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Flow of foams in two-dimensional disordered porous media BENJAMIN DOLLET, BAUDOUIN GERAUD, SIAN A. JONES, Institut de Physique de Rennes, YVES MEHEUST, Geosciences Rennes, ISABELLE CANTAT, Institut de Physique de Rennes, INSTITUT DE PHYSIQUE DE RENNES TEAM, GEOSCIENCES RENNES TEAM — Liquid foams are a yield stress fluid with elastic properties. When a foam flow is confined by solid walls, viscous dissipation arises from the contact zones between soap films and walls, giving very peculiar friction laws. In particular, foams potentially invade narrow pores much more efficiently than Newtonian fluids, which is of great importance for enhanced oil recovery. To quantify this effect, we study experimentally flows of foam in a model two-dimensional porous medium, consisting of an assembly of circular obstacles placed randomly in a Hele-Shaw cell, and use image analysis to quantify foam flow at the local scale. We show that bubbles split as they flow through the porous medium, by a mechanism of film pinching during contact with an obstacle, yielding two daughter bubbles per split bubble. We quantify the evolution of the bubble size distribution as a function of the distance along the porous medium, the splitting probability as a function of bubble size, and the probability distribution function of the daughter bubbles. We propose an evolution equation to model this splitting phenomenon and compare it successfully to the experiments, showing how at long distance, the porous medium itself dictates the size distribution of the foam.

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