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Dielectrophoretic-driven deformations of free surface ISRAEL GABAY, Technion - Israel Institute of Technology, ANTONIO RAMOS, Universidad de Sevilla, AMIR GAT, MORAN BERCOVICI, Technion - Israel Institute of Technology — We present a theoretical model and experimental demonstration for the deformations of a thin liquid layer due to an electric field established by different electrode configurations. We model the spatial electric field created by the electrodes and use it to evaluate the force distribution on the interface through Maxwell's stresses. By coupling this force with the Young-Laplace equation, we obtain the deformation of the interface. These solutions serve as basic building blocks and allow us to explore the inverse problem where we seek the electrode structure and set of parameters which would yield a desired deformation. To validate our theory and demonstrate the feasibility of this mechanism, we designed an experimental setup which allows spatial dielectrophoretic actuation, while providing measurement of the microscale deformations. The system is based on microfabricated metal electrodes deposited on a glass substrate, which we cover with a thin film of oil prior to the application of the electric field. We use digital holographic microscopy to measure the induced deformations, showing highly localized deformations ranging from sub microns to tens of microns.

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