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Taiwan Association for Aerosol Research

Newsletter

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◎Web:http://www.taar.org.tw/
◎E-mail：taarasst@gmail.com

Announcement

- The 2nd Board meeting will be held on December 13, 2014 at China Medical University, Taichung City, Taiwan.
- 22nd International Conference on Aerosol Science & Technology will be held on 2-3 October 2015 at National Environmental Health Research Center, National Health Research Institutes.

We would like to invite all of the members to share you research or new aerosol knowledge with us. Thank you very much for your support and help.

Best wishes to you and your family!

Switzerland

Introducing 12th Work Team of TAAR

Position	Name	Present Job
President	Chih-Chieh Chen	Professor, Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University
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International Journal Editorial Assistant of AAQR	Ginny She	Taiwan Association for Aerosol Research
Secretary and financial assistant of TAAR	Shih-Wan Lin	Taiwan Association for Aerosol Research

Aerosol Researcher Profile – Prof. Hsing-Wang Li

Name: **Hsing-Wang Li**

Current Position:

Engineer, Environmental Bioengineering & Chemical Analysis Section, New Materials Research & Development Dept., China Steel Corporation

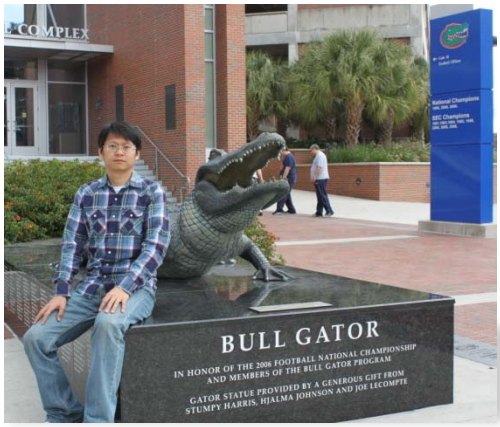
Education:

Ph.D. Environmental Engineering, National Cheng Kung University

M.S. Environmental Engineering, National Cheng Kung University

B.S. Soil and Environmental Science, National Chung Hsing University

Contact: leestanly@yahoo.com.tw



Professional Experience

Hsing-Wang Li received his Ph.D. from the Department of Environmental Engineering at National Cheng Kung University. His dissertation entitled "Characterization of PCDD/F Emission from Industrial Thermal Processes" showed that the raw materials played an important role in the formation of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs). Different air pollution control devices (APCDs) perform different mechanisms and efficiencies of PCDD/Fs removal. Applying the combination of multiple APCDs can effectively reduce PCDD/F emission.

From 2009 to 2010, Dr. Li did his first postdoctoral research at National Cheng-Kung University and focused on developing alternative fuels and sustainability. Utilizing microexplosion for emulsified fuel could improve the combustion efficiency as well as reduced the generation of air pollutants. Afterward, Dr. Li worked in the Dept. of Environmental Engineering Science at University of Florida, which was supported by a postdoctoral research abroad fellowship from National Science Council, Taiwan. He was involved in (1) a bioaerosol nanofiber filtration project that was aimed to protect human beings from adverse exposure to airborne biological agents; and (2) modeling the emissions of hazardous air pollutants from the phosphate fertilizer industry and evaluating the environmental and health impacts to the neighborhood.

Dr. Li is currently serving as an air pollution control engineer at China Steel Corporation. His duty is to reduce air pollutant emission from any possible sources during the production line. The goals are aimed not only to meet the environmental regulations but also to make China Steel Corporation an eco-friendly manufacturer.

Research Topics

(1) PCDD/Fs emission

In 1977, the PCDD/Fs were found to be present in the flue gas and the fly ash of municipal solid waste incinerators. The PCDD/F emission from incineration and/or industrial thermal processes has been a serious concern to numerous countries. The PCDD/Fs exhibit a hydrophobic nature and are resistant towards metabolism. These chemicals remain in the environment and bioaccumulate in the fatty tissues of animals and humans. Figure 1 shows the general structure of PCDD and PCDF. The PCDDs contain two benzene rings with 1,4-dixion as the central ring, whereas the PCDFs have two benzene ring with only one oxygen atom in the central ring. It is known that 7 out of 75 PCDD and 10 out of 135 PCDF congeners are toxic. For example, the 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TeCDD) may be a human carcinogen and has received much attention among all other PCDD/Fs.

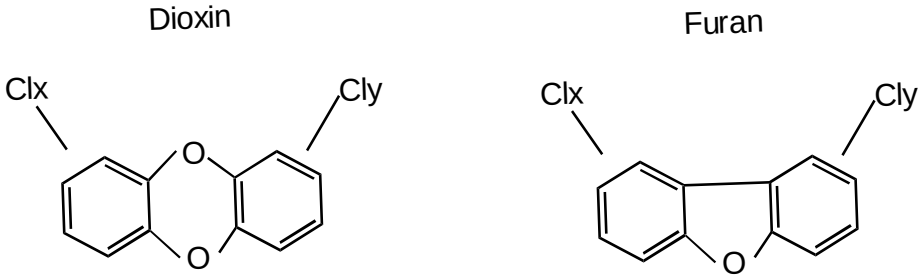


Figure 1. General structure of PCDD (left) and PCDF (right)

To reduce PCDD/F emissions from stationary sources, air pollution control devices (APCDs), such as bag filters and electrostatic precipitators (EP), are used to remove particulate phase PCDD/Fs. Powdered activated carbon (PAC) injection is commonly used for gaseous phase PCDD/Fs removal. However, PAC injection can only adsorb PCDD/Fs but cannot decompose them. In addition, PAC injection is costly because excessive amount of PAC is often used in order to conform to the PCDD/F emission standard.

The usage of filters over the four-year period led to increases of the total I-TEQ levels after the bag filters by 98%-256%, in the three plants. After the replacement of filters, the total I-TEQ after the filters decreased by 53%-89%, in these plants. A great amount of PCDD/Fs were adsorbed by the installed filters over four-year period and their subsequent release from filters led to increases of PCDD/Fs levels in the stack flue gases. The release of PCDD/Fs from filters resulted most likely from the blow-off of fine pieces of the aged filter material by the flue gas when the filter was used after a certain period. High PCDD/F concentrations after the filters are attributed conventionally to the memory effect of the filters.

(2) Bioaerosol Control Technology

Bioaerosols are aerosols of biological origins such as viruses, bacteria, fungi, spores, pollen, and allergens. They can cause adverse health and welfare effects, including allergy, asthma, respiratory illness, crop damage, and animal infection. The spread of airborne pathogens such as severe acute respiratory syndrome (SARS), avian influenza, and the 2001 anthrax attacks have raised the public's concerns for bioaerosols and the protection.

Filtration is one of the most common protections against aerosol because it is simple and economical. However, there are two main issues regarding to filtration: (1) High aerosol removal efficiency is achieved only at the cost of high pressure drop, which correlates to high energy consumption for collective protection or high breathing resistance for individual protection. How to increase aerosol removal efficiency at low pressure drop is a critical challenge for filter development. (2) Adhered biological agents may creep through the filter and re-aerosolize. It is important to effectively retain the biological agents loaded on the filter.

Nanomaterial, due to its unique physical, chemical, and biological properties, has the potential to provide a product superior to its bulk predecessor. A novel alumina nanofiber filter was assessed for its removal and retention capability for MS2 aerosol (Fig. 2). Its physical removal efficiency in the 10 - 400 nm range was 94.35% while its viable removal efficiency was 98.87%. Although these were slightly lower than the removal efficiencies of the three conventional HEPA filters tested. However, the pressure drop of the nanofiber filters was much lower than the HEPA filters. Furthermore, the effectiveness of the nanofiber filter is humidity independent. Overall, nanofiber filters performed better quality than HEPA filters. This novel alumina nanofiber filter presents advantageous potential for removal and retention of viral aerosol agents.

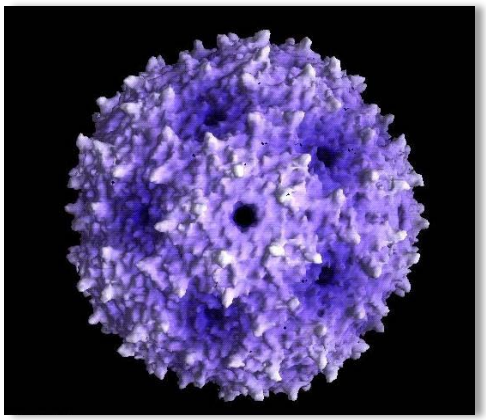


Figure 2. MS2 bacteriophage

Aerosol Information Update

Title: Aerosols Science: Technology and Applications

Author: Ian Colbeck (Editor), Mihalis Lazaridis (Editor)

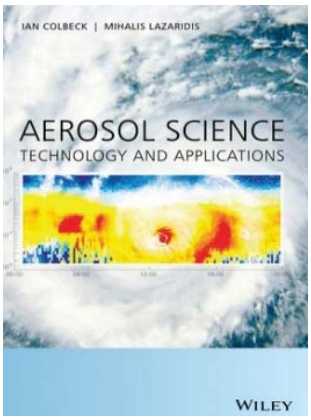
Hardcover: 490 pages

Publisher: Wiley; 1 edition (Feb 3, 2014)

Language: English

ISBN-10: 1119977924

ISBN-13: 978-1119977926



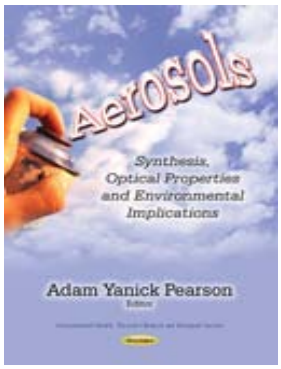
Book Description

Aerosols influence many areas of our daily life. They are at the core of environmental problems such as global warming, photochemical smog and poor air quality. They can also have diverse effects on human health, where exposure occurs in both outdoor and indoor environments.

However, aerosols can have beneficial effects too; the delivery of drugs to the lungs, the delivery of fuels for combustion and the production of nanomaterials all rely on aerosols. Advances in particle measurement technologies have made it possible to take advantage of rapid changes in both particle size and concentration. Likewise, aerosols can now be produced in a controlled fashion.

Reviewing many technological applications together with the current scientific status of aerosol modelling and measurements, this book includes:

- Satellite aerosol remote sensing
- The effects of aerosols on climate change
- Air pollution and health
- Pharmaceutical aerosols and pulmonary drug delivery
- Bioaerosols and hospital infections
- Particle emissions from vehicles
- The safety of emerging nanomaterials

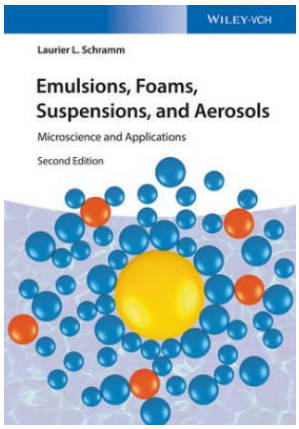


Title: Aerosols: Synthesis, Optical Properties and Environmental Implications
Author: Adam Yanick Pearson
Publisher: Nova Science Pub Inc (May 10, 2014)
Language: English
ISBN-10: 1631175122
ISBN-13: 978-1631175121

Book Description

Nanostructured materials and coatings have gained great importance due to their microstructural properties. Their applications have increased in different technological areas such as in: environmental pollution control, photo catalysis, optics, solid oxide fuel cells, electronic and optoelectronic devices, mechanical protection, catalysis, and biomedical applications. Furthermore, advances in aerosol processing in recent years have increased the variety of produced nanostructured materials, including metals, oxides, ceramics, and composites, in different appearances such as nanoparticles, rods, belts, fibers, tubes, needles, and films. This book discusses the synthesis, properties and implications that aerosols have on the environment.

Title: Emulsions, Foams, Suspensions, and Aerosols: Microscience and Applications
Author: Laurier L. Schramm
Hardcover: 512 pages
Publisher: Wiley-VCH; 1 edition (Oct 27, 2014)
Language: English
ISBN-10: 3527337067
ISBN-13: 978-3527337064



Book Description

Most books on colloid science are either quite theoretical, or focused on a specific types of dispersion, or on specific applications. The second, revised and enlarged edition of this book provides an integrated introduction to the classification, formation and occurrence, stability, and uses of the most common types of colloidal dispersion in the process-related industries. Although the initial emphasis covers basic concepts essential for understanding colloidal dispersions, this is done in the context of emulsions, foams, suspensions, and aerosols, and is aimed at providing the necessary framework for understanding industrial and medical applications.

The first part of the book introduces the fundamental principles, whereas the following chapters discuss a wide range of industrial applications and examples, serving to emphasize the different methodologies that have been successfully applied. Major additions to the new edition comprise the field of aerosols providing the necessary theoretical background as well as an overview on industrial applications and environmental impact.

Calendar of Events

Conference Schedule	Name of Conference	Location
April 12-15, 2015	2nd International Congress on Safety on Engineered Nanoparticles and Nanotechnologies - SENN 2015 http://www.ttl.fi/ARTNER/SENN2015/Pages/default.aspx	Helsinki, Finland
June 15-17, 2015	Aerosol Technology 2015 – Tampere http://www.tut.fi/at2015	Tampere, Finland
June 22-25, 2015	A&WMA's 108th annual Conference & Exhibition Connecting the Dots: Environmental Quality to Climate http://ace2015.awma.org/	Raleigh Convention Center, USA
June 24-27, 2015	Asian Aerosol Conference 2015 http://aac2015.w3.kanazawa-u.ac.jp/	Tokyu, Japan
June 30 - May 3, 2015	20th Congress of the International Society for Aerosols in Medicine (ISAM) http://www.isamcongress.com/	Munich, Germany
September 6-11, 2015	European Aerosol Conference (EAC 2015) http://www.eac2015.it/	Milan ,Italy
October 12-16, 2015	AAAR 34th Annual conference https://www.aaar.org/index2.cfm?section=Meetings_and_Events	Minneapolis, Minnesota, USA

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