Numerical Analysis and Simulations of a Model of Biofilm Growth and Nutrient Utilization at Pore-scale

In this talk, we consider a biofilm—nutrient model at pore-scale. The model is coupled to Brinkman flow model, for which the ambient fluid flows outside and within the biofilm region.  In porous media, microbial cells have finite size, so there is a constraint on the biofilm growth.  Biofilm—nutrient model is a coupled system of two nonlinear parabolic advection-diffusion-reaction PDEs, one of them is characterized as a parabolic variational inequality. We approximate the model using the mixed finite element method. We show the well-posedness of the problem and derive a rigorous error estimate. We also show simulations of realistic scenarios of the model.