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**Osmosis-driven viscous fingering of oil-in-water emulsions** YING LIU, BHARGAV RALLABANDI, MRUDHULA BASKARAN, HOWARD STONE, Princeton Univ — Viscous fingering occurs when a low viscosity fluid invades a more viscous fluid. Fingering of two miscible fluids is more complicated than that of immiscible fluids in that there is no sharp fluid-fluid interface and diffusion occurs between the phases. We experimentally studied the fingering of two miscible fluids: an oil-in-water emulsion and a sodium chloride solution. When the concentration of sodium chloride in the water phase in the emulsion exceeds that in the sodium chloride solution, the consequent osmotic flow automatically facilitates the occurrence of the fingering. On the contrary, when the sodium chloride solution has higher concentration, the spreading of emulsion is more uniform than the case without the concentration difference. We provide a model to rationalize and quantify these observations.

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