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Sustained Reaction Waves Against Flow in Porous Medium: Frozen Fronts DOMINIQUE SALIN, University Pierre Marie CURIE Paris 6, SEVERINE ATIS, HAROLD AURADOU, CNRS, SANDEEP SAHA, Post Doc, LAURENT TALON, CNRS — Autocatalytic reactions lead to fronts propagating as solitary, self-sustained, waves with a constant velocity and an invariant, flat, concentration profile resulting from a balance between reaction and diffusion. In the presence of a hydrodynamic flow, such fronts, while propagating at a new constant velocity, adapt their shape in order to achieve a balance between reaction diffusion and flow advection all over the front. The issue addressed here is the behaviour of autocatalytic reaction fronts when the forced advection is a heterogeneous flow field. It has been recently observed that in inside a porous medium there exist static, frozen, fronts over a wide range of mean flow rates in the opposite direction of the chemical wave propagation. To account for this dynamical equilibrium where the front is pinned at different points, we use both designed experiments around different configurations of solid obstacles and lattice Boltzmann numerical simulations which allows a control of the flow field heterogeneities. These approach allows us to account for the dependence of the range of observation of frozen states with th control parameters. In the case of the porous medium flow field, the transition to this frozen state is understood in term of percolation like path.

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