

ICTS Seminar

Title : Upscaling of a System of Semilinear Diffusion-Reaction Equations in a Heterogeneous Medium: Multi-Scale Modeling and Periodic Homogenization.

Speaker : Hari Shankar Mahato, University of Georgia, USA

Date : Monday, January 9, 2017

Time : 11:30 am

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : In this talk, diffusion and reaction of several mobile chemical species are considered in the pore space of a heterogeneous porous medium. The reactions amongst the species are modelled via mass action kinetics and the modelling leads to a system of multi-species diffusion-reaction equations (coupled semi-linear partial differential equations) at the micro scale where the highly nonlinear reaction rate terms are present at the right hand sides of the system of PDEs. The existence of a unique positive global weak solution is shown with the help of a Lyapunov functional, Schaefer's fixed point theorem and maximal L_p -regularity. Finally, with the help of periodic homogenization and two-scale convergence we upscale the model from the micro scale to the macro scale. Some numerical simulations will also be shown in this talk, however for the purpose of illustration, we restrict ourselves to some 2-dimensional situations.