



Nanofiber Filter Technologies for Filtration of Submicron Particles in Air

Instructor: Prof. Wallace Leung

Course: 8:00 am – 12:00 pm, .4 CEUs

The purpose of this course is to introduce nanofiber filter technologies for filtering airborne particles or aerosols in the submicron (<1 micron) and nano sizes (<100 nanometers). As air pollution is getting worse, the number concentration of submicron aerosols is very high, well in excess of 1000 particles per cubic centimeter. By virtue of the small size, these aerosols can be easily inhaled by us, penetrating deep in the respiratory track to the lung alveoli and got transferred to the vascular system leading possibly to various chronic diseases. Filters made from nanofibers are most suitable for filtering submicron aerosols. One of the important applications of nanofiber filters is to filter airborne viruses, such as SARS-CoV-2 virus leading to the COVID-19 pandemic. Unfortunately, the limitation is pressure drop can be very high due to viscous drag on large surface area of nanofibers. Various pressure drop reduction approaches will be discussed in the course. Also, aerosol loading and cleaning of nanofiber filters will also be discussed.

Learning objectives:

- What are the outdoor and indoor submicron- and nano-aerosols?
- Filtration fundamentals using nanofiber filters
- How nanofibers are electrospun?
- Examples of various polymeric nanofiber filters
- Filter testing and instrumentation
- Pressure drop strategy for light and heavy aerosol loading
- Electrostatic charged nanofibers

Course outline:

Chapter 1 – Outdoor and indoor submicron- and nano-aerosols

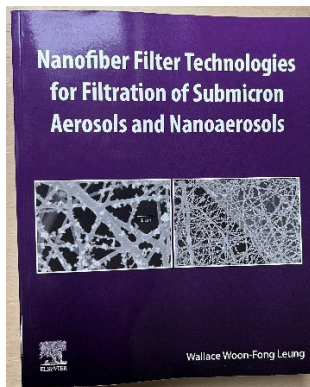
Chapter 2 – Filtration of submicron- and nano-aerosols

Chapter 3 – Nanofiber production

Chapter 4 – Filter testing and standards
Chapter 5 – Pressure reduction for light aerosol loading
Chapter 6 – Pressure reduction for heavy aerosol loading
Chapter 7 – Electrostatic charged nanofiber filters
Workshop (each participant needs to bring a problem to the workshop)

Book included in the course (no extra payment):

Wallace Leung, “Nanofiber filter technologies for filtration of submicron aerosols and nanoaerosols”, Elsevier, 2021, 14 chapters, 570 pages, retail price 210 USD.



Who should attend:

Engineers, scientists, researchers, managers, and technical staff involved in air filtration should find this course informative and essential. The first of its kind, this course has been conducted as a graduate course at the Hong Kong Polytechnic University in the past 10 years by an international expert in the field of nanofibers and air filtration.

Instructor:



Prof. Wallace Leung is a multidisciplinary educator and a practicing engineer. He has been in filtration and separation since 1977 with 25 years working in the United States industries and 21 years in the academia. He has developed many new technologies for nanofiber technologies to reduce pressure drop, including the nanofiber electret, multilayer nanofibers, dual-layer filter, etc. He has 11 US patents on nanofiber technologies to his credit. He has delivered public lectures in public institutions on the subject worldwide, including MIT, Georgia Tech, and Technion (Israel), etc. He delivered the Distinguished Lecture Series at the Waterloo Institute of Nanotechnology, Waterloo, Canada 2019. He is the author of a new Elsevier book, “*Nanofiber filter technologies for filtration of submicron aerosols and nanoaerosols*”. Wallace is currently Distinguished Research Professor and previously for 15 years as Chair Professor of Innovative Products and Technologies in Mechanical Engineering Department at The Hong Kong Polytechnic University. He is a fellow of AIChE, ASME, and AFS. He is also a fellow of the Hong Kong Academy of Engineering Science. He received both MS and ScD from MIT and BSc from Cornell.