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Deposit Structure for Particle-laden Droplets Targeted by Electrospray[1] AREF GHAFOURI, TIMOTHY SINGLER, XIN YONG, PAUL CHIAROT, State University of New York at Binghamton — A hybrid printing technique that combines electrospray atomization with inkjet printing provides unique capabilities for exploring transport creating nanoparticle deposits with controlled structures. In this research, we use electrospray to deliver dry nanoparticles to the interface of particle-laden sessile droplets. Upon evaporation of the target sessile droplet, the particles at the interface are mapped to the underlying substrate. Particle locations in the final deposit were observed separately by tagging the particles dispersed inside the droplet and at its interface with different fluorophores. As expected, surfactant-free particles inside the target droplet were transported to its (pinned) contact line, creating a "coffee ring" morphology in the final deposit. The transport and final location of the interfacial particles was highly dependent on the presence of surfactant in the electrosprayed solution. If surfactant was present, the interfacial particles were transported to the apex of the target droplet, forming a dense region at the center of the final deposit. If the electrosprayed solution was surfactant-free, the transport of the interfacial particles was arrested and they were distributed uniformly across the final deposit. Similar deposit morphologies were found when experimenting with various surfactants, including Tween and sodium dodecyl sulfate. These results highlight the important of Marangoni flow in governing the final deposit structure for hybrid printing.

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