Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Effects of particles diffusion and membrane pore elasticity on membrane filtration performance[1] PEJMAN SANAEI, New York Institute of Technology, SHI YUE LIU, ZHENGYI CHEN, New York University — Membrane filters fouling, which is an inevitable consequence of particle removal from the feed solution, is sensitive to the flow rate and the internal morphology and structure of membrane. In a very slow filtration process or during the late stage of filtration, when the flow is naturally very slow and P'eclet number is small, particle diffusion is essential and can not be neglected. Beside this, real membranes have complex geometry, and consist of a series of bifurcating elastic pores, which decrease in size as the membrane is traversed. In this talk, we introduce two first-principle models considering asymptotic analysis based on the membrane pores aspect ratio and a distinguished limit of the particle P'eclet number. We consider the effects of diffusion for a single membrane pore as well as elasticity in a membrane with branching structure on filtration performance. In the first model, pressure driven flow is considered through the pore and advection-diffusion equation for the particle concentration is coupled with novel fouling models. Furthermore, in the second model, we investigate the membrane pores evolution under two different forcing mechanisms (constant pressure and flux) and describe how the membrane internal morphology changes due to its fouling and elasticity.

[1]The authors gratefully acknowledge support from the following sources: P.S. from the NSF, RTG/DMS-1646339. Z.C., S.Y.L from the SURE offered by Courant Institute of Mathematical Sciences, New York University.

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Date submitted: 31 Jul 2019 Electronic form version 1.4