Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Dynamic Fracture in Drying Nanoparticle Suspensions ERIC R. DUFRESNE, Yale University, DANIEL J. STARK, L. MAHADEVAN, Harvard University, DAVID A. WEITZ, Harvard University — Minute concentrations of suspended particles can dramatically alter the behavior of a drying fluid. Most strikingly, drying suspensions can crack and buckle like elastic solids. We study the fracture of drying nanoparticle suspensions. Evenly-spaced cracks invade from the drying edge of thin films through intriguing intermittent jumps. We resolve individual jumps using high-speed video. While crack jumps within a single sample show a tremendous diversity of lengths and speeds, their scaled trajectories follow a single universal curve when scaled by the length and duration of the jump. The shape of the master curve is given by the coupling of the elastic deformation of the particle network to the flow of interstitial fluid. Scaling parameters are determined by the capillary forces driving fracture, the permeability of the colloidal medium and the geometry of the crack tip.

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Date submitted: 01 Dec 2004 Electronic form version 1.4