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Colloid mobilization by displacement fluid fronts in porous media

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Passage of imbibition or drainage fronts through porous media involves considerable energy dissipation at the front due to pinning and release of interfaces and rapid pore emptying or filling. The abrupt interfacial jumps and pressure bursts at the front may entrain colloidal particles that otherwise would not be mobilize by the subsequent steady flows forming ahead or behind a passing front. We conducted controlled displacement experiments in sintered glass beads Hele-Shaw cells and observed motion of interfaces and colloids using high speed camera (>1000 frames/s). Systematic variation of flow regime, interfacial properties and ionic strength enable separation of interfacial and viscous colloid mobilization. Theoretical predictions of forces acting on colloids under steady shear and during inertial contact line sweeping a surface will be presented.