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**Elastically driven relaxation of a fluid-filled blister on a porous substrate**[1] DANIELLE L. CHASE, Princeton University, CHING-YAO LAI, Columbia University, HOWARD A. STONE, Princeton University — The relaxation dynamics of a fluid-filled blister between an adhered elastic sheet and a porous substrate are controlled by the deformation of the elastic sheet and the viscous stresses in the blister and in the pores. We present experiments where fluid is injected at the interface between a porous substrate and an adhered elastic sheet. First, fluid invades the pores and subsequently, the elastic sheet is peeled and uplifted from the substrate resulting in a fluid-filled blister. Further injection causes the fluid front in the pores and the fracture front of the blister to propagate radially. After injection is stopped, the fracture front is static, and the fluid front continues to advance into the pores as the elastic stresses of the overlying sheet drive drainage of the blister. We develop a mathematical model for the relaxation dynamics, and after rescaling experimental data with characteristic scales for time and blister volume, we find that experiments with varying permeabilities of the porous substrate and moduli of the elastic sheets collapse onto a universal curve. The model has been applied to the relaxation of surface uplift following the drainage of a supraglacial lake and is relevant in other contexts involving fluid-driven fracture in porous media.

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