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The Role of Interfacial Materials in Wetting Phase Drainage from Dead-End Pores[1] MARIO CORDOVA GONZALEZ, HOSSEIN HEJAZI, Department of Chemical and Petroleum Engineering, University of Calgary — Immiscible displacement in porous media is found in many engineering and natural processes including oil production from underground reservoirs. Mobilization of a trapped fluid from cavity-like configurations in porous rocks is minimized due to geometrical restriction. The addition of interfacial materials in the form of colloidal particles in the main flow stream may generate interfacial inhomogeneities and accelerate the residual fluid motion. We present a scenario in which suspended particles in a carrier solution bypass a series of saturated cavities. We employ microfluidic chips consisting of dead-end pores connected to a main channel. We use mineral oil as the wetting phase and dispersions of silica nanoparticles as the displacing fluids. We capture 3D images of the wetting phase drainage from the cavity space using confocal laser microscopy and track the velocity field on the trapped fluid using a micro-PIV system. The rate of the meniscus invasion inside the cavity is considerably altered in the presence of surface-active particles where the oil mobilization could be related to the spontaneous emulsification at the imposed shear rate. Understanding different mechanisms yielding motion of a stagnant phase is critical in many fluid displacement systems.

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Mario Cordova Gonzalez
Department of Chemical and Petroleum Engineering, University of Calgary

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