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Effect of contact angle and humidity on evaporation of inkjet-printed colloidal drops YING SUN, Drexel University, VADIM BROMBERG, SAILEE GAWANDE, TIMOTHY SINGLER, Binghamton University — Inkjet printing has attracted much attention in recent years due to its ability to dispense precise amounts of functional materials onto targeted areas. Although evidence exists for a multi-stage evaporation of a sessile drop, the actual evaporation behavior of an inkjetted colloidal drop is not well understood. In this study, a novel visualization technique is developed wherein aqueous suspensions of fluorescent particles are inkjetted onto transparent surfaces and the evaporation dynamics are observed in real-time using a high-power microscope. Two influencing parameters, the ambient humidity and substrate wettability, are systematically varied. It has been confirmed that jetted drops follow a *pinned*, *dewetting*, and *mixed* multi-stage evaporation process. The results also show that the relative humidity acts mainly to accelerate or decelerate the process whereas its relationship to contact angle is not as direct. Contact angle hysteresis plays an important role in controlling the initial pinned mode. For lower contact angle substrates, evaporation drives a flow of particles to deposit near the contact line which set the conditions for the dewetting stage that follows. Finally, a diffusion-controlled evaporation model is used to predict the time internals for each evaporation stage. The model agrees well with the experimental data, especially for the dewetting mode.

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