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Coalescence, evaporation and particle deposition of consecutively printed colloidal drops VIRAL CHHASATIA, XIN YANG, JAYMEEN SHAH, YING SUN, Dexel University — In applications such as inkjet printing and spray deposition, colloid drops are often used as building blocks for line and pattern printing where their interactions play important roles in determining the deposition morphology and properties. In this study, the particle deposition dynamics of two consecutively printed evaporating colloidal drops is examined using a fluorescence microscope and a synchronized side-view camera. The results show that the relaxation time of the water–air interface of the merged drop is shorter than that of a single drop impacting on a dry surface. It is also found that both morphology and particle distribution uniformity of the deposit change significantly with varying jetting delay and spatial spacing between two drops. As the drop spacing increases while keeping jetting delay constant, the circularity of the coalesced drop reduces. For the regime where the time scale for drop evaporation is comparable with the relaxation time scale for two drops to completely coalesce, the capillary flow induced by the local curvature variation of the air–water interface redistributes particles inside a merged drop, causing suppression of the coffee-ring effect for the case of a high jetting frequency while resulting in a region of particle accumulation in the middle of the merged drop at a low jetting frequency. By tuning the interplay of wetting, evaporation, capillary relaxation, and particle assembly, the deposition morphology of consecutively printed colloidal drops can be controlled.

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