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Hydrodynamic instability induced by a precipitation reaction in a Hele-Shaw cell YUKI ISHII, YUICHIRO NAGATSU, Nagoya Institute of Technology, 466-8555, Japan, ANNE DE WIT, Nonlinear Physical Chemistry Unit, CP 231, Université Libre de Bruxelles (ULB), 1050 Brussels, Belgium — We experimentally demonstrate hydrodynamic fingering destabilization of the interface between two miscible solutions of a reactant A and another reactant B respectively and of same viscosity upon displacement in a Hele-Shaw cell. The instability is driven by an A+B→C precipitation reaction producing a solid C and thus changing the local value of the permeability in the cell. The fingering pattern are observed to be different depending on whether A displaces B or vice-versa. A reaction-diffusion-convection (RDC) model describing the related dynamics is proposed. The origin of the instability is explained on the basis of the underlying mobility profile depending on the one-dimensional reaction-diffusion concentration profiles. Nonlinear simulations of the related RDC model reproduce the experimentally observed instability and explain that the asymmetric characteristics of the patterns depending on whether A displaces B or vice-versa are due to differences in diffusivity properties of A and B.

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