Integrative Filtration Research: Filtration of Nanoparticles, Bioparticles and Agglomerates; Nanofiber Filtration; Liquid-borne Particle Filtration

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Abstract

Integrative approach to filtration research is needed to meet the demand of modern filtration requirements. At the Center for Filtration Research (CFR), consisting of 10 filter manufacturers and end users, we combine knowledge from several interdisciplinary fields, i.e., powder, aerosol and liquid filtration technologies, to meet the challenges in the filtration of vehicle emissions, biological particles, engineered nanoparticles to reduce workers' exposure, and nanoparticle and airborne molecular contaminants (AMC) in semiconductor manufacturing. Examples will be given to show how we apply knowledge in powder technology to model aerosol soot loading, how we apply aerosol technique to evaluate liquid-borne particle filtration, how we disperse liquid-borne engineered nanoparticles and bioparticles using aerosol technique for filtration efficiency evaluations. The integrative filtration research helps our CFR members develop better composite filter media, pleated filters and respirators, with high efficiency and low pressure drop, to reduce exposures to workers and the general public, to lengthen the filter life, and to improve environmental, health and safety (EHS) of exposure to engineered nanoparticles and biological particles. CFR research has impacted environmental, energy, semiconductor and health care industries. The research also trains our students with relevant industrial experience.

David Y. H. Pui, a Distinguished McKnight University Professor, is the L.M. Fingerson/TSI Inc Chair in Mechanical Engineering and the Director of the Particle Technology Laboratory and of the Center for Filtration Research, University of Minnesota. He has a broad range of research experience in aerosol science and technology and has over 190 journal papers and 17 patents. He has developed/co-developed several widely used commercial aerosol instruments. He organized several successful international nanoparticle symposia to promote research cooperation especially among young scientists. Dr. Pui is a fellow of the American Society of Mechanical Engineers (ASME) and a fellow of the American Association for Aerosol Research (AAAR), and is a recipient of the Smoluchowski Award (1992), the Max Planck Research Award (1993), the International Aerosol Fellow Award (1998), the Humboldt Research Award for Senior U.S. Scientists (2000), and the David Sinclair Award (2002). He is currently serving as the President of the International Aerosol Research Assembly (IARA) consisting of 13 international aerosol associations.