Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Fluid Capture Patterns in Hairy Surfaces CHRISTOPHER USHAY, ETIENNE JAMBON-PUILLET, PIERRE-THOMAS BRUN, Princeton University — Interfacial flows past dense arrays of flexible hairs are highly coupled: capillary forces of the moving interface can be strong enough to deform fibres, which in turn modifies local flow geometry. As a result, the ability to drain a pre-existing layer of fluid over the deformable surface can significantly differ from the undeformed reference case. Here we fabricate hairy elastoporous media by casting a curing elastomer and mounting the arrays in a 1D Hele-Shaw cell. Upon displacing a defending phase of oil with water, elastocapillary bundling causes preferential invasion into certain pores at a regular interval. We characterize these patterns and then study pore drainage dynamics and bundle size as a function of capillary number **Ca**. Models for depth-averaged fluid flow and the deflection of elastic beams are adapted to our problem to describe the deformation of the host medium due to interfacial and viscous forces. These experiments are then upscaled to higher dimensions, where oil is displaced from a Hele-Shaw cell textured with a 2D carpet of fibres arranged in a lattice; we present results for oil drainage and pattern formation in both rectangular and radial geometries.

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Date submitted: 02 Aug 2020 Electronic form version 1.4