

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Viscosity contrast effects on fingering formation in rotating Hele-Shaw flows JOSÉ MIRANDA, HERMES GADÊLHA, Departamento de Física - Univ. Federal de Pernambuco, Brazil, ENRIQUE ALVAREZ-LACALLE, Department of Physics of Complex Systems, Weizmann Institute of Science, Israel — The different finger morphologies that arise at the interface separating two immiscible fluids in a rotating Hele-Shaw cell are studied analytically and numerically. The whole range of viscosity contrast is analyzed and a variety of fingering patterns systematically introduced, including the case in which the inner fluid is less viscous than the outer one. Our results demonstrate that both the magnitude and the sign of the viscosity contrast strongly affect the shape of the emerging fingers, and also their length distribution. We have also found that the occurrence and location of pinch-off singularities are remarkably modified when the inner fluid is less viscous: instead of generating an isolated detaching drop, a full finger is disconnected from the interface. Finally, we have verified that the finger competition phenomena revealed by our simulations are correctly predicted by a weakly nonlinear analysis of the pattern development, showing that such important finger competition dynamics is already set at relatively early stages of interfacial evolution.

José Miranda
Departamento de Física - UFPE

Date submitted: 12 Jul 2005

Electronic form version 1.4