# S1.4.4 - *Structural Characterization of the Clogging Process of Fibrous Filter Media during Solid Particle Loading with X-ray Micro-Computed Tomography*

Eunkyoung Shim[1], Yu Song[1]
[1]North Carolina State University

Ideal filter media should exhibit high filtration efficiency at low-pressure drop and have long filter life (i.e. high dust holding capacity). Controlling and engineering various aspects of filter media structures poses critical importance to achieve these goals. Many reported the effects of media structures on filtration efficiency and pressure drop of a clean filter. But these do not address the performances of a filter throughout its lifetime as it collects dust particles inside its structures. During the filtration process, particles are captured from an air stream and entrapped among the fibers inside. It alters filter media structures- solidity, pore structures, etc. It will lead increase in pressure drop and eventually end the filter life. One of the main challenges in the filter design is to create filter media structures that ensure a long life span. This requires an understanding of particle deposition behaviors – such as distribution particle deposition through the thickness direction of filter media, changes of pore structure and clogging– and how initial filter structures affect them. We utilize X-ray micro-computed tomography (XMCT) to non-invasively characterize the 3D structures of clean and particle-loaded fibrous nonwoven coarse filters at

different clogging stages. The image processing and image analysis method were developed to visualize and analyze both the filter structure and particle deposition distribution across the filter depth.

## Eunkyoung Shim

Dr. Eunkyoung Shim is an assistant professor in the Department of Textile Engineering, Chemistry, and Science at North Carolina State University. This appointment followed 15 years of experience in the Nonwovens Institute as a research assistant professor and research associate. She received Ph.D. in Fiber and Polymer Science from North Carolina State University in 2001. Her research areas include nonwoven filtration media, charging technology, fiber spinning, nonwoven and fiber structure analysis, nonwoven process mechanism, fiber modifications with additives and fiber/nonwoven product developments. She had published 5 book chapters and 36 articles in peer-reviewed journals. She has developed and taught graduate courses and workshops and short courses, including materials, polymer, and fibers, nonwoven processing & products, nonwoven.

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