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Stretching liquid bridges with moving contact lines: Comparison of model predictions and experiments CHUNG-HSUAN HUANG, University of Minnesota, MARCIO CARVALHO, PUC-Rio, SATISH KUMAR, University of Minnesota — Transfer of liquid from one surface to another plays a key role in printing processes. During liquid transfer, a liquid bridge is formed and then undergoes significant extensional motion while its contact lines are free to move on the bounding solid surfaces. In this work, we develop slender-jet and finite-element models of this phenomenon and compare the resulting predictions with experimental data. For very low capillary numbers (quasi-static stretching), predictions from both models agree well with the experimental data. For O(1) capillary numbers, the models predict that each surface receives half the liquid, in agreement with experimental observations. For intermediate values of the capillary number, predictions from each model can deviate substantially from each other and from the experimental data due to deviations between the predicted and the observed contact-line motion. The models are also used to understand the influence of initial bridge shape on liquid transfer and to rationalize experimental observations. The results from these fundamental studies will aid the optimization of gravure and other printing processes for manufacturing of printed electronic devices.

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