
Jason, F Hammond
Modeling and Simulating Biofilms in Fluid Flow

9661 Fox St
Northglenn
CO 80260
`hammonjf@colorado.edu`
David, M Bortz

In this talk we use the immersed boundary method to simulate the interaction of fluid flowing in a tube with an attached biofilm on the inner surface of the tube. We use the incompressible viscous Navier-Stokes (N-S) equations to describe the motion of the flowing fluid. In this simulation we can assign different density and viscosity values to the biofilm than that of the surrounding fluid. Also included in this simulation are breakable springs connecting the particles in the biofilm which allow us to include erosion and sloughing detachment into the model. We discretize the fluid equations using finite differences and use a multigrid method to solve it at each time step. Multigrid is used because the biofilm has a different density and viscosity than the surrounding fluid which causes the coefficients in the N-S equations to be non-constant in time. We apply this model in both two and three dimensions.