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Phase Change Effects on Immiscible Flow Displacements in Radial Injection MAJID AHMADLOUYDARAB, JALEL AZAIEZ, ZHANGXIN CHEN, university of Calgary — We report a systematic simulation of immiscible fluid-fluid displacements in radial injection in the presence of phase change. Due to the presence of two fluid-fluid interfaces in the system, a special treatment has been adopted. To track the leading interface position, two highly accurate methods including *Level Set* and *Immersed Interface Method* were used, while for locating the trailing interface an energy equation was adopted assuming the existence of a constant thin condensate layer. Dimensional analysis led to three important dimensionless groups including capillary number (Ca), Jacob number (Ja) and viscosity ratios (M) of the three fluids. Simulation results indicate significant influences of these parameters on the development of the instability and the interfacial morphology of fingers. Increasing Ca or M tends to amplify the interfacial instability, fingertip splitting, and results in longer fingers. In contrast, increasing Ja has stabilizing effects due to an increase of the thickness of the condensate layer. On the other hand at lower viscosity ratios as well as lower Ca, because of compensation effects of the phase change, both leading and trailing interfaces are found to be less unstable. Moreover accumulated condensate and oil saturation depletion curves show increasing and decreasing trends, respectively, when the Ca increases. Although viscosity ratio and Ja have similar effects on the accumulated condensate, they do not show any effect on the oil depletion saturation.

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