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Effects of surface wettability and edge geometry on drop motion through an orifice[1] ANKUR BORDOLOI, ELLEN LONGMIRE, Aerospace Engineering and Mechanics, University of Minnesota — In geothermal energy recovery and CO_2 sequestration, drops move through a porous structure by displacing a surrounding liquid. Both the pore geometry and surface wettability influence the drop motion. We simplify the pore structure to a thin plate with a circular orifice. The plate is held horizontally inside a rectangular tank filled with silicone oil. Drops of water/glycerin with Bond numbers (Bo) of 1-10 are released above and axisymmetric to the orifice, encountering the plate after reaching their terminal speed. We use high speed imaging to examine the effects of orifice-to-drop diameter ratio (d/D), orifice surface wettability (hydrophilic/hydrophobic) and edge geometry on the passage of drop fluid through the orifice. We generate regime maps for d/D and Bo delineating domains of drop capture, passage, and passage with breakup. For d/D < 1, sharp edges are observed to yield contact between the drop and orifice so that surface wettability influences the subsequent dynamics. On the other hand, rounded edges appear to prevent direct contact so that the dynamics are unaffected by the surface wettability.

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