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Studies of lipid vesicle mechanics using an optical fiber dual-beam trap[1] TESSA M. PINON, School of Engineering-University of California, Merced, LINDA S. HIRST, JAY E. SHARPING, School of Natural Sciences-University of California, Merced — Fiber-based optical traps can be used for manipulating micron-sized dielectric particles such as microspheres and biological cells. Here we study the mechanics of giant unilamellar vesicles (GUVs) which are held and stretched by light forces in a fiber-based dual-beam optical trap. Our GUVs are suspended in a buffer solution and encapsulate various concentrations and molecular weights of poly(ethylene glycol) (PEG) polymer yielding a range of refractive index contrasts and trapping conditions. We find that we can trap GUVs in solution with index contrasts of less than 0.01. We explore the mechanical response of the GUV membrane to a range of forces which are proportional to laser power and refractive index contrast. Our trapping system is a compact and inexpensive platform and trapping is viewed in real time under a microscope. We hypothesize that forces within the high-tension regime will induce a linear response in vesicle surface area. This project sets the stage for membrane mechanics and lipid phase change studies.

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