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Buoyancy driven flows in porous media: Effect of chemical reactions and transverse velocities S. HOSSEIN HEJAZI, JALEL AZAIEZ, University of Calgary — Density or viscosity mismatch among different solutions in porous media may result in interfacial instability. Many underground reservoir flow processes such as in-situ upgrading of heavy oil, in-situ water remediation and geological storage of carbon dioxide involve chemical reactions and natural transverse flows. As a result, further complicated hydrodynamical instabilities may be encountered. In this study, a $2D$ vertical porous medium saturated with a reactant A placed at the top of another reactant B is considered where a chemical product C is formed. All chemical components are assumed to have different physical properties namely the density and the viscosity. Moreover, a transverse flow is introduced parallel to the initial reactant interface. In the limit of small times the stability characteristics of the flow are examined. Thereafter, the evolutions of unstable modes are analyzed by conducting full nonlinear simulations. Chemical production concentration isosurfaces are tracked and analyzed in time. A quantitative analysis is performed in terms of the total amount of chemical product. A physical discussion on how fluid reactivity and presence of transverse flows can affect the fate of hydrodynamical instabilities is presented.

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