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Motion of a Spherical Particle Near Porous Boundaries PHANI KANTH SANAGAVARAPU, PRABHU NOTT, Department of Chemical Engineering, Indian Institute of Science — The flow of suspensions near porous boundaries occur in many industrial processes and living systems. The questions that arise are, how do the permeability of the porous walls and the concomitant velocity slip affect the dynamics of individual particles, and the rheology of the suspension? Here we consider the motion of a single sphere near a plane permeable slab. We solve the Stokes equations using an eigenfunction expansion in the bi-spherical coordinate system. The boundary conditions at the porous wall are Darcys flux condition normal to the surface and Saffmans slip condition in the tangential direction. In addition, we impose the condition of zero net flux across the porous slab and obtain the non-zero pressure on the other side of the porous slab. The drag and torque on the particle moving near a porous wall are computed and compared with those obtained for an impermeable wall. We comment on the implications of our results on recent measurements of the suspension stress near porous boundaries.

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