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Stochastic approach to model fouling in membrane filters with complex pore morphology[1] PEJMAN SANAEI, New York University, BINAN GU, LOU KONDIC, LINDA J. CUMMINGS, New Jersey Institute of Technology — Membrane filters are widely used in industrial applications to remove contaminants and undesired impurities (particles) from a solvent. During the filtration process the membrane internal void area becomes fouled with impurities and as a consequence the filter performance deteriorates, a process that depends on filter internal structure, particle concentration and flow dynamics. The complexity of membrane internal morphology and the random nature of the particle dynamics in the flow make the filtration and fouling challenging to predict; nonetheless, mathematical modeling can play a key role in investigating filter fouling, and in suggesting design modifications for more efficient filtration. To date, many models have been proposed to describe the effects of complexity of membrane structure, and the stochasticity of particle dynamics individually but very few studies focus on both together. In this work, we present an idealized mathematical model, in which a membrane consists of a series of bifurcating pores. Pores decrease in size as the membrane is traversed and particles are removed from the feed by adsorption within pores (which shrinks them) and stochastic sieving (pore blocking by large particles).

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