ID de Contribution: **55** Type: **Non spécifié**

Getting out of a tight spot: Cooperative unclogging of hydrogel particles in disordered porous media

lundi 23 juin 2025 11:40 (20 minutes)

The transport of deformable particulates through porous media underlies a broad range of processes in biomedicine, energy, and sustainability. Despite its ubiquity and importance, it is still not possible to predict —for a suspension of particulates of a given size, mechanical properties, and injection conditions in a porous medium of a given geometry — what the spatial distribution of particulates and changes in local flow rates will be. We address this gap in knowledge using network model simulations. Our results provide a way to connect the complex interplay between particle advection, pore occlusion, subsequent redirection of flow, and flow-induced particle deformation and squeezing through pores to the overall distribution of particles and flow rates. We uncover a surprising cooperative effect: adding more particles enables them to penetrate deeper into the medium. This phenomenon arises because individual particles redirect fluid to adjacent throats, forcing nearby particles through tight pores that they would otherwise clog. Altogether, these results help to establish a quantitative framework that connects microscopic particle mechanics to macroscopic transport behavior.

Auteurs: KAMATH, Sanjana (Department of Chemical and Biological Engineering, Princeton University, Princeton); TALON, Laurent (Lab. FAST); RAMASWAMY, Meera (Department of Chemical and Biological Engineering, Princeton University, Princeton); BROWNE, Christopher (Department of Chemical and Biomolecular Engineering, University of Pennsylvania); DATTA, Sujit (Division of Chemistry and Chemical Engineering, California Institute of Technology,)

Orateur: KAMATH, Sanjana (Department of Chemical and Biological Engineering, Princeton University, Princeton)

Classification de Session: Présentations