

Mathematical models in water filtration

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The World Health Organization estimates that more than one billion people lack access to an improved water supply and many more drink water that is grossly contaminated. Water treatment is improving our daily lives and will become even more important in the coming decades.

Membrane filtration is a simple concept for water purification: water containing particulate contaminants is forced through a semi-permeable membrane that rejects the particulates leaving clean water to flow out. Nevertheless, there are many complex features of membrane filtration, the most important of which is the accumulation of the particulates at the membrane surface. This leads ultimately to fouling of the membrane (e.g., via pore blocking) and a reduction in the efficiency of the process.

In this talk we discuss several models of the membrane filtration process, including the effects of a concentration-dependent viscosity, a varying membrane permeability, and elastic deformations.