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Wall effects in Stokes experiment with a liquid foam HAIJING GAO, Purdue University, HARIPRASAD SUBRAMANI, Chevron Corporation, MICHAEL HARRIS, OSMAN BASARAN, Purdue University — Liquid foams are widely used in numerous applications ranging from the oil and gas industry to beauty, healthcare, and household products industries. A fundamental understanding of the relationships between the properties of liquid foams and their flow responses is, however, still in its infancy compared to that involving the fluid dynamics of simple fluids. In this talk, the flow of a dry liquid foam around a spherical bead, i.e. the Stokes problem for liquid foams, is studied experimentally. In contrast to previous work (cf. Cantat 2006), the focus of the present research is to probe the effect of a solid wall that is located a few bubble radii from the bead. The new experimental results show that the elastic modulus of dry liquid foams is directly proportional to the surface tension of the foaming agents and inversely proportional to the average bubble size in the foams, in agreement with previous theoretical and experimental studies. The experiments further show that the close proximity of the solid wall causes profound structural changes to the gas bubbles as the foam flows past the bead. A good understanding of these structural changes and how they can affect the elastic modulus of foams can be indispensable in formulating improved models for accurately describing the dynamical response of foams within the realm of continuum mechanics.

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