International Online Workshop on Multidimensional Particle Characterisation

27-29 January 2021

Multidimensional particle characterisation is of key importance for the understanding of complex multiphase products across all length scales from molecules to particles, complex materials and devices. Unifying principles for the comprehensive design of particulate products in particular include the characterisation of the particles along the five dimensions of size, shape, surface, structure and composition.

Cutting-edge tomographic TEM- and X-ray-microscopy-based techniques open unique views into the internal microstructure of single particles, particle agglomeration, porous materials and photonic structures on different length scales. Analytical ultracentrifugation with its unprecedented accuracy, resolution and reproducibility allows determination of the band gap vs. size dependencies of quantum dots or the measurement of the full 2-dimensional distributions of plasmonic nanorods in one single experiment. Particle formation processes can be monitored in situ by advanced spectroscopic and scattering techniques to enable the tailoring of particle properties in continuous processes in several reaction setups. Gas phase analytics serve as powerful tool to characterise air born particles as well as particles from liquid phase using spraying technologies.

From 27 to 29 January 2021, the Erlangen Collaborative Research Centre 1411 on “Design of Particulate Products” (www.crc1411.research.fau.eu), the Priority Programme 2045 “Highly specific and multidimensional fractionation of fine particle systems with technical relevance” (www.tu-freiberg.de/fakult4/mvtat/SPP2045) and the LUM company (www.lum-gmbh.com) jointly organise an international workshop on multidimensional characterisation of particle systems. Experts from industrial and academic perspectives will review the status quo of multidimensional particle characterisation using state-of-the-art and newly developed methodologies. A special focus is laid upon the identification of key challenges and intersections of the different techniques. The latter is of particular importance, as particle systems of continuously increasing complexity require diverse and multi-instrumental approaches to tackle their multidimensional properties. The scientific exchange between the different experts in the field of particle characterisation will aim in this way for the identification of future prospects of particle characterisation. Overall, the workshop format will promote intense discussions and exchange between the participants and may thus become further the nucleus of future joint activities.

Participation at the workshop is ***free of charge*** but registration is mandatory to log into the online event via ZOOM.

Further information and registration is available on the workshop website:
www.crc1411.research.fau.eu/international-workshop-multidimensional-particle-characterisation/

Workshop programme:

27 January 2021		
13:30	Welcome address by Wolfgang Peukert (*FAU*), Urs Peuker (*TU Bergakademie Freiberg*) and Dietmar Lerche (*LUM GmbH*)	
Session 1: Functional nanoparticles and their characterisation challenges		
14:00	Characterisation of plasmonic and magnetic NPs for biomedical applications	Thanh Nguyen *University College London, UK*
14:30	Development of nano-flow cytometry for the multiparameter characterisation of functional nanoparticles	Xiaomei Yan *Xiamen University, China*
15:00	Challenges and solutions for the multidimensional characterisation of plasmonic patchy particles	Robin Klupp Taylor *FAU, Germany*
15:30	Integrating single particle and ensemble approaches for the characterisation of plasmonic nanoparticles: Are we there yet?	Laura Fabris *Rutgers University, USA*
16:00	Break	
Session 2: Gas phase analytics		
16:15	Multidimensional aerosol mobility-mass measurements: Application in plasma and colloidal systems	Chris Hogan *University of Minnesota, USA*
16:45	Characterisation of aerosol-generated nanoparticles: From ensemble average to single-particle analysis	Maria E Messing *Lund University, Sweden*
17:15	Bulk and surface properties of metal nanoparticles and their influence on particle-wall collisions	Alfred Weber *TU Clausthal, Germany*
17:45	Density determination for particles of unknown shape by mobility classified mass spectrometry	Christian Lübbert *FAU, Germany*
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Session 3: 3D characterisation of particles and particle aggregates I		
14:00	Internal structure and packing of particles: Quantitative morphological analysis and simulations based on electron tomographic reconstructions	Christian Kübel *Karlsruhe Institute of Technology, Germany*
14:30	Multidimensional particle characterisation – particle discrete information – application for separation	Urs Peuker *TU Bergakademie Freiberg, Germany*
15:00	Correlative laboratory nano-CT and 360° electron tomography: Perspectives for scale-bridging characterisation of particles and pore structures	Erdmann Spiecker *FAU, Germany*
15:30	Break	
Session 4: 3D characterisation of particles and particle aggregates II		
15:45	Electron tomography for the study of intriguing materials science and physics phenomena	Gerald Kothleitner *Graz University of Technology, Austria*
16:15	Electron tomography in materials science: From supraparticles to individual atoms	Sara Bals *University of Antwerp, Netherlands*
16:45	Atomic electron tomography of nanoparticles for magnetic and catalytic applications	Colin Ophus *Berkeley Lab, USA*

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Session 5: Sedimentation analysis for dispersions I

13:00	Multidimensional characterisation of nanoparticles by analytical ultracentrifugation with multiwavelength detection	Helmut Cölfen *University of Konstanz, Germany*
13:30	High field stability of ferrofluids for separation of plastics	B.H. (Ben) Erne *Utrecht University, Netherlands*
14:00	Identification, bio-corona and lifecycle releases of nanoparticles: Analytical ultracentrifugation and related techniques	Wendel Wohlleben *BASF SE, Germany*
14:30	Break	

Session 6: Sedimentation analysis for dispersions II

14:45	Approaches for multidimensional property characterisation of particles using sedimentation analytics	Johannes Walter *FAU, Germany*
15:15	Progress of analytical centrifugation: Multidimensional characterisation of nanoparticles	Dietmar Lerche *LUM GmbH, Germany*
15:45	Closing remarks by Wolfgang Peukert (FAU)	