

Foreword

Welcome to this first special issue of the Journal of Engineered Fibers and Fabrics (JEFF). This is what we hope to be the first in a series of special issues dealing with the timeliest topics in fibers, fabrics and other designed matrices.

This first special edition is focused on filtration and is aimed at providing our audience with a snapshot of the current state of the art in modeling and experiments in the field of filtration/separation.

The rising awareness of environmental agencies and the general public for a clean environment together with demands of many advanced industries, such as automotive, electronics, medical, pharmaceutical, biotechnology, and military have urged engineers and scientists to investigate on developing ways to improve and/or control the performance of air and fluid filtration media for the past few years. As you will see in this issue, engineered dependable aerosol filters are now even deemed vitally important in lunar research and space exploration. The motivation for developing this issue was merely to inspire the readers of JEFF by compiling a brief set of snapshots taken from the ongoing computational and experimental research in some of the leading institutions that seemed to be relevant to the needs faced by the industry. In soliciting these contributions, utmost attention was paid to the novelty and uniqueness of the research combined with brevity and conciseness of the materials presented.

Contributions in this issue are in two major categories of modeling and experimentation. The first three contributions are focused on modeling particle filtration from gas or liquid streams. This issue begins with a two-dimensional modeling work by Cox, et al. who reports on a numerical scheme for studying fluid flow through filters made up of shaped fibers. The second paper in this collection is offered by Mazé, et al. and is dedicated to the simulation of nanoparticle filtration via micro- or nano-fiber media in three-dimensional domains. The emphasis of this work has been mostly on expanding the realm of filtration modeling to three-dimensional geometries in order to achieve improved predictions. Our last modeling paper by Jaganathan, et al. presents the latest results of combined microscale-macroscale three-dimensional modeling of fluid flow through nonwoven materials. This paper also presents a recently developed image-based approach for conducting fluid flow calculations in complex three-dimensional microstructures.

Our experimental papers begin with the work of Gibson, et al. that reports on the efficiency of electro-spun nano-fiber mats in collecting lunar dust in comparison with those of spun-bonded and melt-blown media. These authors also studied a variety of micro-porous liners combined with cotton-based fabrics to filter aerosolized spores and reported on the fate of the spores within the fabric layers. Our second experimental paper by Bharadwaj, et al. reports on a novel technique for changing the orientation of

fibers within a filter via electric field. By aligning the fibers with the flow, the authors show an improvement in the filter's quality factor. The last paper of this issue is devoted to membrane science. In this work Kujundzic, et al. presents an overview of the recent developments in ultrasonic reflectometry used for noninvasive, real-time assessments of fouling in membranes. They also describe applications of Scanning Acoustic Microscopy (SAM) for post-mortem characterization of membranes with particular emphasis on biofouling.

This special issue was made possible through the efforts of our guest editors *Hooman Vahedi Tafreshi, Ph.D.* of Virginia Commonwealth University (USA) and *Behnam Pourdeyhimi, Ph.D.* of North Carolina State University (USA). We are extremely indebted to them and to the contributions of the invited authors.

The Journal hopes that you find these papers of interest and encourages you to send any suggestions to the JEFF managing editor at <http://jeff.edmgr.com>.

Again, we extend our appreciation to Hooman Vahedi Tafreshi and Behnam Pourdeyhimi.