Abstract Submitted
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Stochastic Modelling of Sieving in Membrane Filters with Complex Pore Morphology[1] BINAN GU, New Jersey Institute of Technology, PEJMAN SANAEI, New York Institute of Technology, LOU KONDIC, LINDA CUMMINGS, New Jersey Institute of Technology — Membrane filters have been widely used in industrial applications to remove contaminants and undesired impurities from the solvent. During the filtration process the membrane internal void area becomes fouled with impurities and as a consequence the filter performance deteriorates. In addition to the internal morphology of membrane filters, fouling mechanisms contribute to the complexity of the filtration process, in deterministic or stochastic ways. So far various models have been proposed to describe the membrane structure and stochasticity of particles flow individually but very few focus on both together. In this work, we present a model, in which a membrane consists of a series of bifurcating pores, which decrease in size as the membrane is traversed and particles are removed from the feed by adsorption within pores and sieving simultaneously. We derive a probabilistic formulation of the sieving process using a continuous-time Markov chain. Lastly, we discuss how filtration efficiency depends on the characteristics of the branching structure and show the coupling between the two fouling mechanisms.

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