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Effect of transient interfacial tension on miscible viscous fingering[1] MANORANJAN MISHRA, SATYAJIT PRAMANIK, Indian Institute of Ropar, India — The pressure-driven displacement flow of a more viscous fluid by a less viscous one is an unstable configuration in the context of miscible viscous fingering in porous media. Steep concentration, density or temperature gradient at the interface of the underlying fluids gives rise to a nonconventional stress in the system, which causes an effective or transient interfacial tension. Such tension has been incorporated using Korteweg stresses in the momentum equation. The system has been modeled by coupling the continuity and Darcy-Korteweg equations with the convection-diffusion equation for the evolution of the solvent concentration. We have shown by a numerical simulation based on Fourier-spectral method that such system can remain stable for a comparatively longer initial transient period. This delay on the onset of instability is due to transient interfacial tension acting at the miscible diffusive interface. The results show that increasing the strength of the stress the onset of instability can be delayed significantly. However, the system may or may not become completely stable depending upon the configuration of the displaced fluid. Linear stability analysis of such system having two semi-infinite fluids and with a finite slice of fluid has been also investigated.

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