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Evolution of a liquid-liquid interface through a symmetric pore doublet model.[1] JONATHAN SILES GARNER, ANCHAL SAREEN, ELLEN LONGMIRE, University of Minnesota — In applications such as oil recovery, diagnostics and printing, the displacement of one liquid from a porous medium is often achieved by injecting another liquid. In these situations, it is typically desired to minimize entrapment of the receding fluid in the pores. In this study, we investigate experimentally the liquid entrapment process as the liquid-liquid interface evolves through a quasi-two-dimensional pore doublet model. Experiments are performed for various Weber numbers (We) of the invading liquid for three flow geometries. The entrapped volume was found to increase significantly with increasing Weber number of the invading fluid. Beyond a 'critical' We, when the inertia of the invading non-wetting liquid is high compared to the surface tension of the interface, the non-wetting liquid pierces through the pockets of the entrapped receding liquid leading to 'instability'. It was also found that the entrapped volume can be reduced significantly by making the trailing edge of posts pointed. This geometry also delays the interface 'instability' to higher We. Effects of the fluid viscosity ratio and We number of the invading fluid will be discussed in detail for three post geometries.

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