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New synthetic nano-aerosol for accelerated realistic ageing of air filters

*Original*

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# FILTECH 2019

Koelnmesse · October 22–24, 2019

**FILTECH**

October 22 – 24, 2019  
Cologne – Germany

The Filtration Event  
[www.Filtech.de](http://www.Filtech.de)

# Abstract Book

International Conference & Exhibition for  
Filtration and Separation Technology

# FILTECH 2019 · October 22–24

**Venue:**

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**Organizer:**

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Abstract Book  
Proceedings on USB-Stick or paper download

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# Session Overview

Monday 21.10.2019 09:00-18:00h

Short Course I · Solid/Liquid Separation

Short Course II · Fine Dust Separation

Tuesday, 22.10.2019

08:30	Registration				
10:15	Opening Session				
10:45 12:00	<b>PL</b> Plenary Lecture – Dr. Harald Anlauf, Academic Director – Karlsruhe Institute of Technology (KIT) / Germany Centrifugation – Key technology for solid/liquid/liquid separation				
Lunch – Fair					
	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 2 – 2<sup>nd</sup> floor</b>	<b>Room 4A – 4<sup>th</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>
13:00 14:15	<b>K1</b> Keynote Lecture 1 Prof. Dr. H. Nirschl	<b>L1</b> Particle and Slurry Characterization	<b>M1</b> Membrane Design and Characterization	<b>G1</b> Air Filtration	<b>F1</b> Enhancement of Filter Media by Surface Treatment
Coffee Break – Fair					
14:45 16:00	<b>K2</b> Keynote Lecture 2 Prof. Dr. A. Mukhopadhyay	<b>L2</b> Particle, Slurry and Cake Characterization	<b>M2</b> Micro and Ultra Filtration	<b>G2</b> Cabin Air Filters	<b>F2</b> Progress in Wire Mesh Development
Coffee Break – Fair					
16:45 18:00	<b>L3</b> Cake Filtration - Influences on the Cake Structure	<b>L4</b> Wet Particle Fractionation	<b>F3</b> Advanced Filter Media Developments and Manufacturing Methods	<b>G3</b> Gas and Particle Separation	<b>G4</b> Mist and Droplet Separation
18:00	Get Together Reception				

Wednesday, 23.10.2019

	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 2 – 2<sup>nd</sup> floor</b>	<b>Room 4A – 4<sup>th</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>
09:00 10:15	<b>L5</b> Cake Filtration - Characterization, Modelling, Scale-up	<b>G5</b> Surface Filtration I	<b>M3</b> Separation of Complex Systems	<b>F4</b> Quality Control and Pore Size Analysis of Filter Media	<b>F5</b> Bio-Inspired Innovation of Separation
Coffee Break – Fair					
10:45 12:00	<b>K3</b> Keynote Lecture 3 Dr.-Ing. S. Haep	<b>L6</b> Cake Filtration - Characterization, Modelling, Simulation	<b>M4</b> Ceramic Membranes and Fouling	<b>G6</b> Surface Filtration II	<b>F6</b> Performance Improvements of Nonwovens
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Coffee Break – Fair					
	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 4A – 4<sup>th</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>	
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16:00 16:45	Poster Presentation	Poster Presentation	Poster Presentation	Poster Presentation	Poster Presentation
	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 2 – 2<sup>nd</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>	<b>Room 2 – 2<sup>nd</sup> floor</b>
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Thursday, 24.10.2019

	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 2 – 2<sup>nd</sup> floor</b>	<b>Room 4A – 4<sup>th</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>
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Lunch – Fair					
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Coffee Break – Fair					
	<b>Room 1A – 1<sup>st</sup> floor</b>	<b>Room 1B – 1<sup>st</sup> floor</b>	<b>Room 4A – 4<sup>th</sup> floor</b>	<b>Room 4B – 4<sup>th</sup> floor</b>	
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Programme is subject to amendments. Up-to-date Programme is available at [www.Filtech.de](http://www.Filtech.de)

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Institute of Particle Technology

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## NEW SYNTHETIC NANO-AEROSOL FOR ACCELERATED REALISTIC AGEING OF AIR FILTERS

Jesús Marval, Luis Medina, Emanuele Norata, Paolo Tronville\*  
Politecnico di Torino – Corso Duca degli Abruzzi 24, 10129 Turin – Italy

\*Corresponding and presenting author

### ABSTRACT

To assess reliably the energy impact of air filters, it is essential to ascertain changes of their airflow resistance during their whole service life and not just when they are clean.

Current laboratory standards simulate the ageing of air filters by dispersing and loading synthetic dusts with particle size distribution (PSD) completely different from the particulate matter (PM) found in urban atmospheres. Since the size (diameter) of aerosol particles is especially important in determining the kinetics of the clogging process of an air filter, this technique does not replicate the real behavior of the filters in operation. The current methods used for artificial filter ageing are considered acceptable for rating and comparing the performance of air filters, but do not provide an accurate prediction of their airflow resistance increase in a real environment. Therefore, the duration and energy-use assessment of HVAC filters cannot be reliably estimated by means of current laboratory test dusts.

We describe various methods for generating nanoparticles having approximately the same particle size distribution of a typical urban aerosol, but at higher mass concentrations. The purpose is to allow accelerated ageing in a similar way to what happens in actual service conditions.

The paper describes the thermal aerosol generator chosen to produce the desired particle size distribution of the synthetic aerosol in an existing test rig according to ISO 16890:2016 specifications. This generator produces a high number of nanoparticles by burning a salt stick (e.g. made with KCl) with an oxy-propane flame. The salt vapor condenses in the air stream to form a cloud of ultrafine particles.

We present some preliminary data characterizing this thermal generator and we discuss some critical aspects to standardize the new ageing procedure with a synthetic aerosol closely representing a typical urban atmosphere.

### KEYWORDS

Aerosol Generation, Ageing, Dust Loading, Nano Aerosols,  
Particle Size Distribution, Test Dust.

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