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Buoyant miscible displacement flow of shear-thinning fluids: Experiments and Simulations[1] SEYED ALI ALE ETRATI KHOSROSHAHI, IAN FRIGAARD, Univ of British Columbia — We study displacement flow of two miscible fluids with density and viscosity contrast in an inclined pipe. Our focus is mainly on displacements where transverse mixing is not significant and thus a two-layer, stratified flow develops. Our experiments are carried out in a long pipe, covering a wide range of flow-rates, inclination angles and viscosity ratios. Density and viscosity contrasts are achieved by adding Glycerol and Xanthan gum to water, respectively. At each angle, flow rate and viscosity ratio are varied and density contrast is fixed. We identify and map different flow regimes, instabilities and front dynamics based on Fr, $Re/Fr\cos\beta$ and viscosity ratio m. The problem is also studied numerically to get a better insight into the flow structure and shear-thinning effects. Numerical simulations are completed using OpenFOAM in both pipe and channel geometries and are compared against the experiments.

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