Fluidization XVII Technical Program

Monday, May 22nd

Opening Reception
5:30 PM – 7:00 PM: Sheraton Grand Hotel and Spa, Atrium

Monday, May 22nd

Welcome Remarks – Richard Williams & Raffaella Ocone

9:00 AM - 10:00 AM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Richard Williams, Principal & Vice-Chancellor, Heriot-Watt University

Raffaella Ocone, Fluidization XVII Co-Chair, Professor, Chemical Engineering, Heriot-Watt University

Plenary 1 - Joan Cordiner

9:00 AM - 10:00 AM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
9:00 AM
Digital Future of Chemical Industry- Challenges and Opportunities
Joan Cordiner, Chemical and Biological Engineering, University of Sheffield, Sheffield, United Kingdom

Applications Session 1: Design & Operability

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
10:30 AM
KEYNOTE: 100 Years of Scaling Up Fluidized Bed and Circulating Fluidized Bed Reactors
Jia Chew, Particulate Solid Research, Inc. (PSRI), Chicago, IL and Ray Cocco, Retired

11:00 AM
Experimental Investigation on Motion Characteristics and Thermal Behaviour of Lumps in Gas-Solid Fluidized-Bed Reactors
Matteo Errigo, Department of Chemical Engineering, University College London, London, United Kingdom, Massimiliano Materazzi, Department of Chemical Engineering, University College London, United Kingdom and Paola Lettieri, Department of Chemical Engineering, University College London - Torrington Place, London WC1E 7JE, United Kingdom

11:15 AM
Detection of Defluidization in Fluidized Beds
Tadaaki Shimizu1, Shota Fueki2, Mayu Watanabe2, Liuyun Li1 and Heizo Kato2, (1)Program of Chemistry and Chemical Engineering, Niigata University, Niigata, Japan, (2)Niigata University, Niigata, Japan

11:30 AM
Experimental and Modelling Study of the Volatiles Distributor for Improving the Horizontal Gas Distribution in Fluidized Beds
Xiaoyun Li1, Anders Lyngfelt1, Carl Linderholm1 and Tobias Mattisson2, (1)Chalmers University of Technology, Gothenburg,
Sweden, Space, Earth, and Environment, Chalmers University of Technology, Göteborg, Sweden

11:45 AM
Agglomeration Potential of Tropical Residual Biomass – Investigation on the Interactions between Ash Elements and Quartz Sand
Sebastian Achury Ortiz1, Pedro Joaquín Perilla Vargas2, Diana Carolina Guío-Pérez3, Sonia Lucia Rincon-Prat1 and Thomas Heinrich Cramer2, (1)Department of Mechanical and Mechatronics Engineering, Universidad Nacional de Colombia, Bogotá, Colombia, (2)Departamento de Geociencias, Universidad Nacional de Colombia, Bogotá, Colombia, (3)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

Fundamentals Session 1: Bubbling & Mixing & Segregation

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:
10:30 AM
KEYNOTE: Faraday Waves in Granular Particles Subject to Combined Gas Flow and Vibration
Qiang Guo1, Wei Da1, Jingyi Wei2, Christopher Spitter1 and Christopher Boyce1, (1)Department of Chemical Engineering, Columbia University, New York, NY, (2)Chemical Engineering, University of the Basque Country (UPV/EHU), Bilbao, Spain

11:00 AM
Spout Geometry of Fine Particle Conical Spouted Beds Equipped with Fountain Confiner
Maider Bolanos1, Xabier Sukunza1, Mikel Tellabide1, Idoia Estiati1, Haritz Altzibar1, Miriam Arabiourrutia1 and Martin Olazar2, (1)Chemical Engineering, University of the Basque Country (UPV/EHU), Bilbao, Spain, (2)Chemical Engineering, University of the Basque Country UPV/EHU, Leioa, Spain

11:15 AM
Gas Lateral Mixing in a Fluidized Bed – the Effect of the Solid Particles
Diana Carolina Guío-Pérez1, Ulla Praisa2, Bo Leckner3 and David Pallarès1, (1)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2)Eindhoven University of Technology, Eindhoven, Netherlands, (3)Chalmers University of Technology, Gothenburg, Sweden

11:30 AM
Bubble Characteristics in a Fluidized Bed Stripper for Three Types of Internals
Allan Issangya1, S. B. Reddy Karri2, T. M. Knowlton1, Raymond Cocco1 and Jia Chew1, (1)Particulate Solid Research, Inc. (PSRI), Chicago, IL, (2)Consulting, Particulate Solid Research, Inc. (PSRI), Chicago, IL

11:45 AM
The Influence of Fluidising Gas Density and Viscosity on Segregation in a Cylindrical Fluidised Bed Separator
Shanguang Ping1,2, G.J. Nathan3, Peijun Guo1,2 and Woei Lean Saw1,2, (1)School of Chemical Engineering and Advanced Materials, The University of Adelaide, Adelaide, SA, Australia, (2)Centre for Energy Technology, The University of Adelaide, Adelaide, SA, Australia, (3)School of Mechanical Engineering, The University of Adelaide, Adelaide, SA, Australia

Applications Session 2: Circular Economy I - Waste

1:15 PM - 2:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:
1:15 PM
CFD-DEM Modeling of Gas-Solid Reacting Flow (rCFD-DEM): From New Approaches to Industry Applications
Yansong Shen, Chemical Engineering, University of New South Wales, Sydney, Australia

1:45 PM
Gasification of Refuse Derived Fuels in Bubbling Bed Reactors: Bed-Freeboard Coupled Models, Results and Validation
Alex Sebastiani1, Stefano Iannello1 and Massimiliano Materazzi2, (1)Chemical Engineering, University College London, London, United Kingdom, (2)Department of Chemical Engineering, University College London, United Kingdom

2:00 PM
Plastics-Bed Interaction in Industrial Fluidized Bed Reactors during Thermochemical Conversion Processes
Stefano Iannello, Chemical Engineering, University College London, London, United Kingdom and Massimiliano Materazzi, Department of Chemical Engineering, University College London, United Kingdom

2:15 PM
Jonathan Seville1, Gary A. Lecke1, Kit Windows-Yule1, Rex B. Thorpe2, Adrian Griffiths3, Marvine Besong3, Alejandro Sanchez2 and Suchismita Bhattacharya1, (1)Chemical Engineering, University of Birmingham, Birmingham, United Kingdom, (2)Chemical and Process Engineering, University of Surrey, Guildford, United Kingdom, (3)Recycling Technologies, Swindon, United Kingdom

2:30 PM
Effect of CaO Additives on PET Steam Gasification in Bubbling Fluidized Bed
Shouzhuang Li, Muddasser Inayat and Mika Jarvinen, Energy conversion and systems, Aalto University, Espoo, Finland

Modelling Session 1: Circulating Fluidized Beds
1:15 PM - 2:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
1:15 PM
Novel Methods for the Efficient Calibration and Rigorous Validation for Simulations of Fluidised and Spouted Beds
Kit Windows-Yule, Chemical Engineering, University of Birmingham, Birmingham, No State, United Kingdom, Dominik Werner, University of Birmingham, Birmingham, No State, United Kingdom, Andrei-Leonard Nicusan, University of Birmingham, Birmingham, West Midlands, United Kingdom, Hanqiao Che, Institute of Engineering Thermophysics, Chinese Academy of Sciences, Beijing, China and Jonathan Seville, Chemical Engineering, University of Birmingham, Birmingham, United Kingdom

1:45 PM
Markku Nikku, Lappeenranta-Lahti University of Technology LUT, Lappeenranta, Finland and Jouni Ritvanen, LUT University, Lappeenranta, Finland

2:00 PM
A Novel Multi-Resolution Hybrid CFD-DEM Method for High-Fidelity Modelling of Cross-Scale Particulate-Fluid Flow
Zhouzun Xie, Chemical Engineering, University of New South Wales, Sydney, NSW, Australia and Yansong Shen, Chemical Engineering, University of New South Wales, Sydney, Australia

2:15 PM
A Hard Toolbox to Improve Supervision of PhD Studies
David Pallarés, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

2:30 PM
On the Accuracy of the Energy Minimization Multiscale (EMMS) Model for Circulating Fluidized Beds
Pedram Paksresht1, Yuan Yao1, Yi Fan1, Jorg Theuerkauf2, Jesper Capeceletro2 and Sathvik Bhat3, (1)Engineering and Process Science, Core R&D, The Dow Chemical Company, Lake Jackson, TX, (2)Engineering and Process Science, Core R&D, The Dow Chemical Company, Midland, MI, (3)Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

Fundamentals Session 2: Fluctuating Motions
3:15 PM - 4:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
3:15 PM
KEYNOTE: Combining fluidization and gas-phase coating: surface modification at the nanoscale
J Ruud Van Ommen, Chemical Engineering, Delft University of Technology, Delft, No State, Netherlands

3:45 PM
Fluidization and Mixing Behavior of Nano and Micron Sized Particles in a Vibrated Fluidized Bed
Zhi Cheng Hua, Swantje Pietsch-Braune and Stefan Heinrich, Institute of Solids Process Engineering and Particle Technology,
Surface Waves and Pressure Fluctuations in Fluidized Beds with an Oscillating Plate
Jiantao Li1, Li Niu2, Dening Jia3 and Xiaotao Bi4, (1)State Key Laboratory of Heavy Oil Processing, China University of Petroleum (Beijing), Beijing, China, (2)Chemical Engineering, China University of Petroleum, Beijing, Beijing, China, (3)Chemical and Biological Engineering, University of British Columbia, Vancouver, BC, Canada

Finding the Golden Threads: A History of (some) Women in Chemical Engineering
Nina Baker, Unaffiliated, Glasgow, United Kingdom and Raffaella Ocone, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

Migration Characteristics of Fine Cohesive Particles in a Vibrating Gas-Solid Fluidized Bed
Yoshihide Mawatari, Ryouses Nakamura, Kyohei Sonoda and Chihiro Suizu, Applied Chemistry, Kyushu Institute of Technology, Kitakyushu, Japan

Modelling Session 2: Systems Modelling

3:15 PM - 4:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

3:15 PM
KEYNOTE: Modeling and Harnessing Mesoscale Structures in Fluidization and Multiphase Reactors
Xiaoping Guan, State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China

3:45 PM
Today’s Tools in the Scale up and Optimization of Today’s Fluidized Processes
Raymond Cocco, Particulate Solid Research, Inc. (PSRI), Chicago, IL, Peter Blaser, CPFD Software, Houston, TX and James Parker, CPFD Software, Portland, OR

4:15 PM
A Novel Approach to Construct Equivalent Reactor Network (ERN) Models for a CFB Riser
Yupeng Du, Yantai University, Yantai, China

4:30 PM
Development of an Artificial Neural Network EMMS Drag Model for the Simulation of Fluidized Beds in Chemical Looping Combustion
Panagiotis Stamatopoulos1, Dionisis Stefanitsis1, Myrto Zeneli2, Konstantinos Atsonios1 and Nikos Nikolopoulos1, (1)Centre of Research and Technology Applications Chemical Process & Energy Resources Institute (CERTH/CPERI), Athens, Greece, (2)National Technical University of Athens, Athens, Greece

Lightning Presentations - Applications

4:45 PM - 5:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

4:45 PM
Regulating the Crude Oil to Chemical Process in a Multizone Fluidized Bed Reactor Using Intraparticle Heat Carriers
Mengmeng Cui1, Alla Dikhtiatenko1, Shekhar Kulkarni1, Diego Zapater Bes1, Tuiana Shoinkhorova1, Isa Al Aslani1, Mohammad Alabdullah1, Jahirul Mazumder1, Ruben Iran Medina Flores1, Arwa Alahmadi1, Lujain Alfilfil2, Isidoro Morales
Influence of chemical phases on the mechanical strength of oxygen carrier bed particles

Victor Purnomo1, Robin Faust1, Lidiya Abdisa Ejjeta1, Erik Sandell1, Mattias Hertzberg1, Tobias Mattisson2 and Henrik Leion1,
1)Chemistry and Chemical Engineering, Chalmers University of Technology, Göteborg, Sweden, 2)Space, Earth, and Environment, Chalmers University of Technology, Göteborg, Sweden

A Novel Approach for the Autonomous Control of Fluidized Beds with Intelligent Digital Twins Based on Transient Flowsheet Simulations

Robert Kräuter1, Xiye Zhou1, Sven Schiffner2, Swantje Pietsch-Braune1, Stefan Heinrich1, Przemysław Komarnicki2 and Mirko Peglow1,
1)Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany, 2)Fraunhofer Institute for Factory Operation and Automation IFF, Magdeburg, Germany, 3)Pergande Group, Weißandt-Görlitz, Germany

The Techno-Economics of Electrification of Heat and Power Plants with Thermochemical Energy Storage – a Swedish Case Study

Guillermo Martinez Castilla, Diana Carolina Guio-Pérez, Javier Cortés Romea, Alla Toktarova, David Pallarès, Filip Johnsson and Henrik Thunman, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

Proof of Concept Calcination Kinetic in TGA and Fluidised Bed Reactor

Kyra Boege and Juergen Karl, Chair of Energy Process Engineering, Friedrich-Alexander-University Erlangen-Nuremberg, Nuremberg, Germany

Experimental and Modelling Study of CO2 Adsorption for Carbonized Residues Using a Thermo-Gravimetric Fluidized Bed

Gregor Tondl, Adrian Kronawitter and Christoph Pfeifer, University of Natural Resources and Life Sciences, Vienna, Austria

Physical Modelling and Hydrodynamical Characterization of an Internally Circulating Fluidized Bed for Biomass Fast Pyrolysis

Maurizio Troiano1, Stefano Padula2, Roberto Solimene3 and Piero Salatino1,
1)Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, 2)Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, 3)Scienze e Tecnologie per L’Energia e La Mobilità Sostenibili, Consiglio Nazionale delle Ricerche, Napoli, Italy

Investigation of Mixing/Segregation Patterns of Two Dissimilar Granular Solids in Fluidized BEDS By Capacitance Probes

Laura Molignano1,2, Maurizio Troiano2, Roberto Solimene3, Sina Tebianian1, Jean-François Joly1 and Piero Salatino2,
1)Direction Conception Modélisation Procédés, IFP Energies Nouvelles, Solaize, France, 2)Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, 3)Istituto di Scienze e Tecnologie per L’Energia e La Mobilità Sostenibili, Consiglio Nazionale delle Ricerche, Napoli, Italy

Pilot-Plant Investigation of High-Temperature Thermochemical Energy Storage Based on the Material System CaO/Ca(OH)2 in a Bubbling Fluidized Bed

Leander Morgenstern, Elia Talebi, Stephan Gleis, Florian Kerscher and Hartmut Spliethoff, Chair of Energy Systems, Technical University of Munich, Garching b. München, Germany

BIO-OIL Steam Gasification in a Fountain Confined Spouted BED

Maria Cortazar Dueñas1, Jon Alvarez2, Gartzen Lopez3, Laura Santamaria2, Enara Fernandez4, Irati Garcia5, Maider Amutio3 and Martin Olazar6, (1)Chemical Engineering, University of the Basque Country, Leioa, Spain, (2)Chemical Engineering, University of the Basque Country UPV/EHU, Leioa, Spain, (4)Chemical Engineering, University of the Basque Country, Leioa, Spain, (5)Chemical Engineering, University of the Basque Country, Leioa, Spain, (6)Chemical Engineering, University of the Basque Country (UPV/EHU), Leioa, Spain
5:05 PM  
Calculation of the Nusselt Module in a Spouted Bed Reactor from Artificial Neural Networks  
Juan F. Saldarriaga, Environmental Engineering, Universidad de los Andes, Bogotá, Colombia; Chemical Engineering, The Basque Country University, Bilbao, Spain and Julián López, Environmental Engineering, Institución Universitaria Colegio Mayor de Antioquia, Medellín, Colombia

5:07 PM  
Rapid Stabilization of Aluminum Dross Ash By Fluidized Bed Steam Treatment  
Reiji Noda, Department of Environmental Engineering Science, Gunma University, Kiryu, Gunma, Japan, Hirotaka Togashi, Gunma University, Kiryu, Japan and Akio Futawatari, JEMCO Co. Ltd., Midori, Japan

5:09 PM  
Measurement of Bubble Property Distributions for Better Description of Mass Transfer Limitations in Chemical Reactors  
Philipp Riechmann and Tilman Schildhauer, Paul Scherrer Institut, Villigen PSI, Switzerland

5:11 PM  
Roles of Fluidization Technology in Thermal Engineering for a Sustainable Future  
Atsushi Tsutsumi, Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

Lightning Presentations - Fundamentals & Modelling

4:45 PM - 5:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

4:45 PM  
Simulation of an Autothermal Steam Oxygen-Bubbling Fluidized Bed Gasification of Biomass Waste for Hydrogen and Biofuel Production  
Bara Anaya, Chemical Engineering, University College London, London, United Kingdom and Massimiliano Materazzi, Department of Chemical Engineering, University College London, United Kingdom

4:47 PM  
Comparison of Pumping Costs in Different Fluidization Technologies for CSP Applications with SiC Particles  
Minerva Díaz-Heras¹, Juan Ignacio Corcoles Tendero¹, Pedro Domínguez² and José Antonio Almendros Ibáñez³, (1)Instituto de Investigación en Energías Renovables. Escuela Técnica Superior de Ingenieros Industriales, Universidad de Castilla-La Mancha, Albacete, Spain, (2)Instituto de Investigación en Energías Renovables, Universidad de Castilla-La Mancha, Albacete, Spain

4:49 PM  
Numerical Study of the Fluidization of the Binary Types of Particles Using SOM-KTGF-MT  
Dan Sun, National Institute of Clean-and-low-carbon Energy, Beijing, China

4:51 PM  
Fluidization of Size Segregating Binary Mixture  
Harshal G. Gamit, Nikhil Singh, Srinivas Seethamraju and Manaswita Bose, Department of Energy Science and Engineering, Indian Institute of Technology Bombay, Mumbai, India

4:53 PM  
Simulation of a Granular Gas with Non-Spherical Particles - A Stochastic Modeling Approach  
Muhammed Gbolasere, School of Mechanical Engineering, Purdue University, West Lafayette, IN and Aaron Morris, School of Mechanical Engineering, Purdue University, West Lafayette, IN

4:55 PM  
Effect of Particle Size on Solids Distribution in Dense Gas-Liquid-Solid Flow in a Slurry Bubble Column  
Sohela Manna, Chemical Engineering, IIT Delhi, New Delhi, India and Vivek Buwa, Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India

4:57 PM  
Investigation of Particle Properties and Dynamic Modelling of Fluidized Bed Spray Granulation for Its Autonomous Control with Intelligent Digital Twin
Xiye Zhou, Robert Kräuter, Swantje Pietsch-Braune and Stefan Heinrich, Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany

4:59 PM
Bubble Dynamics in Gas Fluidisation of Nonspherical Particles
Zongyan Zhou1,2, Siddhartha Shrestha1 and Aibing Yu1, (1)Jiangxi University of Science and Technology, Nanchang, China, (2)Chemical Engineering, Monash University, Melbourne, Australia

5:01 PM
Dynamic Bubble Tracking in Fluidized Beds Via Electrical Capacitance Volume Tomography
Lennard Lindmüller1, Brigham Watson1, Stefan Heinrich1, Jorg Theuerkauf2, Yuan Yao3, Yi Fan3 and Jesse Capecelatro4, (1)Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany, (2)Engineering and Process Science, Core R&D, The Dow Chemical Company, Midland, MI, (3)Engineering and Process Science, Core R&D, The Dow Chemical Company, Lake Jackson, TX, (4)Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

5:03 PM
A Quantitative Relationship between the Magnitude of Interparticle Forces and the Hausner Ratio
Iman Soleimani1, Jaber Shabanian1 and Jamal Chaouki1, (1)Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada, (2)Polytechnique Montreal, Montreal, Canada

5:05 PM
Systematic Analysis of Mixing Segregation Patterns in Polydisperse Fluidised Beds for Combined Catalytic Applications
Hualun Zhu, Paolo Lettieri and Massimiliano Materazzi, Department of Chemical Engineering, University College London, London, United Kingdom

5:07 PM
Understanding Features in Fluidisation Curves for the Evaluation of Powder Cohesivity
Amalia Thomas, Freeman Technology, Tewkesbury, United Kingdom, Alexander Routh, University of Cambridge, Cambridge, United Kingdom and Nathalie Vriend, University of Colorado, Boulder, CO

5:09 PM
Bed-Wall Frictional Loss in a Bubbling Bed with Horizontal Flow of Solids
Munavara Farha1, Diana Carolina Guío-Pérez1, Mohsen Issa Nimvari2, David Pallarès1 and Filip Johnsson1, (1)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2)Department of Chemical & Biological Engineering, University of Ottawa, Ottawa, ON, Canada

5:11 PM
Investigation on Conveying Mechanisms for Forcing Solids Horizontal Circulation Under Bubbling Fluidized Bed Conditions
Munavara Farha, Diana Carolina Guío-Pérez, Filip Johnsson and David Pallarès, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

5:13 PM
Particle Circulation and Mixing Kinetics in Bubbling Fluidised Beds Using Pept
Dominik Werner1, Adam Wellings2, Kit Windows-Yule1, Jonathan Seville1, Rex B. Thorpe1, Suchismita Bhattacharya2, Alejandro Sanchez2 and Marvine Besong2, (1)Chemical Engineering, University of Birmingham, Birmingham, United Kingdom, (2)Recycling Technologies, Swindon, United Kingdom, (3)Chemical and Process Engineering, University of Surrey, Guildford, United Kingdom

5:15 PM
Characterization of the Solids Flow in Circulating Fluidized Beds By High-Frequency-Radar Measurements
Diana Carolina Guío-Pérez1, Marlene Bonmann2, Filip Johnsson1 and David Pallarès1, (1)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2)Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

Poster Session & Reception

5:45 PM - 7:15 PM: Sheraton Grand Hotel and Spa, Atrium
Presentations:

**Large-scale thermochemical energy storage using high-temperature solid cycles – impact of electricity system composition**

Alla Toktarova, Guillermo Martínez Castilla, Diana Carolina Guio-Pérez, David Pallarès and Filip Johnsson, (1)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2)Department of Mechanical and Mechatronics Engineering, Universidad Nacional de Colombia, Bogotá, Colombia

**Regulating the Crude Oil to Chemical Process in a Multizone Fluidized Bed Reactor Using Intraparticle Heat Carriers**

Mengmeng Cui, Alla Dikhtiarenko, Shekhar Kulkarni, Diego Zapater Bes, Tuiana Shoinkhoroava, Isa Al Aslani, Mohammad Alabdullah, Jahirul Mazumder, Ruben Iran Medina Flores, Arwa Alahmadi, Lujain Alfifi, Isidoro Morales Osorio, Khalid Almajnouni, Jorge Gascon and Pedro Castaño, (1)KAUST Catalysis Center, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, (2)Fuels and Chemicals Division, Research and Development Center, Saudi Aramco, Thuwal, Saudi Arabia

**Systematic Analysis of Mixing Segregation Patterns in Polydispersed Fluidised Beds for Combined Catalytic Applications**

Hualun Zhu, Paola Lettieri and Massimiliano Materazzi, Department of Chemical Engineering, University College London, London, United Kingdom

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Amalia Thomas, Freeman Technology, Tewkesbury, United Kingdom, Alexander Routh, University of Cambridge, Cambridge, United Kingdom and Nathalie Vriend, University of Colorado, Boulder, CO

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Leander Morgenstern, Elija Talebi, Stephan Gleis, Florian Kerscher and Hartmut Spiliethoff, Chair of Energy Systems, Technical University of Munich, Garching b. München, Germany

**Effect of Particle Size on Solids Distribution in Dense Gas-Liquid-Solid Flow in a Slurry Bubble Column**

Sohela Manna, Chemical Engineering, IIT Delhi, New Delhi, India and Vivek Buwa, Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India

**Bed-Wall Frictional Loss in a Bubbling Bed with Horizontal Flow of Solids**

Munavara Farha, Diana Carolina Guio-Pérez, Mohsen Isaac Nimvari, David Pallarès and Filip Johnsson, (1)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2)Department of Chemical & Biological Engineering, University of Ottawa, Ottawa, ON, Canada

**Investigation of Particle Properties and Dynamic Modelling of Fluidized Bed Spray Granulation for Its Autonomous Control with Intelligent Digital Twin**

Xiye Zhou, Robert Kräuter, Swantje Pietsch-Braune and Stefan Heinrich, Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany

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**Calculation of the Nusselt Module in a Spouted Bed Reactor from Artificial Neural Networks**

Juan F. Saldarriaga, Environmental Engineering, Universidad de los Andes, Bogotá, Colombia; Chemical Engineering, The Basque Country University, Bilbao, Spain and Julián López, Environmental Engineering, Institución Universitaria Colegio Mayor de Antioquia, Medellín, Colombia

**Rapid Stabilization of Aluminum Dross Ash By Fluidized Bed Steam Treatment**

Reiji Noda, Department of Environmental Engineering Science, Gunma University, Kiryu, Gunma, Japan, Hirotaka Togashi, Gunma University, Kiryu, Japan and Akio Futawatari, JEMCO Co. Ltd., Midori, Japan

**Investigation on Conveying Mechanisms for Forcing Solids Horizontal Circulation Under Bubbling Fluidized Bed Conditions**

Munavara Farha, Diana Carolina Guio-Pérez, Filip Johnsson and David Pallarès, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

**Particle Circulation and Mixing Kinetics in Bubbling Fluidised Beds Using Pept**
Characterization of the Solids Flow in Circulating Fluidized Beds By High-Frequency-Radar Measurements
Diana Carolina Guío-Pérez1, Marlene Bonmann2, Filip Johnsson1 and David Pallarès1, (1) Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (2) Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

Measurement of Bubble Property Distributions for Better Description of Mass Transfer Limitations in Chemical Reactors
Philipp Riechmann and Tilman Schildhauer, Paul Scherrer Institut, Villigen PSI, Switzerland

Roles of Fluidization Technology in Thermal Engineering for a Sustainable Future
Atsushi Tsutsuji, Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

Bubble Dynamics in Gas Fluidisation of Nonspherical Particles
Zongyan Zhou1, 2, Siddhartha Shrestha2 and Aibing Yu2, (1) Jiangxi University of Science and Technology, Nanchang, China, (2) Chemical Engineering, Monash University, Melbourne, Australia

Dynamic Bubble Tracking in Fluidized Beds Via Electrical Capacitance Volume Tomography
Lennard Lindmüller1, Brigham Watson1, Stefan Heinrich1, Jorg Theuerkauf2, Yuan Yao3, Yi Fan3 and Jesse Capeceletro4, (1) Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany, (2) Engineering and Process Science, Core R&D, The Dow Chemical Company, Midland, MI, (3) Engineering and Process Science, Core R&D, The Dow Chemical Company, Lake Jackson, TX, (4) Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

A Quantitative Relationship between the Magnitude of Interparticle Forces and the Hausner Ratio
Iman Soleimani1, Jaber Shabani2 and Jamal Chaouki1, (1) Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada, (2) Polytechnique Montreal, Montreal, Canada

Physical Modelling and Hydrodynamical Characterization of an Internally Circulating Fluidized Bed for Biomass Fast Pyrolysis
Maurizio Troiano1, Stefano Padula2, Roberto Solimene3 and Piero Salatino1, (1) Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, (2) Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, (3) Scienze e Tecnologie per l’Energia e la Mobilità Sostenibili, Consiglio Nazionale delle Ricerche, Napoli, Italy

Investigation of Mixing/Segregation Patterns of Two Dissimilar Granular Solids in Fluidized BEDS By Capacitance Probes
Laura Mollignano1, 2, Maurizio Troiano3, Roberto Solimene1, Sina Tebianian1, Jean-François Joly1 and Piero Salatino2, (1) Direction Conception Modélisation Procédés, IFP Energies Nouvelles, Solaize, France, (2) Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, (3) Istituto di Scienze e Tecnologie per L’Energia e La Mobilità Sostenibili, Consiglio Nazionale delle Ricerche, Napoli, Italy

Simulation of a Granular Gas with Non-Spherical Particles - A Stochastic Modeling Approach
Muhammed Gbolasere, School of Mechanical Engineering, Purdue University, West Lafayette, IN and Aaron Morris, School of Mechanical Engineering, Purdue University, W Lafayette, IN

Influence of chemical phases on the mechanical strength of oxygen carrier bed particles
Victor Purnomo1, Robin Faust1, Lidiya Abdisa Ejjeta1, Erik Sandell1, Mattias Hertzberg1, Tobias Mattisson2 and Henrik Leion1, (1) Chemistry and Chemical Engineering, Chalmers University of Technology, Göteborg, Sweden, (2) Space, Earth, and Environment, Chalmers University of Technology, Göteborg, Sweden

Effect of Reaction Temperature and Regeneration Temperature of DME Carbonylation to MA Reaction on Regeneration of Spray-Drying Ferrierte catalyst
Woochang Sung, Hyun Seung Jung, Jun Young Kim, Jiyoung Kim, Jong Wook Bae and Dong Hyun Lee, School of chemical engineering, Sungkyunkwan University (SKKU), Suwon-si, Gyeonggi-do, Korea, Republic of (South)

Pressure Fluctuations in a Gas-Solid Fluidized Bed at Temperatures up to 1650°C
Liangliang Fu, Qingjin Zhang, Dingrong Bai and Guangwen Xu, Key Laboratory on Resources Chemicals and Material of Ministry of Education, Shenyang University of Chemical Technology, Shenyang, China
The Role of Cohesion in the Formation of a Raceway of a Blast Furnace

Sebastiaan Kuipers1, Chih-Chia Huang1, Niels Deen1,2 and Yali Tang1,2, (1)Mechanical Engineering, Eindhoven University of Technology, Eindhoven, Netherlands, (2)Eindhoven Institute for Renewable Energy Systems, Eindhoven, Netherlands

A Novel Approach for the Autonomous Control of Fluidized Beds with Intelligent Digital Twins Based on Transient Flowsheet Simulations

Robert Kräuter1, Xiye Zhou1, Sven Schiffner2, Swantje Pietsch-Braune1, Stefan Heinrich1, Przemyslaw Komarnicki2 and Mirko Peglow2, (1)Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany, (2)Fraunhofer Institute for Factory Operation and Automation IFF, Magdeburg, Germany, (3)Pergande Group, Weilimd-Götzau, Germany

Performance of a Limestone-Based Coupled Fluidized Bed Reactor System Aiming CO2 Capture in a 300 kWth Pilot Plant

Comparison of Pumping Costs in Different Fluidization Technologies for CSP Applications with SiC Particles

Minerva Díaz-Heras1, Juan Ignacio Corcoles Tendero1, Pedro Domínguez2 and José Antonio Almendros Ibáñez2, (1)Instituto de Investigación en Energías Renovables. Escuela Técnica Superior de Ingenieros Industriales, Universidad de Castilla-La Mancha, Albacete, Spain, (2)Instituto de Investigación en Energías Renovables, Universidad de Castilla-La Mancha, Albacete, Spain

Hydrodynamic Study of a Bench Scale Fountain Confined Conical Spouted Bed Reactor for Biomass Torrefaction

Xabier Sukunza1, Maider Bolanos1, Mikel Tellabide1, Idoia Estiti1, Roberto Aguado Sr.1 and Martín Olazar2, (1)Chemical Engineering, University of the Basque Country (UPV/EHU), Bilbao, Spain, (2)Chemical Engineering, University of the Basque Country (UPV/EHU), Leioa, Spain

Fundamentals and Applications of Float-Sink in a Gas-Solid Fluidized Bed for Dry Separation

Numerical Study of the Fluidization of the Binary Types of Particles Using SOM-KTGF-MT

Dan Sun, National Institute of Clean-and-low-carbon Energy, Beijing, China

Deep Learning for Drag Force Modelling in Dilute, Poly-Dispersed Particle-Laden, Gas-Solid Flows with Irregular-Shaped Particles

Mathematical Modelling of a Bubbling Fluidized Bed Gasifier for High Ash Indian Coal

Kuldeep Singh, Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India and Shantanu Roy, Department of Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India

Study on Separation Density of Gas-Solid Fluidized Bed Based on Defluidized Hood Theory

Transformation of Plastic into the Liquid Fuel

Kartik Upadhyay, Chemical, PKG Group of Institution, Ambala, India

Use of a Vibrofluidizing Bed for Drying Orange Bagasse

Ana M. Barbosa1, Thalyne Rocha2, José T. Freire2, Fabio Freire2 and Juan F. Saldarriaga1,2, (1)Civil and Environmental Engineering, Universidad de los Andes, Bogotá, Colombia, (2)Chemical Engineering, Federal University of San Carlos, Sao Carlos, Brazil, (3)Chemical Engineering, The Basque Country University, Bilbao, Spain

Optimization of Heat Transfer Coefficient in a Fluidized Adsorption Bed By Gene Expression Programming Approach


JI Young Nam1, Myung Won Seo2, Diyar Tokmurzin3, Ho Won Ra3 and Dong Hyun Lee4, (1)School of chemical engineering, Sungkyunkwan University (SKKU), Suwon-si, Gyeonggi-do, Korea, Republic of (South), (2)School of Environmental Engineering, University of Seoul, Seoul, Korea, Republic of (South), (3)Climate Change Research Division, Korea Institute of Energy Research (KIER), Daejeon, Korea, Republic of (South)

The Techno-Economics of Electrification of Heat and Power Plants with Thermochemical Energy Storage – a Swedish Case Study

Guillermo Martinez Castilla, Diana Carolina Guio-Pérez, Javier Cortés Romea, Alla Toktarova, David Pallarés, Filip Johnsson and Henrik Thunman, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

Proof of Concept Calcination Kinetic in TGA and Fluidised Bed Reactor
Kyra Boege and Juergen Karl, Chair of Energy Process Engineering, Friedrich-Alexander-University Erlangen-Nuremberg, Nuremberg, Germany

Bayesian Optimization of Deep Learning Algorithms in Sorption Processes
Dorian Skrobek¹, Jaroslaw Krzywanski¹, Anna Zylka¹, Karolina Grabowska¹, Marcin Sosnowski¹, Anna Kulakowska¹, Wojciech Nowak², Waqar Muhammad Ashraf³, Tomasz Czakier³ and Yunfei Gao⁴, (1)Faculty of Science and Technology, Jan Długosz University in Częstochowa, Częstochowa, Poland, (2)Faculty of Energy and Fuels, AGH University of Science and Technology, Cracow, Poland, (3)Department of Chemical Engineering, University College London, London, United Kingdom, (4), Department of Advanced Energy Technologies, Częstochowa University of Technology, Częstochowa, Poland, (5)Institute of Clean Coal Technology, East China University of Science and Technology, Shanghai, China

Fluidization of Size Segregating Binary Mixture
Harshal G. Gamit, Nikhil Singh, Srinivas Seethamraju and Manaswita Bose, Department of Energy Science and Engineering, Indian Institute of Technology Bombay, Mumbai, India

Bubble Dynamics in Fluidisation of Nonspherical Particles
Lattice Boltzmann Study on Wet Particles: Capillary Interaction and Aggregate Formation
Modulation of Turbulence By Dispersed Charged Particles in Pipe Flow
Yanlin Zhao, China University of Petroleum, Beijing, China, Min Liu, China University of Petroleum (Beijing), Beijing, China and Jun Yao, China University of Petroleum-Beijing, Beijing, China

Modelling of Gas-Solid-Liquid Flow and Particle Mixing in a Rotary Drum
Xinxin Tang, Yuanye Yue, Shuai Wang and Yansong Shen, UNSW, Sydney, NSW, Australia

Floating and Sinking Behaviour of a Heat Transfer Sphere Submerged in a Gas-Solid Fluidised Bed
Pablo García-Trinanes, School of Engineering, Materials and Chemical Engineering Group, University of Greenwich, Chatham, Kent, United Kingdom

Direct Measurement of Apparent Viscosity of a Fluidized Bed Under Non-Ambient Conditions
Denis Schütz, Rheology, Anton Paar Gmbh, Graz, Austria and Kartik Pondicherry, Rheology, Anton Paar Gmbh., Graz, Austria

Experimental Investigations of Mesoscale Behavior of Solid Particles in the Gas-Liquid-Solid Circulation Fluidized Beds

Accuracy Improvement of Numerical Simulation of a Hydraulics with Wood Pellet Combustion Operating in a Full-Loop Circulating Fluidized Bed Combustor
Sang Shin Park, Computational Science & Engineering Laboratory, Korea Institute of Energy Research, Daejeon, Korea, Republic of (South) and Ji-Hong Moon, Clean Fuel Research Lab., Korea Institute of Energy Research, Daejeon, Korea, Republic of (South)

Pyrolysis and in Line Oxidative Steam Reforming of Hdpe
Mayra Alejandra Suárez Cardona¹, Santiago Orozco¹, Leire Olazar¹, Maria Cortazar Dueñas¹, Pablo Comendador¹, Gartzén Lopez²,³, Maidar Amutio¹ and Martin Olazar¹, (1)Chemical Engineering, University of the Basque Country UPV/EHU, Leioa, Spain, (2)IKERBASQUE, Basque Foundation for Science, Bilbao, Spain

Fractal Heat Exchangers
Sahar Hajizeinalibioki, Chemical and Process Engineering, University of surrey, Guildford, United Kingdom

Research on Non-Uniform Phenomena Due to Spatial Scale Effect in the Scaling up Process of CFB Boilers
Shuangming Zhang, Xinhua Yang, Tuo Zhou, Man Zhang and Hairui Yang, Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Department of Energy and Power Engineering, Tsinghua University, Beijing, China

Gas-Solid Flow Study of Multistage Fluidized Bed Red Mud Reduction Reactor with Downcomer
Hao Kong, Tuo Zhou, Zhong Huang, Man Zhang and Hairui Yang, Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Department of Energy and Power Engineering, Tsinghua University, Beijing, China

Experimental and Modelling Study of CO2 Adsorption for Carbonized Residues Using a Thermo-Gravimetric Fluidized Bed
Gregor Tondl, Adrian Kronawitter and Christoph Pfeifer, University of Natural Resources and Life Sciences, Vienna, Austria

Transformation of Waste Plastics in to Liquid Fuel
Tuesday, May 23rd

Plenary 2 - Piero Salatino

9:00 AM - 10:00 AM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
9:00 AM

**FLUIDIZATION IN NATURE: PYROCLASTIC FLOWS**
Piero Salatino, Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy

Fundamentals Session 3: AI Tools

10:30 AM - 11:45 AM: Sheraton Grand Hotel and Spa, One Space

Presentations:
10:30 AM

**Keynote: Fluidization in the Time of Sustainability Transition and Consilience**
Masayuki Horio, Chemical Engineering, Tokyo University of agriculture and Technology, Koganei, Japan

11:00 AM

**Multiphase Reactors in Solar-Assisted Fuel and Chemical Production**
Chi-Hwa Wang, Department of Chemical and Biomolecular Engineering, National University of Singapore, Singapore 117585,
Singapore and Lifeng Li, Department of Chemical and Biomolecular Engineering, National University of Singapore, Singapore, ACT, Singapore

11:15 AM
Acoustic Emission Techniques Combined with Machine Learning for Particle Size Distribution in Solid-Gas Fluidized Beds
Fria Hossein1, Matteo Errigo1, Sibo Cheng2, Panagiota Angeli3, Paola Lettieri1, Massimiliano Materazzi1 and Rossella Arcucci3, (1)Department of Chemical Engineering, University College London, London, United Kingdom, (2)Department of Computing, Imperial College London, London, United Kingdom, (3)Department of Earth Science and Engineering, Imperial College London, London, United Kingdom

11:30 AM
Optimization of Heat Transfer Coefficient in Fluidized Adsorption Bed By Gene Expression Programming Approach
Jaroslaw Krzywanski1, Wojciech Nowak2, Dorian Skrobek1, Anna Zylka3, Waqar Muhammad Ashraf4, Karolina Grabowska5, Marcin Sosnowski5, Anna Kulakowska5, Tomasz Czakiert5 and Yunfei Gao5, (1)Jan Dlugosz University of Czestochowa, Czestochowa, Poland, (2)Faculty of Energy and Fuels, AGH University of Science and Technology, Cracow, Poland, (3)Faculty of Science and Technology, Jan Dlugosz University in Czestochowa, Czestochowa, Poland, (4)Department of Chemical Engineering, University College London, London, United Kingdom, (5), Department of Advanced Energy Technologies, Czestochowa University of Technology, Czestochowa, Poland, (6)Institute of Clean Coal Technology, East China University of Science and Technology, Shanghai, China

Applications Session 3: Circular Economy II - Carbon Capture & Vectors

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

10:30 AM
Performance of a Limestone Based Coupled Fluidized Bed Reactor System Aiming CO2 Capture in a 300 kWth Pilot Plant
Carina Hofmann, Institute for Energy Systems and Technology, TU Darmstadt, Darmstadt, Germany

10:45 AM
CO2 Capture and Catalytic Methanation over Li-Ru/Al2O3 Dual Function Material in a Twin Fluidized Bed Reactor
Fiorella Massa, Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy

11:00 AM
Startup and Control Concepts for Pressurized Chemical Looping for a Plug Flow with Internal Recirculation Reactor
Nicole Bond1, Scott Champagne1, Christopher McIntyre2, Amanda Alain1 and Robin W. Hughes1, (1)CanmetENERGY, Natural Resources Canada, Ottawa, ON, Canada, (2)Hatch Ltd, Mississauga, ON, Canada

11:15 AM
Future Perspectives of Effective Utilization of Biomass -Renewable Carbon Resource
Chihiro Fushimi, Applied Physics and Chemical Engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan

11:30 AM
Thermocatalytic Decomposition of Methane in a Fluidized Bed Reactor: Proof of Concept
Morteza Hadiani1, Kay Buist1, Rene Bos2, Bennie Reesink1 and J.A.M. (Hans) Kuijpers1, (1)Chemical Engineering and Chemistry, Eindhoven University of Technology, Eindhoven, Netherlands, (2)Shell Global Solutions International B.V, Amsterdam, Netherlands, (3)BASF Nederland bv, Utrecht, Netherlands

11:45 AM
Application of Fluidized Bed Reactors for Carbon Capture
Lunbo Duan1, Zhenkun Sun2, Hongjian Tang1, Yueming Wang1, Yuanqiang Duan3, Lin Li3 and Chun Zhu3, (1)School of Energy and Environment, Southeast University, Nanjing, China, (2)Southeast University, Nanjing, ON, China, (3)School of Chemical & Biomolecular Engineering, Georgia Institute of Technology, Atlanta, GA, (4)Southeast University, Nanjing, UT, China, (5)Southeast University, Nanjing, China

Applications Session 4: Process Intensification
1:15 PM - 2:30 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

1:15 PM
An Exploratory Study of Annular Fluidized Bed Reactor with High Centrifugal Acceleration for Some Industrial Processes
Tingwen Li¹, Sreekanth Pannala¹, Christoph Dittrich² and David West¹, (1)Corporate Technology & Innovation, SABIC, Houston, TX, (2)Chemicals Technology & Innovation, SABIC, Geleen, Netherlands

1:30 PM
Experimental Investigation of Different Limestones As Sorbents for Sorption Enhanced Gasification in a Lab-Scale Dual Interconnected Fluidized Bed System
Antonio Coppola, STEMS, CNR, P.le Tecchio 80, 80125, Napoli, Italy, Fiorella Massa, Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, Fabio Montagnaro, Dipartimento di Scienze Chimiche, Università degli Studi di Napoli Federico II, Napoli, Italy and Fabrizio Scala, University of Naples Federico II, Naples, Italy

1:45 PM
Using a Heat Balance to Determine Solid Circulation Rate in a Cold Flow Plug Flow Reactor with Internal Recirculation
Amanda Alain¹, Nicole Bond¹, Scott Champagne¹, Christopher McIntyre², Sabrina Francey², Robin W. Hughes¹ and Arturo Macchi¹, (1)CanmetENERGY, Natural Resources Canada, Ottawa, ON, Canada, (2)Hatch Ltd, Mississauga, ON, Canada, (3)Chemical and Biological Engineering, University of Ottawa, Ottawa, ON, Canada

2:00 PM
Systematic Analysis of Mixing and Segregation Patterns in Polydispersed Fluidised Beds for Combined Catalytic Applications
Hualun Zhu, Paola Lettieri and Massimiliano Materazzi, Department of Chemical Engineering, University College London, London, United Kingdom

2:15 PM
The Mechanism behind Vibro-Assisted Fluidization of Cohesive Micro-Silica
Rens Kamphorst, Department of Chemical Engineering, Delft University of Technology, Delft, Netherlands

Modelling Session 3: The Role of Particle Size and Shape

1:15 PM - 2:30 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

1:15 PM
Deep Learning for Drag Force Modelling in Dilute, Poly-Dispersed Particle-Laden Flows with Irregular-Shaped Particles
Soohwan Hwang, Jianhua Pan and Liang-Shih Fan, William G. Lowrie Department of Chemical and Biomolecular Engineering, The Ohio State University, Columbus, OH

1:30 PM
Polydisperse, Segregating Fluidized Beds: From Detailed, Small-Scale Investigations to Fast, Large-Scale Simulations
Thomas Lichtenegger, Stefan Pirker and Marco Atzori, Department of Particulate Flow Modelling, Johannes Kepler University, Linz, Austria

1:45 PM
The Fragmentation-Induced Fluidization of Pyroclastic Density Currents
Eric Bread², Josef Dufek², Sylvain Charbonnier², Valentin Gueugneau³ and Thomas Giachetti², (1)University of Edinburgh, Edinburgh, United Kingdom, (2)University of Oregon, Eugene, OR, (3)University of South Florida, Tampa, FL

2:00 PM
CFD-DEM Evaluation of Rod-like Particles Size Effect on the Mixing of Fluidized BED Containing Spheres and Rod-like Particles
Saman Kazemi¹, Reza Zarghami², Navid Mostoufi², Rahmat Sotudeh-Gharebagh² and Jamal Chaouki³, (1)University of Tehran, Tehran, Iran (Islamic Republic of), (2)University of Tehran, Tehran, Iran (Islamic Republic of), (3)Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada
Experimental and Numerical Investigation of the Motion of an Object Immersed in a Fluidized Bed of Fine Particles
Farzam Fotovat1, Renaud Ansart2, William Benguigui1, Jerome Lavieville1, Olivier Simonin4 and Jamal Chaouki5, (1)Chemical and Petroleum Engineering, Sharif University of Technology, Tehran, Iran (Islamic Republic of), (2)Laboratoire de Génie Chimique, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France, (3)Fluid Mechanics, Energy and Environment Department, EDF R&D, Chatou, France, (4)Institut de Mecanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS, Toulouse, France, (5)Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada

Fundamentals Session 4: Transport Phenomena

5:30 PM - 6:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

5:30 PM  
Fundamentals Keynote-Investigation of Wet Particle Contact Mechanics  
Daniel J. Holland, Department of Chemical and Process Engineering, University of Canterbury, Christchurch, New Zealand

6:00 PM  
Float-Sink of Large Objects in a Gas-Solid Fluidized Bed Different from That in a Liquid  
Jun Oshitani, Applied Chemistry, Okayama University of Science, Okayama, Japan, Takuya Tsuji, Department of Mechanical Engineering, Osaka University, Suita, Osaka, Japan and Shusaku Harada, Division of Sustainable Resources Engineering, Hokkaido University, Sapporo, Hokkaido, Japan

6:15 PM  
Analysis of Horizontal Solids Convection and Dispersion in Fluidized Beds  
Munavara Farha, Diana Carolina Guío-Pérez, Filip Johnsson and David Pallarès, Energy Technology, Chalmers University of Technology, Gothenburg, Sweden

6:30 PM  
Instabilities in an Underflow Standpipe Operating in a Bubble-Upflow Regime  

Modelling Session 4: Heat & Mass Transfer

5:30 PM - 6:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

5:30 PM  
3D Numerical Simulation of the Heat Transfer in a Horizontal Tube Bundle in a Vertical Channel  
Juan Ignacio Corcoles Tendero1, Minerva Díaz-Heras1, Pedro Domínguez2 and José Antonio Almendros Ibáñez1, (1)Instituto de Investigación en Energías Renovables. Escuela Técnica Superior de Ingenieros Industriales, Universidad de Castilla-La Mancha, Albacete, Spain, (2)Instituto de Investigación en Energías Renovables, Universidad de Castilla-La Mancha, Albacete, Spain

5:45 PM  
How my choices shaped my career  
Carol Marsh, Celestia UK, Edinburgh, United Kingdom

6:00 PM  
The Effect of Clusters on the Heat and Mass Transfer in Fluidized Gas-Particle Flows  
Simon Schneiderbauer, Christian Doppler Laboratory for Multi-scale Modelling of Multiphase Processes, Johannes Kepler University, Linz, Austria and Stefanie Rauchenzauer, Christian Doppler Laboratory for Multi-Scale Modelling of Multiphase Processes, Department of Particulate Flow Modelling, Johannes Kepler University, Linz, Austria

6:15 PM  
Heat Transfer in a 3D Dynamically Structured Fluidized Bed  
Shuxian Jiang1, Kaiqiao Wu2 and Marc-Olivier Coppens1, (1)Centre for Nature Inspired Engineering and Department of
Chemical Engineering, University College London, London, United Kingdom, (2)Department of Chemical Engineering, Delft University of Technology, Delft, Netherlands

6:30 PM
CFD-DEM Coupled Simulation for Wet Particles Drying Process in a Fluidized Bed
Haigang Wang Sr.¹, Zhiyang Ma², Qiuya Tu², Wuqiang Yang³ and Raffaella Ocone⁴, (1)Chinese Academy of Sciences, Institute of Engineering Thermophysics, Beijing, China, (2)Chinese Academy of Sciences, Beijing, Germany, (3)The School of Electrical and Electronic Engineering, The University of Manchester, Manchester, United Kingdom, (4)School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, United Kingdom

Ceilidh & Dinner

7:15 PM – 9:15 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 2

Wednesday, May 24th

Plenary 3 - Takuya Tsuji

9:00 AM - 10:00 AM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
9:00 AM
Sink and/or float in gas-fluidized beds
Takuya Tsuji, Department of Mechanical Engineering, Osaka University, Osaka, 29, Japan

Fundamentals Session 5: Measurements I

10:30 AM - 11:45 AM: Sheraton Grand Hotel and Spa, One Space

Presentations:
10:30 AM
Understanding Particle Flows in Sub-Fluidized Horizontal Stirred Bed Reactors By Radioactive Particle Tracking
P. Christian van der Sande, Chemical Engineering, Delft University of Technology, Delft, Netherlands, Gabrie M.H. Meesters, Department of Chemical Engineering, Delft University of Technology, Delft, Netherlands and J Ruud Van Ommen, Department of Chemical Engineering, Delft University of Technology, Delft, No State, Netherlands

10:45 AM
Wanqiang Wu¹, Diana Carolina Guio-Pérez², Marlene Bonnmann², Filip Johnsson², Lunbo Duan¹ and David Pallarès², (1)School of Energy and Environment, Southeast University, Nanjing, China, (2)Energy Technology, Chalmers University of Technology, Gothenburg, Sweden, (3)Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden

11:00 AM
Magnetic Particle Tracking for Granular Flows: A Semi-Algebraic Solution
Kay Buist, Chemical Engineering and Chemistry, Eindhoven University of Technology, Eindhoven, Netherlands and Tim Nijssen, Delft University of Technology, Delft, Netherlands

11:15 AM
Effective Drag on Spheres, Rods, and Discs Immersed in a Fluidized Bed at Minimum Fluidization - Measurements and Modeling Work
Anna Köhler¹², Diana Carolina Guio-Pérez¹, Markku Nikku³, Kari Myöhänen³ and David Pallarès¹, (1)Energy Technology,
Applications Session 5: Manufacturing

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

10:30 AM
Stirrer Design for Improving Fluidization of Cohesive Powders
Kaiqiao Wu, Rens Kamphorst, Anna Bakker, Evert C. Wagner, Gabrie M.H. Meesters and J Ruud Van Ommen, Department of Chemical Engineering, Delft University of Technology, Delft, Netherlands

10:45 AM
Impact of Process Conditions on Fluidized Bed Drying: Experiments and Model Predictions
Carlin Leung1, Nina C. Shapley2, Tim A. G. Langrish1, and Benjamin Glasser1, (1)Department of Chemical and Biochemical Engineering, Rutgers, the State University of New Jersey, Piscataway, NJ, (2)Department of Chemical and Biochemical Engineering, Rutgers University, Piscataway, NJ, (3)School of Chemical and Biomolecular Engineering, The University of Sydney, Darlington, NSW, Australia

11:00 AM
The Real-Life Experience of two Ph.D. Candidates in an ITN: Benefits and Challenges
Max Winkelmann, School of Engineering, Institute for Infrastructure and Environment, The University of Edinburgh, Edinburgh, United Kingdom; Multi-Scale Mecahnics, Faculty of Engineering Technology, University of Twente, Enschede, Netherlands and Roxana Saghafian Larijani, Soil MicroMechanics, Faculty of Engineering Technology, University of Twente, Enschede, Netherlands; Johnson Matthey Technology Centre, Cleveland, United Kingdom

11:15 AM
Surface Morphology of Granules Coated with Different Materials from Fluidized Bed Spray Granulation
Maike Orth, Mariam Haschimi, Swantje Pietsch-Braune and Stefan Heinrich, Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology, Hamburg, Germany

11:30 AM
Electrostatics Charging Behavior of a Metallocene Catalyst in Gas-Solid Fluidization of Polyethylene
Mohsen Isaac Nimvari, Andrew Sowinski and Poupak Mehrani, Department of Chemical & Biological Engineering, University of Ottawa, Ottawa, ON, Canada

Applications Session 6: Energy I - Storage & Carriers

1:15 PM - 2:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

1:15 PM
Experimental and Numerical Validations of Energy Storage By Sand in a Fluidized Bed
Zhihong Liu1, Atsushi Ishikawa1, Hai Zhang2, Michitarou Hashiba3, Yang Zhang4, Wantao Yang2 and Zhang Yifei2, (1)Technology Platform Center, Technology & Intelligence Integration, IHI Corporation, Yokohama, Japan, (2)Department of
Modelling Session 5: Towards the Modelling of Large Scale

1:15 PM - 2:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

1:15 PM
Modeling and Optimizing Gas Solid Distribution in Fluidized Beds
Raj Singh¹, Scott Goleczynski² and Steve Shimoda¹, (1)Technip Energies Process Technology, Houston, TX, (2)Technip Energies, Houston, TX

1:30 PM
Industrial Scale Fluidized Bed Simulation Methodology and Bottlenecks on the Road of Exascale with Neptune CFD
Herve Neau, IMFT, CNRS, TOULOUSE, France

1:45 PM
Stochastic Modeling of Dilute and Moderately Dense Particle Flows for Large Scale Systems
Aaron Morris, School of Mechanical Engineering, Purdue University, West Lafayette, IN

2:00 PM
Almir S.L. Ritta, Laboratoire de Génie Chimique (LGC), Université de Toulouse, CNRS, INPT, UPS, Toulouse, France, Renaud Ansart, Laboratoire de Génie Chimique, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France and Olivier Simonin, Institut de Mecanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS, Toulouse, France
Fundamentals Session 6: Measurements II

3:15 PM - 4:45 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:

3:15 PM
Experimental Analysis of a Confined Bed of Granular Material As Thermal Energy Storage System
Antonio Soria-Verdugo¹, José Felix Guíl-Pedrosa², Fernando Hernández-Jiménez¹, Luis Miguel García-Gutiérrez³, Eduardo Cano-Pleite¹ and Néstor García-Hernando¹, (1)Thermal Engineering and Fluid Mechanics, University Carlos III of Madrid, Leganés, Spain, (2)University Carlos III of Madrid, Madrid, Spain

3:30 PM
Employing Positron Emission Tomography to Study the Dynamics of Droplets in Fluid Flows
Avshalom Offner, School of Mathematics, The University of Edinburgh, Edinburgh, United Kingdom

3:45 PM
We Want You to Talk during Class: A New Graduate Course on the Oral Communication of Science
Christine Hrenya, Chemical and Biological Engineering, University of Colorado, Boulder, CO

4:00 PM
Hydrodynamic Characterization of Different Geldart B Solids in Dense Gas-Fluidized Beds By Capacitance Probes
Laura Molignano¹,², Maurizio Troiano¹, Roberto Solimene¹, Sina Tebianian², Jean-François Joly² and Piero Salatino³, (1)Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, Università degli Studi di Napoli Federico II, Napoli, Italy, (2)Direction Conception Modélisation Procédés, IFP Energies Nouvelles, Solaize, France, (3)Istituto di Scienze e Tecnologie per L' Energia e La Mobilità Sostenibili, Consiglio Nazionale delle Ricerche, Napoli, Italy

4:15 PM
Mitigation of Electrostatic Charge and Its Adverse Effects in Gas-Solid Fluidized Beds
Poupak Mehrani¹, Andrew Sowinski¹, Mohsen Isaac Nimvari¹ and Nikhil Sridhar², (1)Department of Chemical & Biological Engineering, University of Ottawa, Ottawa, ON, Canada, (2)Chemical and Biological Engineering, University of Ottawa, Ottawa, ON, Canada

4:30 PM
Experimental Study on Vibro-Fluidized Bed Drying

Modelling Session 6: Coarse Grained Simulations

3:15 PM - 4:45 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:

3:15 PM
Numerical Study of the Erosion of an Immersed Tube in a Bubbling Fluidized Bed
Pedro Dominguez¹, Juan Ignacio Corcoles Tendero², José Antonio Almendros Ibáñez³ and Minerva Díaz-Heras³, (1)Instituto de Investigación en Energías Renovables, Universidad de Castilla-La Mancha, Albacete, Spain, (2)Universidad de Castilla-La Mancha, Albacete, Spain, (3)Instituto de Investigación en Energías Renovables. Escuela Técnica Superior de Ingenieros Industriales, Universidad de Castilla-La Mancha, Albacete, Spain

3:30 PM
Subgrid Drag Model Derivation from Drift Velocity Equation for Coarse-Grid Euler-Euler Simulations of Fluidized Beds
Baptiste Hardy, Institut de Mécanique des Fluides de Toulouse (IMFT), Toulouse, France, Pascal Fede, Ecoulements Et Combustion, Institut de Mécanique des Fluides de Toulouse, Toulouse, France and Olivier Simonin, Institut de Mécanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS-Toulouse, Toulouse, France
3:45 PM
Charge-Velocity Correlation Transport Equation Model with Triboelectric Effect for Gas-Solid Fluidized Bed N-Euler Simulation
Carlos Montilla, Laboratoire de Génie Chimique, Université de Toulouse, CNRS-Toulouse, Toulouse, France, Renaud Ansart, Laboratoire de Génie Chimique, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France and Olivier Simonin, Institut de Mecanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS, Toulouse, France

4:00 PM
The Development of Improved Particle Drag Force Correlations for CFD Simulation
James Parker, CPFD Software, Portland, OR

4:15 PM
Influence of Sparger Design on Local Phase Volume Fraction Distribution in a Slurry Bubble Column: ERT Measurements and Eulerian CFD Simulations
Rajneesh Saini, Chemical Engineering, IIT Delhi, Delhi, India, Sohela Manna, Chemical Engineering, IIT Delhi, New Delhi, India and Vivek Buwa, Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India

4:30 PM
CFD-DEM Modeling of Laboratory-Scale Fluidized BED Containing Binary Mixtures: Validation with Radioactive Particle Tracking (RPT) Experiments
Subi Nath, Chemical Engineering, Indian Institute of Technology, Delhi, Delhi, India and Shantanu Roy, Department of Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India

Banquet (Ticketed Event)
7:00 PM - 10:00 PM: Signet Library, Parliament Square (Entrance on the Right Side of St. Giles Cathedral)

Thursday, May 25th

Plenary 4 - Karl Jacob

9:00 AM - 10:00 AM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
9:00 AM
Teaching our Engineers: A Perspective on the Needs in Fluidization/Fluid Bed Education
Karl Jacob, Chemical Engineering, University of Michigan, Ann Arbor, MI

Applications Session 7: Energy II - Biomass & Bioenergy

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, Edinburgh Suite 1

Presentations:
10:30 AM
Experimental and CFD Investigations of a Biomass Pressurized Feeder for Fixed and Fluidized Beds
Lucas Massaro Sousa, Chemical Engineering, Federal University of São Carlos, São Carlos, Brazil, Benjamin Amblard, Rond-point de l'échangeur de Solaize - BP 3, IFP Energies nouvelles, Solaize, France and Sina Tebianian, Direction Conception Modélisation Procédés, IFP Energies Nouvelles, Solaize, France

10:45 AM
Phase Transition Sorbent Intensified Biomass Gasification: Sorbent Performance, Reactor Design, and Hydrodynamic
Studies
Runxia Cai¹, Casey LaMarche², Raymond Cocco³, Leo Brody⁴, Allan Issangya⁵ and Fanxing Li⁴, (1)North Carolina State University, Raleigh, NC, (2)Particulate Solid Research Inc, Chicago, IL, (3)Particulate Solid Research, Inc. (PSRI), Chicago, IL, (4)Department of Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC

11:00 AM
Chihiro Fushimi, Applied Physics and Chemical Engineering, Tokyo University of Agriculture and Technology, Tokyo, Japan

11:15 AM
Sub-Pilot Chemical Looping Biomass Gasification System Enabled by a Circulating Fluidized Bed Platform Characterized by a Moving Bed Reducer - Fluidized Bed Combustor Operating Scheme
Dawei Wang¹, Cody Park¹, Rushikesh Joshi², Eric Falascino¹, Yaswanth Pottimurthy¹, Dikai Xu¹, Ashin Sunny², Soohwan Hwang¹, Anuj Joshi¹, Pinak Mohapatra¹, Sonu Kumar¹, Qiaochu Zhang¹, Qichang Meng², Andrew Tong¹ and Liang-Shih Fan¹, (1)William G. Lowrie Department of Chemical and Biomolecular Engineering, The Ohio State University, Columbus, OH, (2)The Ohio State University, Columbus, OH, (3)Chemical and Biomolecular Engineering, The Ohio State University, Columbus, OH

11:30 AM
Biomass Chemical Looping Gasification: Preliminary Assessment of Fluidization Issues
Andrea Di Giuliano, Stefania Lucantonio and Katia Gallucci, DIIIE, University of L'Aquila, L'Aquila, Italy

11:45 AM
Roles of Fluidization Technology in Thermal Engineering for a Sustainable Future
Atsushi Tsutsumi, Institute of Industrial Science, The University of Tokyo, Tokyo, Japan

Modelling Session 7: Particle Resolved Simulations

10:30 AM - 12:00 PM: Sheraton Grand Hotel and Spa, One Space

Presentations:
10:30 AM
A New Model for Triboelectric Charging of Polarizable Particles in DEM
Alberto Di Renzo, Francesca Orsola Alfano and Francesco P. Di Maio, University of Calabria, Rende, Italy

10:45 AM
Hydrodynamic of a Riser System with Liquid Injection: A Three-Phase CFD-DEM Approach

11:00 AM
Modelling of Particle-Wall Sustained Contacts in n-Euler Simulation of Dense Fluidised Beds and Comparison with CFD-DEM Predictions
Dupuy Dorian, Laboratoire de Génie Chimique, Université de Toulouse, CNRS-Toulouse, Toulouse, France, Renaud Ansart, Laboratoire de Génie Chimique, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France and Olivier Simonin, Institut de Mécanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS-Toulouse, Toulouse, France

11:15 AM
A Spatially Filtering Approach for Direct Numerical Simulation of Fluid-Particle Systems with the Lattice Boltzmann Method
Chrysovalantis Tsigginos, Jianping Meng, Xiaojun Gu and David R. Emerson, Scientific Computing Department, STFC Daresbury Laboratory, Warrington, United Kingdom

11:30 AM
Open-Source Direct Numerical Simulation Framework for Fluid-Particle Systems
Chrysovalantis Tsigginos, Jianping Meng, Xiaojun Gu and David R. Emerson, Scientific Computing Department, STFC Daresbury Laboratory, Warrington, United Kingdom

11:45 AM
CFD-DEM Modelling of Gas-Solid Flow in Axial Uniflow Cyclones
Francesca Orsola Alfano, Daniel Caputo, Francesco P. Di Maio and Alberto Di Renzo, University of Calabria, Rende, Italy