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Film formation in a vertical Hele-Shaw cell THOMAS WARD, Iowa State University, Department of Aerospace Engineering, ERIC FINLEY, North Carolina State University, DEON WILKINS, Bethune-Cookman University, MICHAEL SULLIVAN, North Carolina State University — A Hele-Shaw cell containing silicone oil is initially displaced in the vertical direction using electrical forces and capillary pressure. Once the equilibrium height is reached, electrical actuation is halted and the system moves to a new equilibrium height based on capillary and hydrostatic forces. Here, the focus is on film formation from the oil to the boundary walls of the Hele-Shaw cell. A theoretical model is used to predict silicone oil/air interface speed. The theory is also compared with experimental data. The resulting differences between predicted equilibrium heights based on theory and actual experimental equilibrium heights are used to predict the thickness of any resulting oil film on the walls which increases the capillary pressure. Plate separation distances of 300, 500, and 750 micrometers are used with silicone oil viscosities of 10, 100 and 1000 cSt to determine the effect of these parameters on film formation. A variety of initial heights are also used to determine how the initial rise height affects film formation as well. By varying these parameters, a wide range of Reynolds and capillary numbers are examined and their corresponding effect on film formation is determined.

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