Abstract:
Diffuse interface models play nowadays an important role in fluid dynamics as analytical and numerical methods for the motion of multi-component or multi-phase fluid flows. The Cahn-Hilliard-Brinkman (CHB) system belongs to a class of diffuse interface models describing the interaction between two incompressible and viscous fluids with uniform density (Boussinesq approximation). In particular, it is employed for phase separation phenomena in porous media and represents a relaxation model of the well-known Cahn-Hilliard-Navier-Stokes and Cahn-Hilliard-Hele-Shaw systems.

The CHB model couples a Stokes system which rules the volume-averaged fluid velocity with a convective Cahn-Hilliard equation with logarithmic potential for the difference of the fluid concentrations.

In this talk I will present a fairly complete mathematical theory for the CHB model with unmatched viscosities in three dimensions. More precisely, I will discuss about uniqueness of weak solutions, global well-posedness of strong solutions and validity of the separation property. This analysis validates the CHB system as a robust diffuse interface model for the description of three dimensional two-component flows.