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The evolution of traveling waves in a simple isothermal chemical system modelling quadratic autocatalysis with strong decay

Abstract

In this talk, we study a reaction-diffusion system for an isothermal chemical reaction scheme governed by a quadratic autocatalytic step $A + B \rightarrow 2B$ and a decay step $B \rightarrow C$, where A, B, and C are the reactant, the autocatalyst, and the inner product, respectively. Previous numerical studies and experimental evidences demonstrate that if the autocatalyst is introduced locally into this autocatalytic reaction system where the reactant A initially distributes uniformly in the whole space, then a pair of waves will be generated and will propagate outwards from the initial reaction zone. One crucial feature of this phenomenon is that for the strong decay case, the formation of waves is independent of the amount of the autocatalyst B introduced into the system. It is this phenomenon of KPP-type which we would like to study analytically.