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**Foam relaxation in fractures and narrow channels** CHING-YAO LAI, BHARGAV RALLABANDI, ANTONIO PERAZZO, HOWARD A. STONE, Princeton University — Various applications, from foam manufacturing to hydraulic fracturing with foams, involve pressure-driven flow of foams in narrow channels. We report a combined experimental and theoretical study of this problem accounting for the compressible nature of the foam. In particular, in our experiments the foam is initially compressed in one channel and then upon flow into a second channel the compressed foam relaxes as it moves. A plug flow is observed in the tube and the pressure at the entrance of the tube is higher than the exit. We measure the volume collected at the exit of the tube, V, as a function of injection flow rate, tube length and diameter. Two scaling behaviors for V as a function of time are observed depending on whether foam compression is important or not. Our work may relate to foam fracturing, which saves water usage in hydraulic fracturing, more efficient enhanced oil recovery via foam injection, and various materials manufacturing processes involving pressure-driven flow foams.

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