Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Spiral pattern in a radial displacement in a Hele-Shaw cell
MITSUMASA BAN, YUICHIRO NAGATSU, ATSUSHI HAYASHI, YOSHIHIRO KATO, YUTAKA TADA, Nagoya Institute of Technology — When a reactive and miscible less-viscous liquid displaces a more-viscous liquid in a Hele-Shaw cell, reactive miscible viscous fingering takes place. We have experimentally shown that the pattern created by the displacement of a more-viscous fluid by a less-viscous one in a radial Hele-Shaw cell develops not radially but spirally when a more-viscous sodium polyacrylate solution is displaced by a less-viscous trivalent iron ion (Fe^{3+}) solution with a sufficiently high concentration of Fe^{3+}. Another experiment in order to investigate the mechanism of spiral pattern formation revealed that an instantaneous chemical reaction takes place between the two fluids and at high Fe^{3+} concentrations it produces a film of the gel at the contact plane. The gel is formed by three-dimensional network structures between the polyacrylate solution and the trivalent iron ion (Fe^{3+}) solution. We have proposed a physical model that the gel's film is responsible for the form of the spiral pattern.

Mitsumasa Ban

Date submitted: 25 Jul 2008 Electronic form version 1.4