Aerosol and Air Quality Research, 17: 2643–2644, 2017

ISSN: 1680-8584 print / 2071-1409 online
doi: 10.4209/aaqr.2017.09.0332

On the Special Issue for the 12th World Filtration Congress

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ABOUT WFC12

The 12th World Filtration Congress (WFC12) was held at the Taipei International Convention Center (TICC), Taiwan, in 2016 from April 11 till April 15. The congress, which occurs every four years, offered both exhibitions and scientific programs on filtration and separation technologies for gases and liquids. WFC12 attracted 3,203 delegates, speakers, sponsors, visitors, and exhibitors from 34 countries. In total, 302 papers were presented at the conference, 80 of which address gas filtration.

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Of the papers presented at the conference, 16 manuscripts related to gas filtration were submitted to this special issue. After peer review, only 9 of them were accepted and published. 4 of them investigate aerosol filtration, which is currently one of the most economical and effective methods of particle control, while the remaining 5 explore various other topics of equal interest and importance.

- In order to develop a low-resistance and high-efficiency filter media, Zhou *et al.* (2017) applied the D2G9 scheme of the Lattice Boltzmann (LB) method to predict both the resistance and the filtration efficiency of the flow through microscale porous media, discovering that the simulated resistance with the slip boundary on fibrous surfaces and the periodic scheme on upper/lower walls was close to the experimental value.
- To improve the quality of pulse-jet cleaning and increase the durability of filtration units, Chen and Chen (2017) used a novel convergent-trapezoidal pleat in a multi-pulsing reverse-flow system. Compared with the single-pulsing mode, multi-pulsing was found to have positive differences in peak pressure in the upper regions of the cartridge due to the increased frequency of cleaning, which is crucial to mitigating mechanical stress and optimizing efficiency.
- While current international standards for filter efficiency mainly focus on the smallest size of penetrating particles, Sachinidou *et al.* (2017) conducted an inter-laboratory evaluation under the Technical Committee 195 of the European Committee for Standardization (CEN/TC195) to develop a methodology for determining the effectiveness of filtration media for airborne particles ranging in size 3–500 nm. Inter-laboratory analysis revealed some deviation among the experimental results. The statistical analysis showed a less than 20% deviation. The charging status of the filter was found to affect the filtration efficiency.
- Using cyclical-flow conditions, which are typically applied to respiratory filter media (as opposed to constant-flow conditions, which are standard for general filter media), Wang *et al.* (2017a) observed the effects of breathing frequency (BF) on particle penetration of respiratory filter media and discovered that peak particle penetration increased with peak inhalation flow rate (PIFR) due to the increase in mean inhalation flow rate (MIFR).
- Recognizing the high potential of moving granular bed filters (MGBFs) in facilitating high-temperature gas cleaning for advanced power-generation systems, Chang *et al.* (2017) proposed and tested a new method that placed two filter-granule sizes in one vessel, called the two-stage filtration mode, and proved that vessel geometry influenced the flow pattern profiles of the granules. The optimal design diminished the filter's stagnant zone in 165 minutes.
- To control gaseous pollutants, Wang *et al.* (2017b) employed a gas-cyclone–liquid-jet absorption separator to desulfurize wet flue gas using sodium hydroxide (NaOH)- and sodium carbonate (Na_2CO_3)-absorbing solutions at various concentrations. The maximum efficiencies for removing SO_2 by NaOH and Na_2CO_3 were 85% and

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77%, respectively, which were representative of their overall trends, in which NaOH exhibited 5%–8% higher efficiency than Na_2CO_3.

- Xie *et al.* successfully developed an activated-carbon aerogel (CA)-based amine-loaded adsorbent for capturing CO_2 (2017), which effectively removes 5% of the CO_2 from gas mixtures. The optimal adsorption temperature and quantity of amine in polyethyleneimine (PEI)-loaded activated CA are 75°C and 55% of the total weight, respectively, at the activation mass ratio KOH to CA of 1. Under these conditions, the PEI-loaded activated CA reached its highest adsorption capacity at 2.06 mmol g^{-1} adsorbent.
- Jiang *et al.* (2017) prepared CeO_2–MoO_3/TiO_2 catalysts for selective catalytic reduction (SCR) of NO with NH_3 using three different methods: a single step sol-gel (SG), impregnation (IM), and the co-precipitation (CP) method. The SG method resulted in the widest temperature window, the best SCR activity below 450°C, and resistance against 10% H_2O and 1000 ppm SO_2. The better deNOx performance of the catalyst prepared via SG was due to the larger BET surface area; more highly dispersed active species of Ce and Mo; the presence of more Ce^{3+} and chemisorbed oxygen; the synergistic effect among ceria, molybdenum, and titania; and better redox ability.
- Exploring the promising field of membrane technology for gas separation, which offers the advantages of low initial capital investment and a smaller footprint compared to conventional processes, Chong *et al.* (2017) applied hollow-fiber polysulfone (PSF) membranes to the separation of oxygen/nitrogen (O_2/N_2). Results indicated that the bore-fluid flow rate significantly affected O_2/N_2 separation by potentially altering the structure and dimensions of the membranes. Using membranes with a lower bore-fluid flow rate improved gas permeance, while coating them with polydimethysiloxane (PDMS) increased structural integrity.

It is our hope that the manuscripts published in this special issue keep AAQR readers updated on the recent advances in aerosol filtration, gaseous-pollutant control, and gas-separation technology. The 13th World Filtration Congress, which will occur in 2020 from April 20 till 24, will be hosted by the American Filtration & Separations Society (AFS) at Hilton San Diego Bayfront Hotel in San Diego, California, U.S.A. More information can be found on AFS's website at https://www.afssociety.org/latest-news/afs-will-host-the-13th-world-filtration-congress-wfc-13/.

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Received for review, September 23, 2017
Revised, September 23, 2017
Accepted, October 11, 2017