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Particle-induced viscous fingering FENG XU, DILLON STRACK, Texas A&M University, GRACE FOMANI, Tuskegee Institute, CELINA LOPEZ, University of Texas at El Paso, SUNGYON LEE, Texas A&M University — A novel fingering instability is experimentally observed when a mixture of particles and viscous oil is injected radially into a Hele-Shaw cell. According to the Saffman-Taylor theory, the equivalent configuration without particles exhibits no fingering. To characterize this particle-induced instability, a series of experiments are conducted with varying particle volume fractions, flow rates, and gap thicknesses. The experimental results show that the onset of finering is most directly affected by the particle volume fraction: the interface is stable when the particle concentration is lower than 10% and becomes unstable with more pronouced fingering patterns with an increasing concentration. The interfacial instability is accompanied by regularized clusters of particles inside the displacing phase, each of which corresponds to a finger. Based on the key observations, we discuss the physical mechanism that drives the instablity.

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