

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

On the Selection Principle for Viscous Fingering in Porous Media

YANNIS C. YORTSOS¹, University of Southern California, DOMINIQUE SALIN², University Pierre et Marie CURIE (Paris 6) — Viscous fingering in porous media at large Peclet numbers is subject to an unsolved selection problem, not unlike the Saffman-Taylor problem. The mixing zone predicted by the entropy solution of the resulting hyperbolic problem, is found to spread much faster than what is observed experimentally or by fine-scale numerical simulations. In this paper we apply a recent approach by Menon and Otto (Com. Math. Phys, **257**, 303-317, (2005)) to develop bounds in the growth of the mixing zone. These predict growth velocities smaller than what is obtained by the entropy solution. For an exponential viscosity-concentration mixing rule, the mixing zone velocity is shown to be bounded by $\frac{(M-1)^2}{M \ln M}$ which is significantly smaller than the entropy solution result $(M - \frac{1}{M})$.

¹Department of Chemical Engineering

²Laboratoire FAST University Pierre et Marie Curie, Paris 6 University Paris Sud and CNRS UMR 7608

Dominique Salin
University Paris 6

Date submitted: 07 Sep 2005

Electronic form version 1.4