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Effects of hydrodynamic interaction on random adhesive loose packings of micron-sized particles WENWEI LIU, RAN TAO, SHENG CHEN, HUANG ZHANG, SHUIQING LI[1], Tsinghua Univ, KEY LABORATORY FOR THERMAL SCIENCE AND POWER ENGINEERING OF MINISTRY OF EDUCATION TEAM — Random loose packings of uniform spherical micron-sized particles under a uniform flow field are investigated via an adhesive discrete-element method with the two-way coupling of both the particles and the fluid. Characterized by a dimensionless adhesion parameter Ad, the packing fraction follows the similar law to that without fluid, but results in larger values due to the hydrodynamic compression. The total pressure drop through the packed bed increases with the packing fraction and agrees well with the theoretical predictions of Ergun function. The effects of different parameters, such as flow velocity, particle size and surface energy, on packing fraction and pressure drop take place through different ways, which can be associated with the local mechanical equilibrium in the presence of fluid.

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