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Comparison of 3DTA and VSEP systems during the ultrafiltration of sweet whey

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ABSTRACT

Whey, a side-product of the cheese-making and casein industry, is a nutritious protein source. The nutritional, biological and functional properties of whey proteins make them attractive and explain why an active whey industry has been developing over the last 30 years. The preconcentration of whey at its production site is the major field of application of membrane separation. The high salt content of whey (8–20% dry matter) gives rise to numerous processing difficulties, a low lactose crystallization rate, and fouling in microfiltration (MF) and ultrafiltration (UF) performed to produce whey protein concentrates. In order to improve UF performance, it is advisable to limit fouling of the membranes by selecting an appropriate flux or shear stress ratio [1]. In this study, the performance of a vibratory shear-enhanced processing system (VSEP) for the concentration of cheese whey was assessed and compared with a classical, cross-flow, plate and frame membrane configuration system (3DTA) with the same membrane (i.e. a C30F UF regenerated cellulose UF membrane with a 30 kDa molecular mass cut-off). The temperature and pressure dependences of the permeate flux, the permeate flux reduction ratio, the resistances and the rejection values were investigated. Comparison of the two systems revealed a definite advantage for the VSEP system equipped with the same membrane and operated at the same pressure and temperature. The flux reduction ratio (J/J0) was 0.60 vs. 0.42, and the total resistances 2.87×10^{13} m^{-1} vs. 4.54×10^{13} m^{-1} for the VSEP and 3DTA system, respectively.

Keywords: VSEP; Ultrafiltration; Whey

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