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Dynamic contact angle under unfavorable viscosity contrast.
BAUYRZHAN PRIMKULOV, JANE Y. Y. CHUI, Massachusetts Institute of Technology, AMIR A. PAHLAVAN, Princeton University, RUBEN JUANES, Massachusetts Institute of Technology — The current view of dynamic contact angle is encapsulated in the seminal experiments of Hoffman from the 1970s. He displaced air with a viscous liquid inside a capillary tube. By varying the wetting properties of the liquid and the liquid's viscosity and injection rate, he determined a relation between the dynamic contact angle and the static contact angle, now known as Cox-Voinov relation. Very little is known, however, about the dynamics of the contact line in the reverse scenario: when a more viscous liquid is displaced by a less viscous fluid. We fill this gap with a series of experiments in capillary tubes, and analyze theoretically the striking deviation from the Cox-Voinov relation. Finally, we point out several practical applications, from spin-coating of capillary tubes to fluid displacement in porous media.

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