DEMINERALISED SKIM MILK CONCENTRATES BY MEANS OF DYNAMIC CROSS-FLOW MICROFILTRATION

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At ambient temperature and native pH of milk, approx. 66 % of milk containing calcium is bound onto the casein micelles (micellar calcium), whereas approx. 34 % is in the serum phase presented as free serum calcium (KOUTINA ET AL. 2014). In membrane filtration processes such as microfiltration (nominal pore size 0.1 µm), the casein fraction is retained so that micellar calcium is enriched in the retentate and is subsequently in the final product. Micellar calcium can be solubilised by reducing pH and/or temperature. This can be applied to reduce the calcium content of the retentate via membrane fractionation. However, under certain temperature and pH combinations, casein micelles change from sol to the gel state and an enhanced gel layer is built up on the membrane surface and flux decreases rapidly (BRANDSMA & RIZVI 1999).
We combined small amplitude oscillation shear rheology and photon correlation spectroscopy to examine the sol-gel-transition behaviour of pasteurised skim milk (protein content = 3.4 %) and microfiltrated (nominal pore size = 0.1 µm) skim milk retentates (protein content = 6 to 12 %) between pH 4.6 and 6.8 at temperatures ranging from 1 to 65 °C. The aim of this study was to predict pH-temperature-protein content combinations for membrane separation while maintaining adequate flux to get skim milk retentates with defined calcium content without macroscopic aggregated casein micelles. To proof the concept filtration experiments comparing appropriate and unappropriate pH-temperature combinations to get particle free calcium degraded skim milk retentates by means of a novel dynamic cross-microfiltration (nominal pore size: 0.06 and 0.2 µm) were carried out. Results will be shown and discussed.

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