S3.1.4 Pore Scale Modeling and Simulation for Surface Activated Filtering Media
Oleg Iliev
Fraunhofer Inst. for Industrial Mathematics

Fibrous and sponge filtering media usually have complex microstructures. In all applications, the morphology of the filtering media influences its performance in one way or another. This is especially true for surface activated filtering media. Understanding the flow, transport and reaction/adsorption processes at the pore scale is important for explaining and interpreting the overall performance of such filtering media. In certain cases an effective media approach, which accounts for the membrane morphology in an average way (e.g., via porosity) can provide useful information. However, increasing the filtration efficiency needs a more detailed knowledge of the impact of the microstructure. Mathematical modelling and computer simulations are useful approaches, supporting researchers and manufacturers in their work on designing better filtering media and on selecting appropriate ones for a particular application.

Here we present simulation results for sponge functionalized membranes and for surface activated fibrous web. Navier-Stokes equations are used to describe the flow, the solute/contaminant transport is described by a convection-diffusion equation with reactive boundary conditions. The surface adsorption/reaction is modeled with Henry or Langmuir isotherms. Results from computer simulations are presented and discussed.