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Electrically-driven size separation of giant vesicles SIGOLENE LECUYER, OLIVIER VINCENT, WILLIAM D. RISTENPART, HOWARD A. STONE, Harvard University — Giant unilamellar lipid vesicles are widely used due to their potential as model systems in biophysics. The typical preparation method, electroformation, yields very polydisperse suspensions ($\simeq$1-100 μm). Giant vesicles are fragile and size separation is problematic. Here we present an electric field technique inside a microfluidic device to separate large vesicles from a polydisperse suspension. We establish that electrohydrodynamic (EHD) flows, of the sort known to induce aggregation of colloidal particles near electrodes [Trau et al., Science 272, 706, 1996], also act on vesicles; the competition between dipolar, EHD and gravitational effects leads for the latter to a complex aggregation process, of which main features are described. This results in large vesicles stacked on top of smaller ones. After adhering small vesicles, a gentle flow can be used to remove large ones. We measure the vesicle size distributions and demonstrate that the majority of small vesicles (of diameter $\leq$20 μm) is removed from a polydisperse suspension. We discuss how this versatile technique could be used to sort more complex systems and eventually be integrated in more advanced microfluidics devices.

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