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Effects of Polarization and Charging on the Deposition of Fine Particles on a Cylindrical Fiber: Simulation and Experiments[1] SHUIQING LI, GUANQING LIU, MENGMENG YANG, Tsinghua University, JEFFREY MARSHALL, The University of Vermont — In this work, the particle deposition on a cylindrical fiber is investigated using a novel particle-level approach–discrete element method (DEM). The electrostatic effects, including both pre-charging and pre-polarization of fine particles, on the deposition patterns are discussed. Particularly, by this kind of method, a microscopic view on the depositions of neutral, polarized or charged particles is built, in which some basic finding are drawn. First, we find pre-polarization of fine particles enhances the deposition at nearly an order of magnitude; secondly, the charge of particle initially increases the deposition but finally inhibit it because of the repulsion between incident particles and deposited particles. A bench-scale set-up consisting of single fiber filtration system, particle charger, particle polarization unit and digital microscopy unit is built. The validation of DEM by experimental results is conducted.

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Shuiqing Li
Tsinghua University

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