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*Analysis of a cross-diffusion model with excluded volume effects and asymptotic gradient flows*

In this talk we discuss the analysis of a cross-diffusion PDE system for a mixture of hard spheres, which was derived by Bruna and Chapman from a stochastic system of N interacting Brownian particles using the method of matched asympototics. Gradient-flow techniques have become a well established tool to study these kind of nonlinear PDEs. Hence expressing a nonlinear diffusion equation as a gradient flow of an entropy is a very desirable feature. The PDE system under consideration satisfies a gradient flow structure if particles have the same size. For particles of different size we can interpret the equations as an asymptotic gradient flow structure (which results from the asymptotic expansion in the derivation). We shall use this asymptotic gradient flow structure to provide existence of stationary solutions and stability close to equilibrium. Furthermore we discuss global in time existence for the full gradient flow system and illustrate the behavior of the model with various numerical simulations.
Joint work with M. Bruna (University of Oxford), M. Burger (WWU Münster) and Helene Ranetbauer (RICAM)