

A SURVEY OF POROUS MEDIA SIMULATIONS OF FIBROUS FILTERS DRIVEN BY AUTOMOTIVE APPLICATIONS

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ABSTRACT

Considering cars, filter elements are often overlooked. Consequently, there is not much design space left in the engine compartment. Driving a car, filter elements are most often only remembered when a caution light calls for an oil filter change. However, today's cars would not work without innovative fibrous filters. After stopping for service at a workshop, filter elements show up frequently as items on the bill. Replacing used filters by new ones of trusted original quality is essential for maintaining driving performance and a clean environment.

The performance of filter elements strongly depends on the fibrous media. Simulation of such porous media has become an indispensable tool for development of innovative fibrous filters. Emerging from simple analytical or empirical equations, state-of-the-art simulations deal with multi-physics challenges on a sub-micron to meter scale.

The plenary will start with a tour around a car showing the variety of filters applied in modern vehicles. Subsequently, a short virtual drive points out the challenges for today's filter media. Then, a closer look at air and oil filter elements illustrates how simulation of porous media is driven by automotive application. An overview briefly covers some filtration fundamentals as well as advances during the past years. As an outlook, the lecture highlights that automotive applications are going to continue driving advances in porous media simulation. Today's cabin air filter media and fuel filters add additional challenges to solve.