Characterization and adsorption-based applications of nanoporous materials

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The workshop program will focus on adsorption measurement techniques and methodologies for the assessment of adsorption properties and textural/structural characterization of novel nanoporous materials including zeolites, carbons, MOFs as well as materials consisting of hierarchically structured pore networks. A major point will be the correlation of textural properties, adsorption behavior, catalytic reaction pathways as well as transport properties with applications in gas and energy storage, separations and catalysis. Within this framework, the workshop will offer a platform for scientific discussions and for a knowledge transfer between various scientific areas where diffusion and transport properties of porous materials are of importance.

The workshop will include an in-depth discussion of gravimetric and manometric adsorption techniques and their application areas. Within this context, we will provide a general view of state-of-the-art gravimetric sorption analysis using magnetic-suspension balances (MSB). The implications of density determination with equations of state and the MSB will be discussed, which will finally lead to a practical approach on how to reliably determine measurement uncertainties. Another main topic is the application of manometric adsorption techniques coupled with advanced theoretical and molecular simulation-based methods for a reliable textural characterization of nanoporous materials. We will also highlight adsorption-based applications of porous materials correlated with structure-property relationships for applications in gas separation and storage.

Martin Hartmann studied chemistry at TU Dortmund and obtained his Ph.D. in 1993. He held postdoctoral positions at the University of Houston (1994-1995) and the University of Stuttgart (1996-1999) and finished his Habilitation in Chemical Technology at TU Kaiserslautern in 2002. In 2005, he accepted an offer to be Professor of Advanced Materials Science at the University of Augsburg. He joined the Friedrich-Alexander-University Erlangen-Nürnberg (FAU) in 2009 to become Professor of Catalysis and Director of the Erlangen Catalysis Resource Center (ECRC). His research interests focus on the synthesis and spectroscopic characterization of porous materials for applications in catalysis, separation and energy storage. He published more than 220 papers in peer-reviewed journals (> 10,000 citations, HI = 49). M. Hartmann served as President of the German Zeolite Association from 2011 to 2017. Currently, he is member of the council of International Zeolite Association (IZA) and Chairman of the Catalysis Commission of IZA

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Markus Richter is full professor of applied thermodynamics at the department of mechanical engineering of Chemnitz University of Technology. His major research focus is on the accurate experimental determination of thermophysical properties of fluid mixtures, including measurements of density, speed of sound, viscosity and dielectric permittivity over wide temperature and pressure ranges. In 2015, Markus Richter was admitted into the Emmy Noether Program of the German Research Foundation, awarding him a five-year grant for fundamental research on phase equilibria of fluid mixtures, which also involves the investigation of sorption phenomena. These investigations mainly deal with sorption effects on quasi non-porous surfaces, however, functionalized porous materials became part of the research program as well. The applied methods are gravimetric sorption analysis (using custom magnetic-suspension balances), Raman spectroscopy and molecular dynamics simulation. Markus Richter's research is also part of the cluster of excellence RESOLV and the collaborative research center Oxyflame. In 2018, Markus Richter was admitted into the "Young College" of the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts.

Prof. Dr. Matthias Thommes is the Head (Chair) of the Institute for Separation Science and Technology, which belongs to the Department of Chemical and Biological Engineering (CBI) at the Friedrich-Alexander-University Erlangen-Nürnberg (FAU), Germany. He is a Visiting Professor at the University of Edinburgh, U.K. (since 2012) and currently holds also a Guest Professor position at Lorraine University, Nancy, France. In addition, he holds and held leadership positions in a number of authoritative bodies in his field including: Board of Directors of the International Adsorption Society (IAS), Council Member of the International Zeolite Association (IZA), Chairman of the IUPAC (International Union for Pure and Applied Chemistry) Task Group "Physisorption of Gases, with Special Reference to the Evaluation of Surface Area and Pore Size Distributions", Chair/Vice-Chair of the Separations Division Area 2e, American Institute of Chemical Engineering (AIChE, 2013–2017), Convener of the International Standard Organization (ISO) Working Group on Surface Area and Porosity, Principal Scientific Advisor to the new ARPA-E/DOE funded NIST/FACT laboratory (Gaithersburg, Maryland). He has also been a Council Member of the International Mesostructured Materials Association (IMMA, 2006-2013). He also serves as Editorial Board Member of the journals Adsorption, Advanced Porous Materials, and Adsorption Science &Technology. Prof. Thommes has authored/co-authored more than 125 scientific papers, reviews and book chapters, patents as well as a monograph on the characterization of porous solids and powders. He has an H-index of 44 (Google Scholar) and has given more than 200 presentations, including invited plenary and keynote lectures at prestigious international scientific conferences and universities all over the world. In addition, Prof. Thommes has co-chaired various important scientific conferences (e.g. the CPM workshop series) and symposia in the field of adsorption and materials characterization.

Prof. Thommes has received his Doctorate in Physical Chemistry in 1993 at the Technical University Berlin (1992/93). From 1992-1995, he was a Project Scientist for a microgravity experiment on critical adsorption, which was carried out on the EURECA mission of the European Space Agency (ESA). From 1996-1997, he was an ESA fellow and Postdoctoral Research Associate at the Institute for Physical Science and Technology at the University of Maryland at College Park, USA. In 1998, he joined Quantachrome as Head of Applications Department at Quantachrome GmbH, Germany (until 2001), followed by a move to the headquarters of Quantachrome in Boynton Beach, FL, where he held the position of Scientific Director until he became Full Professor at FAU in June 2018.