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Isothermal buoyancy instabilities due to an A+B → S reaction in a Hele-Shaw cell P. TREVELYAN, Y. DE DECKER, A. DE WIT, University Libre de Bruxelles — We investigate theoretically the conditions necessary to trigger buoyancy-driven convection in a Hele-Shaw cell when two solutions containing separate reactants A and B are brought in contact. The initial density stratification is statically stable. We show that a simple isothermal A+B → S chemical reaction can induce nonmonotonic density profiles in the course of time which then lead to buoyancy-driven convective instability. As the base state is time dependent, we perform linear stability analysis of the problem using a quasi-steady state approximation to predict which regions of the parameter space spanned by diffusion coefficient ratios and Rayleigh numbers will have unstable reaction fronts. Full non-linear simulations are used to verify the predictions. A useful guide to the instability is provided by approximating the density profile by its large time analytical asymptotic limit.

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