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Electric field induced alignment and self-assembly of rods and ellipsoids on fluid-fluid interfaces MUHAMMAD JANJUA, SAI NUDURUPATI, IAN FISCHER, New Jersey Institute of Technology, NADINE AUBRY, Carnegie Mellon University, PUSHPENDRA SINGH, New Jersey Institute of Technology —
We show that an external electric field normal to a fluid-fluid interface can be used to align rods and ellipsoidal particles floating on a fluid-fluid interface, as well as to adjust the lattice spacing of a monolayer of these particles. A rod or ellipsoidal particle floating on a fluid-fluid interface experiences a lateral capillary force and a torque normal to the interface due to capillarity. In the presence of an electric field, it is also subjected to an electric force and torque. The lateral electric force affects the particles approach velocity and the torque aligns them parallel to each other. In the absence of an electric field, two rods (or two ellipsoidal particles) that are initially more than one rod length away from each other come in contact so that they are either perpendicular or parallel to the line joining their centers, depending on their initial orientations. Our experiments show that in an electric field of sufficiently large strength, only the latter arrangement is stable for rods. Ellipsoidal particles, on the other hand, align so that their major axes are parallel, but the line joining their centers makes a small angle with the major axis.

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