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Tracer Diffusion for Rough Hard Spheres OLGA KRAVCHENKO, MARK THACHUK, UBC — We present a study of tracer diffusion in a rough sphere fluid. In such fluid collisions between particles exchange rotational and translational energy and momentum. As tracer particles grow in size, their diffusion constant is described by the Stokes-Einstein hydrodynamic result. In this limit, smooth hard spheres are shown to adopt "slip" boundary conditions. The current results show that rough hard spheres adopt boundary conditions proportional to their degree of roughness, defined by the radius of gyration. Spheres with maximum roughness adopt "stick" boundary conditions while those with intermediate roughness adopt values between the "slip" and "stick" limits. This dependence is found to be almost linear. Changes in the diffusion constants as a function of roughness are also examined and it is found that the dependence is stronger than suggested by the low-density, Boltzmann result. Rough hard spheres model the effect of inelasticity of a real collision and show that even without the presence of attractive forces, the boundary conditions for large particles can deviate from "slip" and approach "stick."

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