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The Influence of Interfacial Block Copolymer on the buckling and drainage of an emulsion droplet approaching a flat surface DAMITH ROZAIRO, ANDREW B. CROLL, North Dakota State Univ — When a liquid droplet surrounded by a homogeneous fluid approaches a flat wall it can buckle and trap a thin layer of the surrounding fluid. The thin layer of trapped fluid slowly drains out, driven by the capillary forces which will eventually flatten the buckled droplet. The dynamics of these interactions are a critical stage of many industrial and biomedical applications. There is now a body of research surrounding the process and the effects of small surfactant molecules on thin film drainage. Long chain surfactants (block copolymers) are seeing increased use in emulsion stabilization, however, the unique effects of long polymer surfactants on simple hydrodynamic processes are often ignored. In this work we experimentally study how a self-assembled diblock copolymer interface on an emulsion drop influences the entrapment and subsequently drainage of surrounding fluid. Specifically, we investigate several different polystyrene-b-poly(ethylene oxide) (PS-PEO) molecules on toluene droplets in water as they approach an atomically flat mica surface. The film drainage rate is found to vary with the molecular weight of the PS-PEO molecules. Remarkably, we observe slower drainage rate for longer PEO chains, which can be understood with a simple hydrodynamic model.

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