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**Colloidal Particle Flow through Porous Media: A Multiscale Study** NAVID BIZMARK, Princeton Institute for the Science and Technology of Materials, Princeton University, JOANNA SCHNEIDER, RODNEY PRIESTLEY, SUJIT DATTA, Department of Chemical and Biological Engineering, Princeton University — Colloidal particles hold promise for improved oil recovery and groundwater aquifer remediation. These applications rely on the transport of injected particles through a subsurface three-dimensional (3D) porous medium. However, this behavior is difficult to model due to diverse processes that may arise, including particle advection through the pore space by fluid flow, adsorption and deposition onto the solid matrix, and erosion or resuspension. Moreover, these processes are particularly difficult to study experimentally due to the opacity of typical 3D media. Here, we directly visualize the transport of colloidal particles in a model 3D porous medium using confocal microscopy. For the first time, we characterize the interplay between particle adsorption and erosion at the pore scale. Analysis of these pore-scale processes allows us to determine the net particle deposition rate, which enables us to predict the macroscopic net particle deposition profile. Our work thus demonstrates how pore-scale transport dynamics of colloidal particles can be controlled to achieve desired macroscopic goals with consequences for oil recovery, aquifer remediation, and other emerging applications.

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