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DEM Simulation of Particle Clogging in Fiber Filtration[1] RAN TAO, MENGMENG YANG, SHUIQING LI, Tsinghua Univ — The formation of porous particle deposits plays a crucial role in determining the efficiency of filtration process. In this work, an adhesive discrete element method (DEM), in combination with CFD, is developed to dynamically describe these porous deposit structures and the changed flow field between two parallel fibers under the periodic boundary conditions. For the first time, it is clarified that the structures of clogged particles are dependent on both the adhesion parameter (defined as the ratio of interparticle adhesion to particle inertia) and the Stokes number (as an index of impaction efficiency). The relationship between the pressure-drop gradient and the coordination number along the filtration time is explored, which can be used to quantitatively classify the different filtration regimes, i.e., clean filter stage, clogging stage and cake filtration stage. Finally, we investigate the influence of the fiber separation distance on the particle clogging behavior, which affects the collecting efficiency of the fibers significantly. The results suggest that changing the arrangement of fibers can improve the filter performance.

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Shuiqing Li
Tsinghua Univ

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