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Synthesis of $BaSO_4$ nanoparticles with a membrane reactor: Parameter effects on membrane fouling

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Abstract

Membrane fouling exists in the preparation of nanoparticles with a membrane reactor. The effects of membrane molecular weight cut-off (MWCO), transmembrane pressure and reactants concentration on the membrane fouling, as well as fouling mechanism and membrane cleaning, were investigated with the preparation of $BaSO_4$ nanoparticles as a typical example. It was found that, the fouling degree at the entrance side of membrane module was lower than that at the exit side due to the different transmembrane pressure, permeation fluxes and boundary layer. At the same reaction degree, the reduction factor of permeation fluxes increased with the increasing membrane MWCO, transmembrane pressures, and reactants concentration. Two opposite processes, i.e. deposition and growth of nanoparticles on the membrane surface and the sweeping effects by the liquid, determined the membrane fouling. Ultrasonic cleaning displayed some effects on the recovery of permeation fluxes.

Key words: membrane reactor; synthesis; nanoparticles; membrane fouling; $BaSO_4$

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