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Modeling Electrospray Deposition of Nanoparticle Inks AO LI, Binghamton Univ, JEFFERSON FIDELES DA SILVA, Murray State University at Murray, KY, XIN YONG, Binghamton Univ — Electrospray of nanoparticle inks is of great importance to the manufacturing of functional materials. In this study, we develop a new three-dimensional multiphysics method to model the electrospray of colloidal suspension to a flat substrate. The Lagrangian Particle Tracking (LPT) transport equation is coupled to mass and heat transfer using convective droplet vaporization model, which allow us to track each particle-laden ink droplets and dry nanoparticles in the electrospray plume and probe the deposit structures. Herein, we consider dilute inks that are experimentally relevant, assuming monodisperse nanoparticles. We characterize the overall statistics of the plume and the dynamics of individual ink droplet or dry nanoparticle. It is shown that the segregation effect affects not only primary and satellite droplets but also dry nanoparticles. We observe nanoparticles deposit structure changing process, in particular time evolution of the density profile along radial direction. Our results show that the region of high nanoparticle density transitioning from only the edge to both the edge and center, which agrees with previous experimental studies.

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