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Transition from solid-like to liquid-like rheological behavior in foam REINHARD HÖHLER, SÉBASTIEN VINCENT-BONNIEU, SYLVIE COHEN-ADDAD, Université de Marne-la-Vallée — Aqueous foams can pass from solid-like to liquid-like behaviour not only as a function of applied stress but also as a function of experimental time scale. This is demonstrated by our experiments with stable 3D foams that age only due to coarsening: When subjected for a long time to stresses well below the yield stress, these foams slowly creep like Maxwell fluids. We present 2D numerical simulations that provide detailed insight about the local bubble rearrangements at the origin of macroscopic flows. In the case of creep flow, rearrangements are induced by coarsening, whereas for plastic flow they are triggered by the applied shear. We show that elementary rearrangements involving 4 bubbles can be represented in a continuum model as force dipoles whose moment is determined by the length and orientation of the created bubble edge. Based on our simulations, we have constructed an analytical model that explains quantitatively the macroscopic creep flow. Concerning strain induced rearrangements, we discuss how a mesoscopic yield stress may be defined, in the aim of constructing a physical model of plastic flow.

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