# Karlstad Applied Analysis Seminar (2022)

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# On the homogenization of a system of parabolic PDEs modeling mass transfer in heterogeneous catalysis

## Abstract

In industry, heterogeneous catalysts are widely used to enable faster large-scale production by increasing the rates of certain chemical reactions. We consider a system of parabolic PDEs in moving domains modeling mass transfer in heterogeneous catalysis with a Robin boundary condition on the interface. The behavior of such systems becomes increasingly complex as the number of catalyst particles increases. This motivates the search for a homogenized model that would describe the asymptotic behavior of the solutions to the problem and emergent properties in the limit of infinitely many particles. We transform the moving domain problem into a problem in a fixed domain by constructing a diffeomorphism out of the known solid particle velocities. We prove that solutions exist in any finite time and show that these solutions two-scale converge to solutions of a PDE/ODE system. We provide examples of solid velocities for which our result applies and discuss future research directions.