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A Diffuse Interface Model for Electrowetting Droplets In a Hele-Shaw Cell HSIANG-WEI LU, Department of Mechanical and Aerospace Engineering, UCLA, GLASNER KARL, Department of Mathenatics, University of Arizona, ANDREA BERTOZZI, Department of Mathematics, UCLA, CHANG-JIN KIM, Department of Mechanical and Aerospace Engineering, UCLA — Electrowetting has recently been explored as a mechanism for moving small amounts of fluid in confined spaces. We propose a diffuse interface model for droplet motion, due to electrowetting, in Hele-Shaw geometry. In the limit of small interface thickness, asymptotic analysis shows the model is equivalent to Hele-Shaw flow with a voltage-modified Young-Laplace boundary condition on the free surface. We show that details of the contact angle significantly affect the timescale of motion in the model. We measure receding and advancing contact angles in the experiments and derive their influences through a reduced order model. These measurements suggest a range of timescales in the Hele-Shaw model which include those observed in the experiment. The shape dynamics and topology changes in the model agree well with the experiment, down to the length scale of the diuse interface thickness.

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