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Experimental study of the ultrafiltration for bi-disperse silica systems

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ABSTRACT

The filtration rate in monodisperse colloidal systems has previously been predicted by taking into account the interactions between particles, interpreted in the form of an osmotic pressure. However, most membrane filtration applications deal with multi-component feeds, consisting of particles of different sizes. These polydisperse ultrafiltrations are poorly understood, largely due to the lack of adequate experimental data and the complexity of the system. These systems are also more difficult to interpret when compared to the single component feed systems. This work investigates the ultrafiltration of bi-disperse feed solutions of colloidal silica. Experimental studies were carried out on two different sized silica particles: X30 and W30. Feed solutions with a total silica concentration of 4 g l^{-1} were prepared. These solutions consisted of a 0.03M NaCl electrolyte with the following mixing ratio of X30:W30 by weight: (i) 100% X30, (ii) 100% W30, (iii) 20%:80% (iv) 40%:60%, (v) 60%:40% and (vi) 80%:20%. The solutions were filtered at an applied pressure of 200 kPa, through a 4 kDa molecular weight cut-off membrane. The permeate flux versus time data was recorded at pH's 4, 6 and 9. At each pH, the variation of the permeate flux was observed and compared to the two monodisperse systems.

Keywords: Ultrafiltration; Polydisperse; Colloidal Interactions; Modelling; Cake Resistance; Colloidal Silica

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