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Flow Driven Transport of Soft Particles in Porous Media[1] SHUAIJUN LI, HONGHUI YU, JING FAN, City College of New York — Flow driven transport of soft particles in porous media occurs in many natural and engineering processes. For example, in preformed-particle-gel (PPG) treatment in oil recovery, microgels are injected into reservoirs for improved conformance. While the measurable properties in this process are at microscale, such as gel size, stiffness, and pore flow velocity, the macroscopic permeability directly correlates to the overall recovery efficiency. Therefore, it is desirable to find the quantitative relation between the macroscopic permeability and the relevant microscopic properties. In this work, we address this issue by equating total energy consumption with the sum of energy dissipation in the system. The viscous dissipation is obtained from Darcy's law. The frictional loss is determined by multiplying scaled gel sliding distance and the force exerted on one gel blocking a pore, which was derived in our previous study. We then obtain a differential equation with respect to pressure. The solution of the differential equation gives a quantitative relation between the total pressure drop and pore-scale properties. The work improves our understanding on transport of soft particles in porous media and directly benefits the relevant industrial applications.

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