

Abstract Submitted
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Dynamics of evaporative colloidal patterning¹ L. MAHADEVAN, C. NADIR KAPLAN, Harvard University, NING WU, Colorado School of Mines, SHREYAS MANDRE, Brown University, JOANNA AIZENBERG, Harvard University — Evaporating suspensions of colloidal particles lead to the formation of a variety of patterns, ranging from rings left behind a coffee drop to periodic bands or uniform solid films deposited on a substrate suspended vertically in a container of the colloidal solution. To characterize the transition between different types of patterns, we develop minimal models of the liquid meniscus deformation due to the evaporation and colloidal deposition. A complementary multiphase model allows us to investigate the detailed dynamics of patterning in a drying solvent. This approach couples the inhomogeneous evaporation at the evolving liquid-air interface to the dynamics inside the suspension, i.e. the liquid flow, local variations of the particle concentration, and the propagation of the deposition front where the solute forms a wet, incompressible porous medium at high concentrations. The results of our theory are in good agreement with direct observations.

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C. Nadir Kaplan
Harvard University

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