

# Conference Programme

12th International Conference on Fluidized Bed Technology, May 23-26, 2017

## Monday, 22nd May 2017

Center of Energy (CE), AGH University of Science and Technology, Czarnowiejska Street 36

16.00-20.00 Early Registration

18.00-21.00 Welcome cocktail

## Tuesday, 23rd May 2017

Center of Energy, AGH University of Science and Technology, Czarnowiejska Street 36

7.30-8.30 Registration

U2 auditorium, AGH University of Science and Technology

8.30-9.00 Opening ceremony

Plenary Session I - (9.00-10.30)

Session Chairman: Marek Ściążko

9.00-9.45 ***Chemical-looping technologies using circulating fluidized bed systems: status of development***

Tobias Mattisson, Department of Energy and Environment, Chalmers University of Technology, Sweden

9.45-10.30 ***Mesoscale Modeling for Computational Fluid Dynamics of Circulating Fluidized Beds***

Wei Wang, State Key Laboratory of Multiphase Complex Systems, IPE, Chinese Academy of Sciences, China

10.30-11.00 Coffee Break

Parallel Session 1A - (11.00-12.30)

U2 auditorium, AGH University of Science and Technology

***Combustion, pyrolysis and gasification***

Session Chairman: Bo Leckner

11.00-11.15 ***Treatment of a sulphur rich sludge and mixed zinc concentrate residue using a fluidised bed reactor in pilot scale***

Tobias Lindbäck, Ulf Sjöström, Marcel Magnusson, Johan Sjöström, Justin Salminen, Aija Rytioja, Jens Nyberg

11.15-11.30 ***Effect of Fe<sub>2</sub>O<sub>3</sub> on sulfur transformation during pyrolysis in a fluidized bed reactor***

Qinhui Wang, Xin Jia, Leming Cheng, Mengxiang Fang, Zhongyang Luo, Kefa Cen

11.30-11.45 ***Pyrolysis of sewage sludge in a bubbling fluidized bed: determination of the reaction rate***

Antonio Soria-Verdugo, Andrés Morato-Godino, Luis Miguel Garcia-Gutierrez, Nestor Garcia-Hernando

11.45-12.00 ***A lab-scale method to determine the fuel ignition characteristics in fluidized bed reactors***

Sebastian Krusch, Oguzhan Narin, Björn Brosch, Sven Haarmann, Viktor Scherer

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12.00-12.15	<b>Calcium sulfation characteristics at high oxygen concentration in a 1MWth pilot-scale oxy-fuel circulating fluidized bed</b> Wei Li, Mingxin Xu, <b>Shiyuan Li</b>
12.15-12.30	<b>Combustion characteristics of distilled spirit lees on a dual FB system and a CFB system</b> <b>Xi Zeng</b> , Zhennan Han, Fang Wang, Guangwen Xu
Parallel Session 1B - (11.00-12.30) ROOM 307/C-6, Center of Energy, AGH University of Science and Technology <i>Fluid dynamics of gas-solid flow</i> Session Chairman: Ted Knowlton	
11.00-11.15	<b>Two fluid modeling for 3D cylindrical fluidized beds using kinetic theory of rough spheres</b> <b>Lei Yang</b> , J. T. Padding, J. A. M. Kuipers
11.15-11.30	<b>Experimental study of particles mixing behavior in a modified internally circulating fluidized bed</b> <b>Mengxi Liu</b> , Zhenliang Meng, Yiping Fan, Chunxi Lu
11.30-11.45	<b>Effect of electrostatic charge on hydrodynamics of gas-solid fluidized beds</b> Mahshad Manafi, <b>Navid Mostoufi</b> , Reza Zarghami
11.45-12.00	<b>Experimental investigation of the flow hydrodynamics in a 1MWth dual fluidized bed pilot plant with a capacitance probe</b> <b>Alexander Daikeler</b> , Jochen Ströhle, Bernd Epple
12.00-12.15	<b>Fluidized bed process intensification via high-g flows</b> <b>Ronald Breault</b> , Michael Bobek, Steven Rowan, Justin Weber, Esmail Monazam
12.15-12.30	<b>Investigation of the dense flow regimes in a gas-solids fluidized bed with complex riser shape by CFD simulation and experiment measurement</b> <b>Wang Haigang</b> , Ye Jiemin, Tu Qiuya, Wang Xiaofang
Parallel Session 1C - (11.00-12.30) ROOM 308/C-6, Center of Energy, AGH University of Science and Technology <i>Fine particle and nano-particle systems. Fluid catalytic cracking and other catalytic process</i> Session Chairman: Franz Winter	
11.00-11.15	<b>Processing cohesive fine particles in a spouted bed via mixing with spoutable media</b> Steven L. Rowan, <b>Ronald W. Breault</b> , David A. Berry, Nichilas Hillen
11.15-11.30	<b>Particle size distribution and enrichment of selected metals from waste sludge combustion at air and oxy-fuel combustion</b> <b>Ha-Na Jang</b> , Jin-Ho Sung, Seung-Ki Back, Hang Seok Choi, Yong-Chil Seo
11.30-11.45	<b>Coating of fine aerogel particles using spouted bed technology</b> <b>Monika Goslinska</b> , Stefan Heinrich, Ilka Selmer, Irina Smirnova, Christian Kleemann, Ulrich Kulozik
11.45-12.00	<b>Solid flux measurement in a solid-liquid micro-circulating fluidised bed</b> <b>Vladimir Zivkovic</b> , Orlando L do Nascimento, David A. Reay

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12.00-12.15	<b><i>Using a spouted bed spray granulation process to study the influence of aspect ratio on fracture toughness in composites</i></b> <b>Eduard Eichner</b> , Maksym Dosta, Stefan Heinrich, Gerold A. Schneider
12.15-12.30	<b><i>Particle Attrition: Mechanisms and Methods to Determine Attrition Indices</i></b> <b>Yeook Arrington</b> , S.B. Reddy Karri, Ray Cocco
12.30-13.45	<b>Lunch</b> <b>Tent in front of Center of Energy</b>
	Parallel Session 2A - (13.45-14.45) U2 auditorium, AGH University of Science and Technology <b><i>Combustion, pyrolysis and gasification</i></b> Session Chairman: Adam Luckos
13.45-14.00	<b><i>Research on pore structure of coal char during pyrolysis in fluidized bed</i></b> <b>Yiqun Huang</b> , Man Zhang, Hairui Yang, Junfu Lyu, Qing Liu
14.00-14.15	<b><i>Transformation behavior of alkali metals in high alkali coals</i></b> <b>Yanquan Liu</b> , Leming Cheng, Yonggang Zhao, Jieqiang Ji, Qinhui Wang, Zhongyang Luo, Yang Bai
14.15-14.30	<b><i>Biomass combustion in bubbling fluidized bed boilers (BFB) - potential problems and remedies identified during long-term operational tests</i></b> Krzysztof Głód, Marcin Kopczyński, <b>Jarosław Zuwała</b> , Wojciech Nowak, Wojciech Barut
14.30-14.45	<b><i>Oxy-fuel combustion of coal under higher pressure and low oxygen concentration</i></b> <b>Janusz Lasek</b> , Krzysztof Głód, Jarosław Zuwała
	Parallel Session 2B - (13.45-14.45) ROOM 307/C-6, Center of Energy, AGH University of Science and Technology <b><i>Fluid dynamics of gas-solid flow</i></b> Session Chairman: Christopher Pfeifer
13.45-14.00	<b><i>Modeling the axial hydrodynamics of counter-current gas-solid downers</i></b> Juanbo Liu, <b>Xinhua Liu</b> , Zhixin Zhang, Hui Zhao, Wei Ge
14.00-14.15	<b><i>CFD-DEM modeling of a particle coating process in a spouted bed and improvement of spouting stability</i></b> <b>Swantje Pietsch</b> , Paul Kieckhefen, Stefan Heinrich, Michael Müller, Michael Schönherr, Frank Kleine Jäger
14.15-14.30	<b><i>High speed secondary gas injection in fluidized beds: flow pattern analysis by fast X-ray computed tomography</i></b> <b>Benedikt Koeninger</b> , Timo Hensler, Sebastian Schug, Wolfgang Arlt, Karl-Ernst Wirth
14.30-14.45	<b><i>Investigation on the fluidization dynamics of cohesive Geldart B particles using X-ray tomography and pressure fluctuation analysis</i></b> <b>Jiliang Ma</b> , Ruud van Ommen, Daoyin Liu, Robert F. Mudde, Xiaoping Chen, Cai Liang

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Parallel Session 2C - (13.45-14.45)

ROOM 308/C-6, Center of Energy, AGH University of Science and Technology

*Looping processes*

Session Chairman: Tomasz Czakiert

- 13.45-14.00 ***Volatile matter capture by calcined limestone under calcium-looping process conditions***  
Tadaaki Shimizu, Keisuke Koseki
- 14.00-14.15 ***Performance of a raw hematite and a manufactured copper-iron oxygen carrier in a 50-kW natural gas chemical looping system***  
Samuel Bayham, Justin Weber, Douglas Straub, Ronald Breault
- 14.15-14.30 ***1MWth long-term pilot testing of the carbonate looping process with hard coal and lignite***  
Jochen Hilz, Martin Helbig, Martin Haaf, Alexander Daikeler, Jochen Ströhle, Bernd Epple
- 14.30-14.45 ***Effect of HCl addition on cyclic carbonation performance of calcium-based sorbent during calcium looping cycles***  
Yingjie Li, Xiaotong Ma, Wenjing Wang, Lunbo Duan

14.45-15.15 **Coffee Break**

Parallel Session 3A - (15.15-17.00)

U2 auditorium, AGH University of Science and Technology

*Combustion, pyrolysis and gasification*

Session Chairman: Jarosław Zuwała

- 15.15-15.30 ***Modeling of conversion of a single fuel particle in a CFD model for CFB combustion***  
Timo Niemi, Sirpa Kallio
- 15.30-15.45 ***The multi-functional role of high-throughput CFB's in the oil shale industry***  
Timo Hensler, Christian Binder, Hermann Sieger, Indrek Aarna, Andreas Orth
- 15.45-16.00 ***Production of tailored syngas for dimethyl ether synthesis by sorption enhanced gasification***  
Selina Hafner, Nina Armbrust, Reinhold Spörl, Günter Scheffknecht
- 16.00-16.15 ***Experimental study on combustion characteristics of pulverized coal preheated in a circulating fluidized bed***  
Jianguo Zhu, Chengbo Man, Ziqu Ouyang, Jingzhang Liu, Qinggang Lu
- 16.15-16.30 ***Mercury Emissions in a 50kWth oxy-fuel circulating fluidized bed with recycled warm flue gas***  
Hui Wang, Shen Wang, Ya-ning Li, Yufeng Duan
- 16.30-16.45 ***Study on the static behaviors of circulating fluidized bed boiler based on optimizing combustion***  
Suxia Ma, Guosheng Li, Xiongfeng Pan, Zhongyuan Liu, Jianhua Liu
- 16.45-17.00 ***Mechanisms of agglomeration in fluidized bed: reactions between potassium carbonate and silica***  
Bozidar Anicic, Weigang Lin, Hao Wu, Kim Dam-Johansen

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Parallel Session 3B - (15.15-16.45)

ROOM 307/C-6, Center of Energy, AGH University of Science and Technology

*Fluid dynamics of gas-solid flow*

Session Chairman: Joachim Werther

15.15-15.30 ***The investigation of fluidization of solids mixture with different particle density***

**Georgy Ryabov**, Dmitriy Sankin, Oleg Folomeev, Ilya Dolgushin

15.30-15.45 ***Characterization of bubbling fluidization regime by analysis of pressure fluctuations***

**Jie Xiang**, Qinghai Li, Yanguo Zhang

15.45-16.00 ***Bottom-bed fluid dynamics: influence on solids entrainment***

**Tove Karlsson**, David Pallarès, Filip Johnsson

16.00-16.15 ***Cold flow model investigation of two interconnected reactors for calcium looping hydrogen generation with CO2 capture***

**Yijun Liu**, Wenguo Xiang, Shiyi Chen, Min Zhu

16.15-16.30 ***L-Valve design study for a continuous temperature swing adsorption CO2 capture unit***

**Egon Zehetner**, Gerhard Schöny, Hermann Hofbauer

16.30-16.45 ***Investigations towards the particle flow pattern within swirl vanes of uniflow cyclones***

**Michael Kraxner**, Tobias Kofler, Martin Pillei

Parallel Session 3C - (15.15-17.00)

ROOM 308/C-6, Center of Energy, AGH University of Science and Technology

*Looping processes*

Session Chairman: Tadaaki Shimizu

15.15-15.30 ***Calcium looping for CO2 capture in the cement industry - pilot scale experiments***

**Matthias Hornberger**, Reinhold Spörl, Günter Scheffknecht

15.30-15.45 ***The effect of steam on calcium looping: a comparison between the performances of two limestone-based sorbents***

Antonio Coppola, Piero Salatino, Fabrizio Scala, Michele Allocca, Fabio Montagnaro

15.45-16.00 ***Effect of steam hydration on reactivity and strength of cement-supported calcium sorbents for CO2 capture***

**Lunbo Duan**, Changsui Zhao

16.00-16.15 ***Assessment of the carbon looping (Carboloop) concept in a novel twin fluidized bed reactor***

**Antonio Coppola**, Osvalda Senneca, Piero Salatino

16.15-16.30 ***Enhancement of calcium-based waste for cyclic CO2 capture under severe calcination condition***

**Xiaotong Ma**, Yingjie Li, Lunbo Duan

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**16.30-16.45** *Evaluation of Fe-based oxygen carriers supported with Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub> and CeO<sub>2</sub> in chemical looping hydrogen generation*  
**Shiwei Ma**, Wenguo Xiang, Shiyi Chen

**16.45-17.00** *Modeling of solid fuels combustion in a complex geometry CLC equipment*  
**Jaroslav Krzywanski**, Anna Zylka, Tomasz Czakiert, Krzysztof Kulicki, Sylwia Jankowska, Karolina Grabowska, Anna Pajdak, Kamil Idziak, Wojciech Nowak

**17.00-18.00** **Steering Committee Meeting**  
ROOM 109/C5, Center of Energy, AGH University of Science and Technology

**18.30-22.00** **Conference Dinner**  
**Coach trip to the Zalesie Manor Complex**

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### Wednesday, 24th May 2017

Plenary Session II - (9.00-10.30)

U2 auditorium, AGH University of Science and Technology

Session Chairman: Fabrizio Scala

9.00-9.45

***Oxy-Fuel Combustion: The state of the art***

Tomasz Czakiert, Institute of Advanced Energy Technologies, TUCz, Poland, Jarosław Zuwała, Institute for Chemical Processing of Coal, Poland

9.45-10.30

***Role and challenges of CFB in a changing energy market***

Edgardo Coda, Amec Foster Wheeler

10.30-11.00 **Coffee Break**

U2 auditorium, AGH University of Science and Technology

Parallel Session 4A - (11.00-12.30)

***Combustion, pyrolysis and gasification***

Session Chairman: Prabir Basu

11.00-11.15

***Chemical interaction effects of carbon dioxide gasification and oxygen oxidation on oxy-char burning rates under moderate and high temperature***

Jingzhang Liu, Baihang Li, Jianguo Zhu, Shiyuan Li, Shiqi Lao

11.15-11.30

***Comparing the structural development of sand and rock ilmenite during long-term exposure in a biomass fired 12MWth CFB boiler***

Angelica Corcoran, Pavleta Knutsson, Fredrik Lind, Henrik Thunman

11.30-11.45

***Development and operation of large scale circulating fluidized bed coal gasification***

Qinggang Lu, Kuangshi Yu, Weiwei Liu, Yanfang Sun, HaiXia Zhang, Yujuan Sun, Jianguo Bian

11.45-12.00

***Slagging prediction and strategy study on circulating fluidized bed gasification of high sodium coal***

Haixia Zhang, Zhiping Zhu, Kuangshi Yu, Weiwei Liu, Qinggang Lu

12.00-12.15

***Laboratory scale studies of solid-particle erosion in boilers***

Varun Raj, Emil Vainio, Leena Hupa, Edgardo Coda Zabetta, Kyösti Vänskä

12.15-12.30

***Research on preheating combustion technology of residual carbon and demonstration project of 100tons/day of residual carbon boiler***

Jianguo Zhu, Chengbo Man, Jingzhang Liu, Ziqu Ouyang, Qinggang Lu

Parallel Session 4B - (11.00-12.30)

ROOM 307/C-6, Center of Energy, AGH University of Science and Technology

***Fluid dynamics of gas-solid flow***

Session Chairman: Marek Ściażko

11.00-11.15

***Dynamic aspects of solids flow in a circulating fluid bed***

Lawrence J. Shadle, Rupen Panday, Esmail Monazam, Ronald Breault, Steve Rowan, Justin Weber

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11.15-11.30 ***Effect of particle size on hydrodynamics of an internally circulating fluidized bed with a draft tube***

**Ravi Gujjula**, Narasimha M, Priyanka K, Bala Narasaiah T

11.30-11.45 ***Effects of temperature, pressure, and interparticle forces on gas-solid fluidization behavior***

**Jaber Shabanian**, Jamal Chaouki

11.45-12.00 ***Hydrodynamics of high velocity circulating fluidized bed risers of FCC catalyst particles***

**Allan Issangya**, S.B. Reddy Karri, Ray Cocco, Ted Knowlton

12.00-12.15 ***Capacitance probes for the investigation of the fluid dynamics of turbulent fluidized beds***

**Tom Wyrwat**, Ernst-Ulrich Hartge, Mahdi Yazdanpanah, Stefan Heinrich

12.15-12.30 ***Uniform bubble growth in fluidized bed and its stability analysis***

**Chenxi ZHANG**, Weizhong QIAN, Fei WEI

Parallel Session 4C - (11.00-12.30)

ROOM 308/C-6, Center of Energy, AGH University of Science and Technology

*Looping processes*

Session Chairman: Rafaella Ocone

11.00-11.15 ***Relevance of plant desing on CLC process performance using a Cu-based oxygen carrier***

**Alberto Abad**, Pilar Gayán, Francisco García-Labiano, Luis F. de Diego, Juan Adáñez

11.15-11.30 ***A cyber-physical observer for fluidized bed chemical looping process development***

**Lawrence Shadle**, Samuel Bayham, David Tucker, Paolo Pezzini, Esmail Monazam, Justin Weber, Ronald Breault, Mark Bryden

11.30-11.45 ***Characterization of calcium looping sorbents with a novel twin bed reactor***

Antonio Coppola, **Fabrizio Scala**, Liberato Gargiulo, Piero Salatino

11.45-12.00 ***Examination of methane chemical looping combustion with selected natural Fe-based oxygen carrier in 10kW fluidized bed***

**Ewelina Ksepko**, Piotr Babinski, Marek Ściążko

12.00-12.15 ***Performance of a dual fluidized bed reactor for chemical looping combustion with oxygen uncoupling***

**Kevin Whitty**, Matthew Hamilton, Kirsten Merrett, JoAnn Lighty

12.15-12.30 ***Reaction kinetics for flowsheet modeling of chemical looping combustion in fluidized bed reactors***

**Johannes Haus**, Matthis Goltzsche, Ernst-Ulrich Hartge, Stefan Heinrich, Joachim Werther

Lunch

12.30-14.00

Tent in front of Center of Energy



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Parallel Session 5A - (14.00-15.00)

U2 auditorium, AGH University of Science and Technology

*Combustion, pyrolysis and gasification*

Session Chairman: Małgorzata Pilawska

- 14.00-14.15 ***Effect of Additives on The Ash Fusion Temperature***  
Jieqiang Ji, Leming Cheng, Huijun Xu, Yanquan Liu, Mengxiang Fang, Zhongyang Luo, Yonghong Zhao
- 14.15-14.30 ***An investigation on oxy-fuel combustion of sewage sludge in a 12kW bench-scale CFB combustor***  
M. Kosowska-Golachowska, A. Magdziarz, Adam Luckos, K. Wolski, A. Kijo-Kleczkowska, T. Musiał, D. Richter, K. Środa
- 14.30-14.45 ***Modelling of the fluidized bed sorption enhanced steam gasification considering partial load operation***  
Marcel Beirow, Max Schmid, Reinhold Spörl, Günter Scheffknecht
- 14.45-15.00 ***Coal gasification: scaling into pressurised CFB system***  
Grzegorz Tomaszewicz, Marek Ściążko, Leszek Stępień

Parallel Session 5B - (14.00-15.00)

ROOM 307/C-6, Center of Energy, AGH University of Science and Technology

*Heat and mass transfer*

Session Chairman: David Pallares

- 14.00-14.15 ***Dimensioning tube bundle heat exchangers for a continuous temperature swing adsorption process***  
Gerhard Hofer, Johannes Fuchs, Gerhard Schöny, Tobias Pröll
- 14.15-14.30 ***A parameter variation in a multi-stage fluidized bed system for continuous CO<sub>2</sub> capture by means of temperature swing adsorption***  
Florian Dietrich, Gerhard Schöny, Johannes Fuchs, Hermann Hofbauer
- 14.30-14.45 ***Investigation of the granulation process in a multi-staged continuous fluidized bed: Influence of the process conditions on the product properties***  
Eugen Diez, Katja Meyer, Andreas Bück, Evangelos Tsotsas, Stefan Heinrich,
- 14.45-15.00 ***Adsorption of CO<sub>2</sub> in a confined fluidized bed of a pelletized 13x zeolite: fluidization velocity and process performance***  
Rossella Girimonte, Brunello Formisani, Flaviano Testa

Parallel Session 5C - (14.00-15.00)

ROOM 308/C-6, Center of Energy, AGH University of Science and Technology

*Modeling and simulation*

Session Chairman: Wei Wang

- 14.00-14.15 ***CFD study of mixing and segregation in CFB risers of binary gas-solid flow with EMMS drag model***  
Zhiyuan Qin, Quan Zhou, Junwu Wang
- 14.15-14.30 ***Numerical CFD simulation of the 1 MWth CFB carbonator using the discrete element method***  
Alexander Stroh, Martin Haaf, Alexander Daikeler, Maximilian V. Bohnstein, Falah Alobaid, Jochen Ströhle, Bernd Epple

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14.30-14.45	<b><i>Emission improvements in CFB boilers - model predictions and field validation</i></b> <b><u>Leea Kipinoinen</u></b> , Ari Kettunen, Marko Lyytikäinen, Kari Myöhänen
14.45-15.00	<b><i>Validation study on spatially averaged two-fluid model for dense gas-solid flows</i></b> <b><u>Simon Schneiderbauer</u></b>
15.00-15.45	<b>Coffee Break</b>
	Parallel Session 6A - (15.45-17.15) U2 auditorium, AGH University of Science and Technology <b><i>Measurements and instrumentation</i></b> Session Chairman: Xiaotao Bi
15.45-16.00	<b><i>Measurement of Bubble Properties in a Fluidized Bed using Electrical Capacitance Tomography</i></b> <b><u>Cornelius Agu</u></b> , Lars-André Tokheim, Britt Halvorsen
16.00-16.15	<b><i>Annulus flow behavior of Geldart Group B particles in a pilot-scale CFB riser</i></b> Aditya Anantharaman, Allan Issangya, S.B. Reddy Karri, John Findlay, Christine M. Hrenya, Ray A. Cocco, <b><u>Jia Wei Chew</u></b>
16.15-16.30	<b><i>Determination of the tensile strength of a particulate solid by the raining bed method</i></b> <b><u>Brunello Formisani</u></b> , Rossella Girimonte, Vincenzino Vivacqua
16.30-16.45	<b><i>Dynamic force sensors and their applications in fluidized beds</i></b> <b><u>Shyam Sundaram</u></b> , Allan Issangya, S.B. Reddy Karri
16.45-17.00	<b><i>Impact of using thermocouples to measure char particle temperature in a fluidized bed reactor</i></b> J. Salinero, A. Gómez-Barea, J. J. Leahy, <b><u>Bo Leckner</u></b>
17.00-17.15	<b><i>Causes of low-temperature corrosion in combustion of bituminous coal</i></b> <b><u>Emil Vainio</u></b> , Kyösti Vänskä, Tor Laurén, Patrik Yrjas, Edgardo Coda Zabetta, Mikko Hupa, Leena Hupa
	Parallel Session 6B - (15.45-17.15) ROOM 307/C-6, Center of Energy, AGH University of Science and Technology <b><i>Process design and scale-up</i></b> Session Chairman: Yue Guangxi
15.45-16.00	<b><i>An investigation into partial capture of CO<sub>2</sub> released from a large coal/petcoke fired circulating fluidized bed boiler with limestone injection using its fly and bottom ash</i></b> Anantkumar Patel, <b><u>Prabir Basu</u></b> , Bishnu Acharya
16.00-16.15	<b><i>Influence of the internal orientation on the hydrodynamics in gas-solid bubbling fluidized beds</i></b> <b><u>Frank Schillinger</u></b> , Simon Maurer, Evert C. Wagner, Serge M. A. Biollaz, J. Ruud van Ommen, Robert F. Mudde, Tilman J. Schildhauer
16.15-16.30	<b><i>Use of an automatic L-valve with FCC group A particles at large scale</i></b> <b><u>A. Forret-Cloupet</u></b> , B. Amblard, F. Montjovet, L. Raynal, Th. Gauthier

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16.30-16.45 **COMBO-CFB: Integration of Concentrated Solar Power with Circulating Fluidized Bed Power Plants**

István Selek, Jenő Kovács, Enso Ikonen, Ari Kettunen

16.45-17.00 **Small modular nuclear reactor - a promising application of fluidized bed**

Prabir Basu, Akash Kulshreshtha, Debapriya Mandal

17.00-17.15 **The impact of scaling rules on parameters of the cyclone working with CFB boilers**

Paweł Mirek, Maciej Komorowski

Parallel Session 6C - (15.45-17.30)

ROOM 308/C-6, Center of Energy, AGH University of Science and Technology

*Modeling and simulation*

Session Chairman: Jarosław Krzywański

15.45-16.00 **Three-dimensional coal combustion simulation of circulating fluidized bed by Eulerian-Eulerian method**

Ying Wu, Daoyin Liu, Jiliang Ma, Xiaoping Chen

16.00-16.15 **Computational studies on effect of novel accelarting perforated distributor on fluid dynamic characteristics of circulating fluidized bed riser**

Mahesh Dasar, Ujash D. Shah, Prahmarsh Pai Raikar, Ranjit S. Patil

16.15-16.30 **Modelling of indirect steam gasification in circulating fluidized bed reactors**

Kari Myöhänen, Juha Palonen, Timo Hyppänen

16.30-16.45 **Comparison of Ansys Fluent and OpenFoam in simulation of Circulating Fluidized Bed riser**

Markku Nikku, Payman Jalali, Timo Hyppänen

16.45-17.00 **Numerical investigation of hydrodynamics and heat transfer in a pressurized Circulating Fluidized Bed riser**

Abinash Mahapatro, Pinakeswar Mahanta

17.00-17.15 **Modeling study on non-uniform distribution in the lateral direction in large scale CFB Boilers**

Yi Zhang, Man Zhang, Hairui Yang, Hai Zhang, Guangxi Yue

17.15-17.30 **Dynamic behavior of a commercial CFB unit – measurements and related studies**

Jenő Kovács, Ari Kettunen, István Selek

20.00-23.00 Gala Dinner Juliusz Slowacki Theatre

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### Thursday, 25th May 2017

Plenary Session III - (9.00-10.30)

U2 auditorium, AGH University of Science and Technology

Session Chairman: Joachim Werther

9.00-9.45

***Particle agglomeration in fluidized beds: mechanisms, early detection and possible countermeasures***

Fabrizio Scala, Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale Università degli Studi di Napoli, Italy

9.45-10.30

***Cyclone Systems in Circulating Fluidized Beds***

Ted Knowlton, Particulate Solid Research Inc., USA

10.30-11.00 **Coffee Break**

Parallel Session 7A - (11.00-12.30)

U2 auditorium, AGH University of Science and Technology

*Industrial experience*

Session Chairman: Kevin Whitty

11.00-11.15

***Operation characteristics of external heat exchangers in the 600MW CFB boiler***

Runxia Cai, Xin Mo, Junfu Lv, Hairui Yang, Xiujian Lei, Wen Ling, Hu Su, Qi Zhou

11.15-11.30

***Design and operation of a MSW and straw co-firing CFB boiler***

Junping Gu, Hairui Yang, Changlong Li, Junfu Lyu

11.30-11.45

***Experimental study of adsorption of alkali with bed material when co-firing biomass with coal***

Hang Shi, Yuxin Wu, Hairui Yang, Junfu Lyu

11.45-12.00

***Design and operation of 127MWe cfb biomass boiler in thailand***

Lele Feng, Junfu Lu, Hairui Yang, Yuxin Wu, Guangxi Yue

12.00-12.15

***Design and operation of 300MW ultra-low emission cfb boiler burning low calorific value coal***

Boheng Tong, Chengliang Liu, Xiaoyu Zhang, Junfu Lu, Guangxi Yue

12.15-12.30

***Startup the first 330MWe CFB unit in Russia at Novochoerkasskaya TPP***

E. Antonenko, I. Krutitskiy, G. Ryabov, O. Folomeev, D. Melnikov, K. Khaneyev, V. Haletskiy

Parallel Session 7B - (11.00-12.30)

ROOM 307+308/C-6, Center of Energy, AGH University of Science and Technology

*Modeling and simulation*

Session Chairman: Stefan Heinrich

11.00-11.15

***Numerical investigation on the solids mixing in fluidized beds***

F. Hernández-Jiménez, J. Sánchez-Prieto, A. Soria-Verdugo, E. Cano-Pleite, A. Acosta-Iborra

11.15-11.30

***A numerical study of the carbonator design effect on CO2 capture efficiency***

Myrto Zeneli, Aristeidis Nikolopoulos, Nikos Nikolopoulos, Panagiotis Grammelis, Sotirios Karellas, Emmanuel Kakaras

## Conference Programme

12th International Conference on Fluidized Bed Technology, May 23-26, 2017

11.30-11.45	<b><i>The hydrodynamic characteristics of embattlement shaped water wall of a 350MW supercritical Circulating Fluidized Bed boiler</i></b> <b><u>Bin Tang</u></b> , Man Zhang, Hairui Yang, Junfu Lyu, Guangxi Yue
11.45-12.00	<b><i>Modelling axial mixing of char - application to the dense bottom bed in CFB boilers</i></b> <b><u>Anna Köhler</u></b> , David Pallarès, Filip Johnsson
12.00-12.15	<b><i>Attrition prediction for new materials in circulating fluidized systems</i></b> <b><u>Ronald Breault</u></b> , Samuel Bayham, Nathan Galinsky, Esmail Monazam
12.15-12.30	<b><i>Verification of filtered Two-Fluid Models in different flow regimes</i></b> <b><u>Jan Hendrik Cloete</u></b> , Schalk Cloete, Stefan Radl, Shahriar Amini
12.30-14.00	<b>Lunch</b> <b>Tent in front of Center of Energy</b>
<b>Parallel Session 8A - (14.00-15.00)</b> U2 auditorium, AGH University of Science and Technology <i>Industrial experience</i> Session Chairman: Georgy Ryabov	
14.00-14.15	<b><i>Simultaneous reduction of no and kcl during injection of ammonium sulphate in a biomass fired BFB boiler</i></b> <b><u>Lars-Erik Åmand</u></b> , Håkan Kassman
14.15-14.30	<b><i>Reduced superheater corrosion by injection of ammonium sulphate in a biomass fired BFB boiler</i></b> <b><u>Hakan Kassman</u></b> , Christer Forsberg, Pamela Henderson
14.30-14.45	<b><i>Experimental investigation of spatial temperature distribution in a large-scale CFB boiler</i></b> <b><u>Rafał Kobytecki</u></b> , Robert Zarzycki, Zbigniew Bis
14.45-15.00	<b><i>Large scale CFB gasification of waste and biomass</i></b> Joonas Kaasalainen, Melina Kallio-Könnö, <b><u>Juhani Isaksson</u></b>
<b>Parallel Session 8B - (14.00-15.15)</b> ROOM 307+308/C-6, Center of Energy, AGH University of Science and Technology <i>Modeling and simulation</i> Session Chairman: Jinghai Li	
14.00-14.15	<b><i>Performance comparison of uniflow cyclones and standard cyclones</i></b> <b><u>Ulrich Muschelknautz</u></b>
14.15-14.30	<b><i>Granular multiphase cfd model for fluidized beds: effect of drag model</i></b> Bhargav M.M.S.R.S, <b><u>Teja Reddy Vakamalla</u></b> , Narasimha Mangadoddy
14.30-14.45	<b><i>Modelling primary NOx and primary N2O of Pulverised Fuel Combustion (PFC) and Circulating Fluidised Bed Combustion (CFBC)</i></b> <b><u>Frans Van Dijen</u></b>
14.45-15.00	<b><i>Dynamic modelling of a cfb boiler including the solids, gas and water-steam systems</i></b> <b><u>Jari Lappalainen</u></b> , Virginie Lalam, Romain Charreire, Jukka Ylijoki

## Conference Programme

12th International Conference on Fluidized Bed Technology, May 23-26, 2017

15.00-15.15

*Effect of primary air maldistribution due to nozzle wear on CFBC performance*

Martin Weng, Adlan Omer

15.15-16.00 **Coffee Break**

Poster Session - (16.00-18.00)

Center of Energy, AGH University of Science and Technology

16.00-18.00

**1. *Pressurized flash drying characteristics using sub-bituminous coals for circulating fluidized bed gasifier***

See Hoon Lee, In Seop Gwak

**2. *Modeling of oxy-combustion and gasification lignite dust in a cyclone furnace***

Robert Zarzycki, Zbigniew Bis

**3. *Vertical swirl chamber for coal gasification and vitrification of fly ash***

Robert Zarzycki

**4. *Estimation of agglomerate size of multi-walled carbon nanotubes in gas-solid fluidized beds***

Sung Woo Jeong, Jimin Kim, Dong Hyun Lee

**5. *Characteristics of particle beneficiation with various components using an air dense medium fluidized bed***

Chenyang Zhou, Chenlong Duan, Bo Zhang, Yuemin Zhao, Liang Dong

**6. *Characteristic of fine coal density segregation in gas-vibro fluidized bed***

Junyu Lu, Liang Dong, Chenyang Zhou, Yuemin Zhao, Chenlong Duan

**7. *Fluid dynamic characterization of a 50 kW unit for clc of coal with improved configuration***

Alberto Abad, Raúl Pérez-Vega, José Bueno, Pilar Gayan, Francisco García-Labiano, Luis F. de Diego, Juan Adánez

**8. *Research on air dense medium fluidization and separation characteristics under thermal conditions***

Zhenfu Luo, Guilin Zhang, Bo Zhang, Shulei Song, Bo Lv

**9. *Optimal design of guide vane in the cyclone vortex finder based on orthogonal analysis***

Zhong HUANG, Ming LIU, Guanjie LIU, Fengyang WANG, Defu CHE

**10. *Characteristic features of the fluidized bed boiler starting***

Eugeni Pitsukha, Yury Teplitski, Alexander Roslik, Rafail Isemin, Dmitry Klimov, Alexander Mikhalev, Valentin Borodulya, Vitaly Dubina

**11. *SrCuO<sub>2</sub> the potential oxygen carrier material for chemical looping combustion applications***

Ewelina Ksepko

**12. *Experiences from the operation of a fluidized-bed chemical-looping-combustion solid-fuels test rig***

Tomasz Czakiert, Krzysztof Kulicki, Kamil Idziak, Jaroslaw Krzywanski, Anna Zylka, Sylwia Jankowska, Wojciech Nowak

## Conference Programme

12th International Conference on Fluidized Bed Technology, May 23-26, 2017

EMMS Workshop - (16.00-18.00)

ROOM 307+308/C-6, Center of Energy, AGH University of Science and Technology

Session Chairmen: Joachim Werther, Wei Ge

16.00-16.15	<b><i>A review of EMMS drag and its applicaitons in CFD</i></b> Wei Wang, Institute of Process Engineering, CAS, China
16.15-16.30	<b><i>Application of EMMS for modelling of CFB-Risers - Euler/Euler approach vs MPPIC-method</i></b> Ernst-Ulrich Hartge, TUHH, Germany
16.30-16.45	<b><i>Meso-Scale Structure, Drag Model and Eulerian Simulation of Fluidization Processes</i></b> Haiying Qi, Tsinghua University, China
16.45-17.00	<b><i>The influence of sub-grid drag model on coarse-grained particle simulation of fluidized bed</i></b> Sofiane Benyahia and Ron Breault, NETL, USA
17.00-17.15	<b><i>Investigation of the full loop of gas-solid flow in a CFB with multi-cyclone separators by CPFD simulation based on EMMS drag model</i></b> Haigang Wang, Institute of Engineering Thermophysics, CAS, China
17.15-17.30	<b><i>Development of EMMS model in Fluidized Bed modelling with TFM, CFD-DEM and DDPM methods</i></b> Myrto Zeneli and Aris Nikolopoulos, CERTH, Greece
17.30-17.50	<b><i>Limitation to be removed to enable further application</i></b> Discussion led by Chairmen
17.50-18.00	<b><i>Conclusive closing talk with perspective</i></b> Jinghai Li

Friday, 26th May 2017

Technical Excursion