* Electronic Address: mielke@wias-berlin.de
[1] Weierstrass Institute of Berlin

Exponential decay into thermodynamical equilibrium for reaction-diffusion systems with detailed balance

Alexander Mielke[1]*

We consider reaction-diffusion systems on a bounded domain with no-flux boundary conditions. All reactions are given by the mass-action law and are assumed to be reversible and satisfy the detailed balance condition. In that case the whole system can be understood as a gradient system, where the relative entropy is the driving functional. We also give a version of the fact for energy-reaction-diffusion systems, where the internal energy is used as a state variable instead of the temperature. Using this structure we study the decay into equilibrium by using the energy-dissipation relation or the entropy entropy-production relation, respectively. This part even works for reaction systems satisfying a complex-balanced condition. We discuss three different methods to derive exponential decay estimates: (i) a compactness argument of Glitzky and Huenlich, (ii) a convexification argument, and (iii) a series of analytical estimates derived by Desvillettes, Fellner, and Tang. This is joint work with Jan Haskovec, Sabine Hittmeir, Peter Markowich, and Markus Mittnenzweig.