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Triggered Release of Dispersed Microdroplets from Anisotropic Fluids YOUNG-KI KIM, XIAOGUANG WANG, EMRE BUKUSOGLU, PRANATI MONDKAR, NICHOLAS L. ABBOTT, Department of Chemical and Biological Engineering, University of Wisconsin-Madison — In contrast to isotropic fluids, molecules within nematic liquid crystals (NLCs) exhibit long-range orientational order (defined by a so-called director) that leads to elasticity. Micrometer-sized droplets dispersed in NLCs typically strain the director and generate topological defects. Consequently, microdroplets experience strong repulsive forces (elastic repulsion) near NLC interfaces, leading to their sequestration within the bulk of the phase. In this presentation, we will describe how the elasticity and phase behavior of NLCs can be used to trigger the escape of microdroplets. We will demonstrate that the release of sequestered microdroplets from NLC can be triggered by elastic repulsive forces that transport droplets ahead of an interface generated by nematic-isotropic phase transition. Alternatively, we will describe strategies to release microdroplets by tuning the elasticity of NLCs to permit buoyant or interfacial forces to override their sequestration. These mechanisms can be triggered both thermally and isothermally. Theoretical descriptions of these mechanisms establish their applicability to gas, liquid and solid microphases. These results hint at potential applications for drug delivery, sensors, and microfluidics.

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