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Spiral viscous fingering. YUICHIRO NAGATSU, ATSUSHI HAYASHI, YOSHIHITO KATO, YUTAKA TADA, Department of Material Engineering, Graduate School of Engineering, Nagoya Institute of Technology — When a less-viscous fluid displaces a more-viscous fluid in a radial Hele-Shaw cell, viscous fingering pattern is believed to develop in a radial direction. We performed experiments on viscous fingering in a radial Hele-Shaw cell when a polymer solution, a sodium polyacrylate (SPA) solution is used as the more-viscous fluid and the trivalent iron (Fe^{3+}) solution is as the less-viscous fluid. The experiment was done by varying the concentration of Fe^{3+}, c_{Fe3+}. We have found that viscous fingering pattern develops spirally when c_{Fe3+} is larger than a threshold value, while the pattern develops in a radial direction for small c_{Fe3+}. We confirmed from different experiments that an instantaneous chemical reaction takes place between SPA solution and Fe^{3+} solution. The chemical reaction produces precipitation and significantly reduces the viscosity of the SPA solution. The quantity of the precipitation is increased with c_{Fe3+}. We will make a discussion on the relationship between the formation of spiral viscous fingering and the chemical reaction taking place between the two fluids.

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