Modeling Nanofiltration: The Fundamentals and its Application in Softening and Pretreatment

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Abstract

The high selectivity of nanofiltration (NF) for multivalent ions has made it very attractive for scale-preventive softening and pretreatment applications. A better predictive capability of the separation efficacy of NF membranes, and what features govern this performance, however, is needed to facilitate predictive design for large-scale. Modeling NF membranes often poses a serious challenge given the variety of separation and transport mechanisms that influence the process. In this study, an overview of the fundamentals underlying the calibration of NF membranes models, based on the Donnan Steric Pore Model with Dielectric Exclusion (DSPME-DE), will be discussed. Experiments run on a recently developed low-pressure cross-linked layer-by-layer (LbL) NF membrane, and the results obtained from this first model of the membrane will be presented. Additional experiments run on hard water and artificial seawater will be considered to assess the membrane's potential for low-pressure softening and pretreatment.