Homogenization of a system of multi-species semilinear diffusion-reaction equations in an $H^{1,p}$ setting

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In this talk, we consider a system of semilinear multi-species diffusion-reaction equations with homogeneous Neumann boundary condition. All reactions are reversible which give rise to the highly nonlinear reaction rate terms. For this system, the existence and uniqueness of the weak solution are proved at the micro scale on the interval $[0, T)$ for any $T > 0$. We obtain, global in time, *a-priori* estimates of the solution with the help of a Lyapunov functional. For the existence of the solution, we use Schaefer's fixed point theorem, maximal regularity and Lyapunov type arguments (cf. [3]). In the second part, we upscale (homogenize) the model from the micro to the macro scale by using *two-scale convergence* and *periodic unfolding* (cf. [1], [2]).

References

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[3] *S. Kräutle*: General Multi-Species Reactive Transport Problems in Porous Media: Efficient Numerical Approcahes and Existence of Global Solutions. Habilitation thesis, University of Erlangen-Nürnberg, Germany, 2008.