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Drag force exerted on a confined porous aggregate GUILLAUME GROSJEAN, ALBAN SAURET, University of California, Santa Barbara — Cohesive particles flowing in tubings and microfluidic channels sometimes lead to the growth of aggregates of sizes comparable to the dimension of the channel. In this situation, the viscous force exerted on the aggregate is influenced both by the confinement and the permeability of the aggregate. In particular, for sufficiently large permeabilities, the drag force decreases significantly. We numerically consider the drag force exerted on a porous particle in a cylindrical tube and in a rectangular microchannel at small Reynolds number to determine how the combination of the confinement and the permeability modifies the drag of the aggregate. The Navier-Stokes equations for the fluid are coupled with the Darcy-Brinkman equations in the porous aggregate. We determine the drag force as a function of the Reynolds number, the confinement ratio, and the permeability of the aggregate. Using these numerical results, we provide empirical expressions of the evolution of the drag. The strong decrease of the drag force induced by the permeability and the confinement has important implications on the ability to transport and unclog a porous aggregate in a microchannel.

Guillaume Grosjean
University of California, Santa Barbara

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