

Effect of Fiber Orientation Distribution on Filter Performance

S. Fotovati¹, H. Vahedi Tafreshi^{1*}, and B. Pourdeyhimi²

¹*Mechanical Engineering Department,
Virginia Commonwealth University, Richmond, Virginia 23284-3015*

²*Nonwovens Cooperative Research Center, The Nonwovens Institute,
NC State University, Raleigh, NC 27695-8301*

Abstract

To study the effects of fiber orientation on pressure drop and particle collection efficiency of filter media, 3-D virtual geometries are generated to model the microstructure of fibrous filters. These 3-D fibrous structures are then utilized to numerically simulate the pressure drop and capture efficiency of fibrous media when challenged with aerosol particles. It was found that pressure drop and particle capture efficiency of a filter medium are independent of the in-plane orientation of the fibers. However, pressure drop and collection efficiency decrease with increasing the fibers' through-plane orientation. Calculating the Figure of Merit of the media, we conclude that better filters can be produced by increasing the fibers' through-plane orientation.

Bio Sketch

The presenter is Shahryar Fotovati who is a Mechanical Engineering PhD student in Virginia Commonwealth University.

Shahryar got his BS and MS in Mechanical Engineering from Persian Gulf University (2001) and Shiraz University (2007) in Iran.

* Corresponding author, email: htafreshi@vcu.edu, telephone: 804-828-9936, fax: 804-827-7030