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Electrophoresis of an emulsion droplet near an air-water interface

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Electrophoretic motion of a charged liquid droplet normal to an air-water interface is investigated theoretically in this study, motivated by the rapid development of various practical applications q involving micro/nano emulsions, as well as the fascinating potentials of using the air-water interface as a platform for the two-dimensional colloidal crystallization, for instance. Liquid emulsion droplet is widely involved in various colloidal applications in practice. With the fast advances in the development of microfluidic and nanofluidic devices in recent years, the tiny droplets there function as nearly ideal novel chemical reactors with various merits like high heat transfer rate and efficient mixing. The presence of an air-water interface is found to reduce the droplet mobility in general, especially when the double layer is thick or the particle is close to the interface, mainly due to the deformation of the double layer when it touches the interface. A counterclockwise vortex flow around the droplet pumps up the counterions originally in the wake to the front region. This significantly alleviates the motion-deterring polarization effect when the thickness of double layer is comparable to the emulsion droplet radius.

Biography

Shan-Chi Tsai is currently a PhD student under the guidance of Professor Eric Lee. She has published a journal paper in 2016.

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