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Elastic deformations in a Hele-Shaw cell driven by local non-homogeneities of fluid properties SHIMON RUBIN, AMIR GAT, MORAN BERCOVICI, Technion Israel Institute of Technology — We consider a Hele-Shaw chamber with an elastic top plate, and study the effect of spatial variations in fluid properties on deformations of the plate. Specifically, we present analytical solutions for the pressure and depth-averaged flow field for axially-symmetric variations in slip velocity, viscosity, slip length, and channel height. We then focus on electroosmotic flow, which may be a practical method for obtaining gradients in slip velocity via non-uniform zeta-potential patterning of the surface. We derive an equation which relates elastic deformations of a Kirchhoff-Love plate to gradients in zeta potential, and obtain an analytical solution for the zeta potential distribution which gives rise to a local Gaussian deformation. Owing to the fact that any surface can be represented by superposition of Gaussians, we are thus able to determine the zeta potential necessary for creation of arbitrary deformations.

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