

Abstract Submitted  
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**Primary and Secondary Spread of Wetting Droplet into Porous Medium** B. MARKICEVIC, H.K. NAVAZ, Kettering University — The spread of the wetting droplet into the porous medium is a two-step process where these two steps are referred as primary and secondary droplet spread. In the primary spread there is a free liquid present at the porous medium surface. The spread does not stop once all fluid from the surface is spread into porous medium, but it continues as a secondary spread due to the local medium heterogeneities that cause the gradient in the capillary pressure and liquid saturation. For both spreads, a capillary network model based on the micro-force balance is developed. The primary spread starts as single-phase (fully saturated), and as the liquid flows further into porous medium the multiphase flow can develop. As the spread progresses, the interface becomes irregular in shape and the immobile clusters of the originally present phase can be formed due to the entrapment. Besides the clusters of the originally present phase, regions filled with liquid phase at the interface can detach from the droplet main body forming insulated fluid ganglia. The secondary spread further increases the interface irregularity that causes the clusters of originally present phase to open and promotes ganglia formation. This leads to the reduction in ganglia size, and the liquid ganglia become immobile and the secondary spread is terminated. Finally, these are dynamic processes and the separation and coalescence of the fluid ganglia is governed with the force balance at the interface.

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