

Mechano-chemical fluid-structure interactions including solid growth and non-Newtonian flow

Thomas Wick
Centre de Mathématiques Appliquées
Ecole Polytechnique

In this presentation, we develop numerical schemes for mechano-chemical fluid-structure interactions with long-term effects. We investigate a model of a growing solid interacting with an incompressible fluid of Newtonian or non-Newtonian type. A typical example for such a situation is the formation and growth of plaque in blood vessels. This application includes two particular difficulties: First, growth may lead to very large deformations, up to full clogging. Second, different time scales are important since the dynamics of the fluid demand to resolve a scale of seconds, growth typically takes place in a range of months. Here, a temporal two-scale approach is proposed using local small-scale problems to compute an effective wall stress that will enter the long-scale problem. Our algorithmic frameworks are substantiated with several numerical tests.