## Minisymposium 9 - Nichtlineare Evolutionsgleichungen und Probleme mit freiem Rand

### Mathematical issues concerning evolving sharp-reaction interfaces in unsaturated reactive porous materials: global well-posedness of a moving-boundary system with a kinetic condition

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A variety of reaction-diffusion scenarios taking place in unsaturated reactive porous materials involve the formation and propagation of moving-sharp interfaces, where fast chemical reactions are assumed to happen. When spatially separated reactants meet, the separation boundary may be assumed as sharp provided that the characteristic time scale of reaction is much smaller than that of transport. We illustrate this situation by means of a non-equilibrium one-dimensional moving-boundary system with a kinetic condition modeling the driving force. We employ this formulatoion in order to study the evolution of the carbonation reaction in concrete-based materials. The model relies on the idea that carbonation might be considered to be localized on a sharp interface. It consists of a set of semi-linear mass-balance equations coupled with a non-linear ordinary differential equation, which accounts for the motion of the interface. We refer to this differential equation driving the sharp-reaction interface into the material as the *kinetic (non-equilibrium) condition*. The model equations are non-linearly coupled by the *a priori* unknown position of the moving-reaction interface and non-linearities in the production terms. We show that if the model parameters are selected such that local strict positive weak solutions to our model exist, then the kinetic condition can be suitably used to extend these local solutions globally in time. Finally, we present numerical predictions of penetration depths and show expected qualitative behaviors and feasibility of both the model and numerical approach. This is joint work with Michael Böhm (University of Bremen) supported by the DFG through the special priority program SPP 1122 *Prediction of the Course of Physicochemical Damage Processes involving Mineral Materials*.