suspension; the shear force is dependent on the radius and the amount of the particles. This approach has been successful in increasing fluxes of MF. The larger particles induce a much higher shear-induced diffusion and therefore dramatically improve mass transfer. Increasing size of the Bakelite particles could be associated with increasing flux. To prevent the fouling of MF membranes during the processing of chalk-dust solutions, a high degree of turbulence should be introduced in the membrane surface. The application of microparticles (Bakeliteas dolly-particles was investigated for this purpose. The experiments were carried out in MF/K1 equipment. The influence of the microparticles on the flux was investigated with a 0.45 μm tubular ceramic membrane. The size of the Bakelite particles used was 90–125 μm, 125–160 μm, 160–200 mm or 200–400 μm. It was concluded that in all cases the applied bakelite increased the permeate flux. Increasing size of the Bakelite particles was associated with an increasing flux. The largest Bakelite particles (200–400 μm) caused the highest fluxes and the smallest cake resistance (R_{Cake}) and total (R_T) resistance. This work has yielded new experimental results in an alternative approach for the reduction of fouling.

Keywords: Microfiltration; Microparticles; Shearing

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