



1st International Workshop on Reacting Particle-Gas Systems

Collaborative Research Center 287 – BULK-REACTION

Ruhr-Universität Bochum

Program for Tuesday 7th June 2022:

07:00 pm “Welcome Reception” in the Mercure Hotel Bochum City

Program for Wednesday 8th June 2022:

All keynote lectures will take place in **Hall 2 b** of the VZ (Veranstaltungszentrum)

09:00 am	Introduction CRC – Prof. Dr.-Ing. Viktor Scherer	
09:30 am	Keynote IV – Prof. Jennifer Curtis (University of California, USA): Irregular soil particle shape modelling	
10:30 am	Coffee break	
11:00 am	Session I Hall 2 a	Session II Hall 1
12:20 pm	Lunch in “RUB Mensa”	
01:20 pm	Keynote II – Prof. Dr. Bernhard Peters (University of Luxembourg, LUX): Recent developments and challenges in reacting granular multi-phase flows	
02:20 pm	Session III Hall 2 a	Session IV Hall 1
03:40 pm	Coffee break	
04:10 pm	Session V Hall 2 a	Session VI Hall 1
05:30 pm	Bus transport to “Museum unter Tage”	
from	Guided tour “Museum unter Tage”	
06:00 pm	Conference Dinner Baristoteles	
	Bus transport to the Hotels and Bochum HBF (main station)	

Program for Thursday 9th June 2022:

09:00 am	Keynote III – Prof. Jonathan Seville (University of Birmingham, UK): Positron emission imaging methods in process engineering	
10:00 am	Poster session and Coffee break	
11:20 am	Session VII – Examples from industry - -Hall 2b	
12:00 pm	Lunch in “RUB Mensa”	
01:00 pm	Keynote I – Prof. Jim Wild (University of Sheffield, UK): Methods and applications of hyperpolarised ¹²⁹ Xe magnetic resonance	
02:00 pm	Session VIII Hall 2 a	Session IX Hall 1
03:20 pm	Wrap-Up	
03:40 pm	End of workshop	



Details Sessions:

8th June, 11:00 am – Sessions:

Session I	
11:00 am	<p>CFD-DEM simulation of raceway dynamics and coke combustion in an ironmaking blast furnace <u>Shuai Wang</u> Organization(s): University of New South Wales, Australia</p>
11:20 am	<p>Coke-Air interactions in the raceway region of an iron-making blast-furnace <u>Navid Aminnia, Bernhard Peters</u> Organization(s): University of Luxembourg, Luxembourg</p>
11:40 am	<p>Reduction and sintering behaviour of combusted iron powder in a packed bed reactor <u>Conrad Hessels¹, Anke Smeets¹, Giulia Finotello^{1,2}, Yali Tang^{1,2}, Tess Homan^{1,2}, Niels Deen^{1,2}</u> Organization(s): 1: Power and Flow Group, Department of Mechanical Engineering, Eindhoven University of Technology, P.O. Box 513, 5600MB Eindhoven The Netherlands; 2: Eindhoven Institute of Renewable Energy Systems (EIRES), P.O. Box 513, 5600MB Eindhoven, The Netherlands</p>
12:00 am	<p>Modelling of a biomass-based iron ore direct reduction process <u>Tao Wang, Oliver Mirgoux, Fabrice Patisson</u> Organization(s): University of Lorraine, France</p>

Session II	
11:00 am	<p>In situ characterisation of particle formation in spray flame synthesis using wide-angle light scattering <u>Franz Johann Thomas Huber, Simon Aßmann, Peter Lang, Stefan Will</u> Organization(s): Lehrstuhl für Technische Thermodynamik (LTT) and Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany (FAU)</p>
11:20 am	<p>Turbulence effects on the formation and growth of nano-particles in premixed and non-premixed flames <u>Luis Cifuentes, Irenaeus Wlokas, Andreas Kempf</u> Organization(s): Chair for Fluid Dynamics, Institute for Combustion and Gas Dynamics (IVG), University of Duisburg-Essen</p>
11:40 am	<p>Secondary Motion of Non-spherical Particles in Gas-Solid Flows <u>Cihan Ates, Rainer Koch, Hans-Jörg Bauer</u> Organization(s): Institute of Thermal Turbomachinery, Karlsruher Institut für Technologie</p>
12:00 am	<p>Ignition and flame propagation in lean hybrid mixtures of flammable dusts and gases <u>Ulrich Krause¹, Zaheer Abbas², Dieter Gabel¹</u> Organization(s): 1: Otto von Guericke University Magdeburg, Germany; 2: Roche Diagnostics GmbH, Penzberg, Germany</p>



8th June, 02:20 pm – Sessions:

Session III	
02:20 pm	<p>Microstructured-based prediction of drag forces in particle-laden flows: Characterisation of local anisotropy using Minkowski tensors and Voronoi diagrams</p> <p><u>Nelly El Achkar</u>, Fabien Evrard, Victor Chéron, Berend van Wachem Organization(s): OVGU, Germany</p>
02:40 pm	<p>Microstructural aspects of combusted iron powder for green energy carrier application</p> <p><u>Laurine Choisez</u>¹, Niek van Rooij², Conrad Hessels², Alisson da Silva¹, Yan Ma¹, Isnaldi Souza Filho¹, Philip de Goey², Hauke Springer^{1,3}, Dierk Raabe¹ Organization(s): 1: Max-Planck Institut für Eisenforschung GmbH, Germany; 2: Eindhoven University of Technology, Netherlands; 3: RWTH Aachen University, Germany</p>
03:00 pm	<p>Modelling of the laminar droplet-laden reactive flow around a vaporizing aluminum particle using a population balance approach</p> <p><u>Jannis Finke</u>, <u>Fabian Sewerin</u> Organization(s): Otto-von-Guericke-Universität Magdeburg, Germany</p>
03:20 pm	<p>Flowsheet Simulation of a Chemical Looping Combustion Process for Solid Fuels</p> <p><u>Lennard Lindmüller</u>, Stefan Heinrich Organization(s): Hamburg University of Technology, Germany</p>

Session IV	
02:20 pm	<p>Simulation of Flow Mixing in Packed Beds using Porous Media Model and Resolved Particle Model with experimental Validation</p> <p><u>Eckehard Specht</u> Organization(s): Otto-von-Guericke-Universität Magdeburg, Germany</p>
02:40 pm	<p>Jet dispersion and velocity measurements in a packed bed using 3D printing, LIF and stereoscopic-PIV</p> <p><u>Afrinbanu Mehboob Merchant</u>, Frank Beyrau, Berend van Wachem Organization(s): OVGU, Germany</p>
03:00 pm	<p>Investigating the inflow into a granular bed using a locally resolved method</p> <p><u>Maximilian Brömmer</u>, Maik Scharnowski, Siegmart Wirtz, Viktor Scherer Organization(s): Ruhr Uni Bochum, Germany</p>
03:20 pm	<p>Investigation of porous drag and permeability at porous-fluid interface</p> <p><u>Wojciech Sadowski</u>, Francesca di Mare Organization(s): Chair of Thermal Turbomachines and Aeroengines, Ruhr-University Bochum</p>



8th June, 04:10 pm – Sessions:

Session V	
04:10 pm	<p>Numerical Study of Heat Transfer Phenomena within an Array of Fixed Cylinders using Thermal-Compressible Lattice Boltzmann Method: Comparison with Experimental Results</p> <p><u>Reza Namdarkedenji</u>¹, Hesameddin Safari², Mohammadhassan Khodsiani³, Seyed Ali Hosseini^{2,4}, Benoit Fond^{3,5}, Frank Beyrau³, Fathollah Varnik¹, Dominique Thévenin²</p> <p>Organization(s): 1: Interdisciplinary Centre for Advanced Materials Simulation (ICAMS), Ruhr-University Bochum, 44801 Bochum, Germany; 2: Laboratory of Fluid Dynamics and Technical Flows, University of Magdeburg "Otto von Guericke", D-39106 Magdeburg, Germany; 3: Laboratory of Technical Thermodynamics, Otto-von-Guericke-Universität Magdeburg, Universitätsplatz 2, 39106 Magdeburg, Germany; 4: Department of Mechanical and Process Engineering, ETH Zürich, 8092 Zürich, Switzerland; 5: Department of Aerodynamics, ONERA the French Aerospace Lab, 92190 Meudon</p>
04:30 pm	<p>Eulerian-Lagrangian simulation of dense reactive gas-particle flows in fluidized beds</p> <p>Junjie Lin, <u>Kun Luo</u>, Jianren Fan</p> <p>Organization(s): State Key Laboratory of Clean Energy Utilization, Zhejiang University (ZJU), Hangzhou 310027, China</p>
04:50 pm	<p>Modelling adsorptive mass transfer properties of oxyfuel gases in porous biomass chars</p> <p><u>Carsten Wedler</u>¹, Markus Richter², Roland Span³</p> <p>Organization(s): 1: Department of Chemical Engineering, Imperial College London, United Kingdom; 2: Applied Thermodynamics, Chemnitz University of Technology, Germany; 3: Thermodynamics, Ruhr University Bochum, Germany</p>
05:10 pm	<p>Numerical study of pneumatic conveying of flexible elongated biomass particles through a pipe bend by DEM-CFD</p> <p>Darius Markauskas, Stefan Platzk, <u>Harald Kruggel-Emden</u></p> <p>Organization(s): TU Berlin, Germany</p>

Session VI	
04:10 pm	<p>Quantitative Imaging of Gas Adsorption Equilibrium and Dynamics by X-ray Computed Tomography</p> <p><u>Ronny Pini</u>¹, Sayed Alireza Hosseinzadeh Hejazi²</p> <p>Organization(s): 1: Imperial College London, United Kingdom; 2: Amirkabir University of Technology, Islamic Republic of Iran</p>
04:30 pm	<p>Development of a Cost-effective PET-like Detector System for Particle Tracking in Granular Assemblies</p> <p><u>Josephine Oppotsch</u>, Antonios Athanassiadis, Fritz-Herbert Heinsius, Thomas Held, Matthias Steinke, Ulrich Wiedner</p> <p>Organization(s): Ruhr-University Bochum, Germany</p>
04:50 pm	<p>Applying Ray Tracing Based Reconstruction to Particle Image Velocimetry Measurements of Gaseous Flow in Packed Beds</p> <p><u>Christin Velten</u>¹, <u>Mirko Ebert</u>², Christian Lessig², Katharina Zähringer¹</p> <p>Organization(s): 1: Laboratory of Fluid Dynamics and Technical Flows, University of Magdeburg, Universitätsplatz 2, 39106 Magdeburg, Germany; 2: Department of Computer Science, University of Magdeburg, Universitätsplatz 2, 39106 Magdeburg, Germany</p>
05:10 pm	<p>Magnetic Resonance Relaxometry and susceptibility of contemporary 3D printing materials</p> <p><u>Mariia Anikeeva</u>¹, Maitreyi Sangal², Maryia S Pravdivtseva^{1,3}, Hendrik Mattern², Oliver Speck^{2,4,5,6}, Jan-Bernd Hövener^{1,3}</p> <p>Organization(s): 1: Section Biomedical Imaging, Molecular Imaging North Competence Center (MOIN CC), Kiel University, Kiel, Germany; 2: Department of Biomedical Magnetic Resonance, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany; 3: Department of Radiology and Neuroradiology, University Medical Center Schleswig-Holstein (UKSH), Kiel, Germany; 4: Center for Behavioral Brain Sciences, Magdeburg, Germany; 5: German Centre for Neurodegenerative Diseases, Magdeburg, Germany; 6: Leibniz Institute for Neurobiology, Magdeburg, Germany</p>



9th June, 10:00 am – Postersession:

1	<p>Experimental investigations on the adsorptive mass transfer of H₂O vapor on HTC char particles Tim Eisenbach¹, Horacio A. Duarte², Carsten Wedler³, Roland Span¹ Organization(s): 1: Ruhr University Bochum, Germany; 2: Texas A&M University Kingsville, USA; 3: Imperial College London, UK</p>
2	<p>Dielectrical and micro-structural properties of pyrolyzed biomass Nicole Vorhauer-Huget¹, Jakob Seidenbecher¹, Supriya Bhaskaran¹, Francesca Schenkel², Lucas Briest¹, Jan Barowski², Alba Dieguez Alonso¹ Organization(s): 1: Otto von Guericke University, Germany; 2: Ruhr University Bochum, Germany</p>
3	<p>Effect of boundary reactions on biomass char conversion under pulverized fuel combustion conditions Hao Luo¹, Weigang Lin², Hao Wu² Organization(s): 1: Wuhan University of Science and Technology, China; 2: Technical University Of Denmark, Denmark</p>
4	<p>Incorporation of Flamelets Generated Manifold method in coarse-grained Euler-Lagrange simulations of pulverized coal combustion Chih-Chia Huang¹, Yali Tang^{1,2}, Jeroen van Oijen^{1,2}, Niels G. Deen^{1,2} Organization(s): 1: Power & Flow group, Department of Mechanical Engineering, Eindhoven University of Technology, PO Box 513, 5600 MB, Eindhoven, the Netherlands; 2: Eindhoven Institute of Renewable Energy Systems (EIRES), Eindhoven University of Technology, PO Box 513, 5600 MB, Eindhoven, the Netherlands</p>
5	<p>Concepts Towards a Microwave Imaging System for Particle Localization in Bulk Material Francesca Schenkel¹, Jonas Schorlemer¹, Birk Hattenhorst², Marcel van Delden², Jan Barowski¹, Thomas Musch², Ilona Rolfes¹ Organization(s): 1: Institute of Microwave Systems, Ruhr University Bochum, Universitätsstraße 150, 44801 Bochum, Germany; 2: Institute of Electronic Systems, , Ruhr University Bochum, Universitätsstraße 150, 44801 Bochum, Germany</p>
6	<p>Spatially resolved drying kinetics of single particles using adaptive pore structures Xiang Lu, Jing Chen, Abdolreza Kharaghani Organization(s): Thermal Process Engineering, University of Magdeburg</p>
7	<p>Investigation of thermal radiation propagation within a generic packed bed configuration with simplified particle geometries Matthias Tyslik¹, Mirko Ebert², Christian Lessig², Siegmund Wirtz¹, Martin Schiemann¹ Organization(s): 1: Ruhr-University Bochum, Germany; 2: University of Magdeburg, Germany</p>
8	<p>NeuroPNM: Model Reduction of Pore Network Models using Neural Networks Robert Jendersie¹, Ali Mjalled², Xiang Lu³, Lucas Reineking², Abdolreza Kharaghani³, Martin Mönnigmann², Christian Lessig¹ Organization(s): 1: Otto-von-Guericke-Universität Magdeburg, Germany; 2: Ruhr University Bochum, Germany; 3: Otto-von-Guericke-Universität Magdeburg, Germany</p>
9	<p>A Eulerian description of aluminum dust combustion in a laminar counterflow flame Fabian Sewerin, Jannis Finke Organization(s): Otto-von-Guericke-Universität Magdeburg, Germany</p>
10	<p>Particle temperature distribution in granular assemblies using luminescence thermometry and radiative transfer simulation Guangtao Xuan¹, Mirko Ebert¹, Simson Julian Rodrigues¹, Christian Lessig¹, Nicole Vorhauer-Huget¹, Benoît Fond^{1,2} Organization(s): 1: Otto-von-Guericke-Universität Magdeburg; 2: Office National d'Études et de Recherches Aérospatiales (ONERA)</p>
11	<p>A combined flue gas cleaning system with a novel entrained flow SCR using an online synthesized catalyst Janis Beimdiek, Sascha Schiller, Hans-Joachim Schmid Organization(s): Paderborn University, Germany</p>
12	<p>Storage Effects on the Properties of Biomass Pellets Abdullah Sadeq, Swantje Pietsch-Braune, Maksym Dosta, Stefan Heinrich Organization(s): Hamburg University of Technology, Germany</p>
13	<p>Configuration-related errors in numerical and experimental studies of gaseous flow in packed beds Christin Velten¹, Wojciech Sadowski², Katharina Zähringer¹, Francesca di Mare² Organization(s): 1: Laboratory of Fluid Dynamics and Technical Flows, Otto-von Guericke-University Magdeburg, Universitätsplatz 2, 39106 Magdeburg, Germany; 2: Chair of Thermal Turbomachines and Aeroengines, Ruhr-University Bochum, Universitätsstraße 150, 44780 Bochum, Germany</p>



14	Influence of particle shape on mixing on a batch stoker grate: A comparison of spheres and dodecahedrons <u>Nikoline Hilse</u> , Max Kriegeskorte, Viktor Scherer Organization(s): Ruhr-University Bochum, Germany
15	Decomposition kinetics of lumpy dolomite particles for carbon dioxide absorption from flue gas <u>Waliyu Abdulkadir Aliyu</u> Organization(s): Otto von Guericke Universität Magdeburg, Germany
16	Going beyond multiphase CFD — On recent developments towards real fluid behaviour and material interactions <u>Holger Marschall</u> Organization(s): Technische Universität Darmstadt, Germany
17	Combining the Multi-Level Coarse-Grain Model of the DEM with an Unreacted Shrinking Core Model for Simulations of Iron Ore Reduction <u>Daniel Queteschiner</u> ¹ , <u>Thomas Lichtenegger</u> ¹ , <u>Simon Schneiderbauer</u> ^{1,2} , <u>Stefan Pirker</u> ¹ Organization(s): 1: Department of Particulate Flow Modelling, Johannes Kepler University Linz, Austria; 2: Christian Doppler Laboratory for Multi-Scale Modelling of Multiphase Processes, Johannes Kepler University Linz, Austria
15 informational posters – Subprojects CRC 287	

9th June, 11:20 pm – Session: Examples from industry

Session VII	
11:20 am	Methane pyrolysis: CO₂ free production of hydrogen from natural gas <u>David Schlereth</u> , <u>Clemens Thomas Chan-Braun</u> , Rouven Weiler, Grigorios Kolios, Johannes Bode, Dieter Flick Organization(s): BASF SE, Ludwigshafen, Germany
11:40 am	The challenge of simulating industrial fluidised beds <u>Adlan Omer</u> , Martin Weng Organization(s): aixprocess GmbH, Germany



9th June, 02:00 pm – Sessions:

Session VIII	
02:00 pm	<p>Experimental study of regeneration of iron fuel using hydrogen in a lab-scale fluidized bed <u>Xin Liu</u>¹, Xu Zhang^{2,3}, Jun Li², Qingshan Zhu^{2,3}, Niels Deen^{1,4}, Yali Tang^{1,4} Organization(s): 1: Power and Flow Group, Department of Mechanical Engineering, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands; 2: State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, China; 3: School of Chemical Engineering, University of Chinese Academy of Sciences, Beijing 100049, China; 4: Eindhoven Institute for Renewable Energy Systems (EIRES), Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands</p>
02:20 pm	<p>Bulk particle process simulation with parametrized reduced single particle models <u>Lucas Reineking</u>¹, Jonas Fischer², Enric Illana², Siegmund Wirtz², Viktor Scherer², Martin Mönnigmann¹ Organization(s): 1: Automatic Control and Systems Theory, Ruhr-University Bochum, Germany; 2: Energy Plant Technology, Ruhr University Bochum, Germany</p>
02:40 pm	<p>Study of the thermally thin and thermally thick particle approaches on the Eulerian modelling of an internally cooled biomass combustor César Álvarez-Bermúdez, <u>Miguel Ángel Gómez</u>, Sergio Chapela, Jacobo Porteiro Organization(s): CINTECX-GTE, Universidade de Vigo, Lagoas-Marcosende s/n, Vigo, Pontevedra, 36310, Spain</p>
03:00 pm	<p>Particle-resolved transient simulations of reactive transport in non-adiabatic packed bed reactors <u>Claire Claassen</u>, Vishak Chandra, Maïke Baltussen, Frank Peters, Hans Kuipers Organization(s): Eindhoven University of Technology, Netherlands</p>

Session IX	
02:00 pm	<p>On the discrepancies in results of gas-solid kinetics by TGA: the cases of biomass combustion and iron ore reduction <u>Osvalda Senneca</u>¹, Francesca Cerciello² Organization(s): 1: CNR, Italy; 2: RUB, Germany</p>
02:20 pm	<p>CFD-based kinetic analysis of thermochemical conversion in a high-pressure TGA <u>Fengbo An</u>, Felix Küster, Stefan Guhl, Andreas Richter Organization(s): TU Bergakademie Freiberg, Germany</p>
02:40 pm	<p>Effective thermal conductivity in packed beds of polyhedral particles <u>Simson Julian Rodrigues</u>, Nicole Vorhauer-Huget, Evangelos Tsotsas Organization(s): Thermal Process Engineering, Otto von Guericke University Magdeburg, Germany</p>
03:00 pm	<p>Experimental investigation of the interaction between the flame and the particles in packed beds <u>Mohammadhassan Khodsiani</u>¹, Reza Namdarkedenji², Hesameddin Safari¹, Seyed Ali Hosseini^{1,3}, Frank Beyrau¹, Dominique Thévenin¹, Fathollah Varnik², Benoît Fond^{1,4} Organization(s): 1: Chair of Technical Thermodynamics, Otto-von-Guericke Universität Magdeburg, 39106 Magdeburg, Germany; 2: Interdisciplinary Centre for Advanced Materials Simulation (ICAMS), Ruhr-University Bochum, 44801 Bochum, Germany; 3: Department of Mechanical and Process Engineering, ETH, Zürich, 8092 Zürich, Switzerland; 4: ONERA - The French Aerospace Lab - Centre de Meudon 8, rue des Vertugadins - 92190 MEUDON</p>