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Discrete Element Modeling of Particle Transport by an Electric Curtain[1] JEFFREY MARSHALL, University of Vermont, GUANQING LIU, Tsinghua University — Particle transport by a planar electric curtain is studied with a discrete element method (DEM). The electric curtain is consists of four sets of parallel stripe electrodes embedded in an insulating material. The electrodes are connected to a four-phase square-wave AC source and produce a traveling wave above the curtain plate. Current work focuses on different modes of particle transport and associated operating conditions, which include particle relevant properties (size, charge, adhesive surface energy, air drag) and device relevant parameters (amplitude, frequency of applied AC voltage). Both Coulomb and dielectrophoretic forces on particles are considered. The electric field produced by the curtain is solved by a two-dimensional boundary element method (BEM). The computation is validated by comparison with experimental data for particle transport speed. A series of simulations are conducted to investigate the influence of different factors, demonstrating different modes of particle transport. The effect of air flow over the curtain on transport of levitated particles is examined. The particle motion is found to exhibit a wealth of interesting phenomena due to the complex and combined affects of different physical parameters and processes.

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