

Network Models for Filtration Simulation

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Membrane filters formed by a porous layer with a structured porosity distribution can allow filtration to be tailored in a variety of novel ways. We characterise this process using a novel mathematical network model, where we represent the porous medium as a large number of interconnected (point) pores. Each pore is assumed to be connected to all its neighbours within a prescribed distance. Any two pores are connected by a cylindrical pipe whose radius can decrease as particles foul the filter. The model allows us to understand the response of the system when challenged with a particular feed composition, characterized through the particle size and adhesivity to the membrane. In particular, we quantify the change in the flow rate as the membrane becomes fouled and track change in the tortuosity of the particle path through the filter over time.