

Nonlinear hypocoercivity for a generation-recombination model

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A reaction-kinetic model for a two-species gas mixture undergoing pair generation and recombination reactions is considered on a flat torus. For dominant scattering with a non-moving constant-temperature background the macroscopic limit to a reaction-diffusion system is carried out. Exponential decay to equilibrium is proven for the kinetic model by hypocoercivity estimates. This seems to be the first rigorous derivation of a nonlinear reaction-diffusion system from a kinetic model as well as the first hypocoercivity result for a nonlinear kinetic problem without smallness assumptions. The analysis profits from uniform bounds of the solution in terms of the equilibrium velocity distribution.

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