From Energy- to Electro-Energy-Reaction-Diffusion Systems

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This talk will be concerned with a thermodynamically correct formulation of reaction-diffusion systems describing the dynamics of charged species. This is achieved by employing the Onsager formalism of gradient flow systems along with Poisson's equation for the electrostatic potential. In the first part of the talk, we shall revisit some fundamental works on the thermodynamical modeling of semiconductor-type equations, while special emphasis will be placed on recent results on energy-reaction-diffusion systems. The second part will focus on electro-energy-reaction-diffusion models, in particular, the choice of appropriate entropies, the dependence of the Onsager operator on the electrostatic potential, and the existence of fundamental conservation laws. Finally, I will also comment on the expected outcome of the project concerning the well-posedness and the long-time asymptotics of our electro-energy-reaction-diffusion models. Proving the corresponding results is still work to be done and one of the goals of my two-year stay at WIAS.