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Using fluid flow to control the structure of soluble surfactants deposited through receding contact lines. BENJAMIN BEPPLER, KALYANI VARANASI, STEPHEN GAROFF, KRISTINA WOODS, Carnegie-Mellon University, GUENNADI EVMENENKO, Northwestern University — Moving contact lines are often used to deposit soluble organic molecules in applications such as spin coating and dip coating. In this study, we demonstrate that altering the flow field near such a contact line fundamentally changes the deposited surfactant structure. At slow contact line speeds, the substrate emerges dry. The rolling fluid motion near the contact line deposits a densely packed, tilted monolayer of surfactant along the emerging solid-vapor interface. Above a critical contact line speed, an evaporating thin film is entrained on the emerging substrate. Surfactant concentration constantly increases in this confined environment due to solvent evaporation. Monodisperse crystalline islands nucleate and grow on the surface with sizes and shapes controlled by varying the deposition conditions. These results contrast with disordered deposits that result from evaporation at a pinned contact line. Our results suggest that dip-coating with control of dipping speed and evaporation rate produces unique assembled structures and may provide better control of deposition through moving contact lines.

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