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**Numerical simulations of two-fluid channel flow with wall deposition and ageing effects**[1] DANIELE SILERI, Imperial College London, HANG DING, University of California, Santa Barbara, OMAR MATAR, Imperial College London — We study the dynamics of two immiscible fluids with a high viscosity contrast in pressure-driven channel flow using direct numerical simulations at moderate Reynolds numbers. The equations of mass, momentum and energy conservation in both fluids are solved using a procedure based on the diffuse interface method. A Cahn-Hilliard equation is also solved for the volume fraction. Numerical solutions are obtained subject to no-slip and no-penetration conditions at the walls, and constant flow rate conditions at the channel inlet; outflow conditions are imposed at the outlet. This model accounts for a thermal instability in the bulk, through a chemical equilibrium model based on the Gibbs free energy, which leads to the formation of the highly viscous phase and its deposition at the channel walls. We also account for the evolution of the rheology of the deposited phase through "ageing." We present results showing typical flow dynamics and the effect of system parameters on the average deposit thickness.

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