

# 23<sup>rd</sup> International Conference on Fluidized Bed Conversion

| Date        | MAY 13 (SUN.)  | MAY 14 (MON.)  |   |  | MAY 15 (TUE.)  |   |   | MAY 16 (WED.)   |   |  | MAY 17 (THU.)                    |  |
|-------------|--|--|---|--|--|---|---|---|---|--|----------------------------------|--|
| Time/Room   |  | Grand Ballroom A (2F)  | Grand Ballroom B (2F)   | Chardonnay Room (B1F)  | Grand Ballroom A (2F)                                      | Grand Ballroom B (2F)   | Chardonnay Room (B1F)   | Grand Ballroom A (2F)                                       | Grand Ballroom B (2F)   | Chardonnay Room (B1F)  |                                  |  |
| 08:00-08:30 | Registration<br>16:00-18:00  | Registration 08:00-17:00 / Poster session 09:00-18:00                            |   |  |  |   |   |   |   |  |                                  |  |
| 08:30-09:00 |  | Opening Ceremony<br>08:30-09:00  |   |  |  |   |   |   |   |  |                                  |  |
| 09:00-09:30 | 76th IEA-FBC<br>ExCo Meeting &<br>Technical<br>Workshop<br>(Chardonnay Room,<br>B1F) | Plenary Lecture 1<br>Prof. Alberto Gómez-Barea<br>(University of Seville, Spain) |   |  |  | Plenary Lecture 2<br>Prof. Yue, Guangxi<br>(Tsinghua University, China) |   |   |   | Plenary Lecture 3<br>Dr. Sang-Ho Yi<br>(POSCO, Korea)                |                                  |  |
| 09:30-09:50 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 09:50-10:20 |  |  | Coffee Break I 09:50-10:20  |  |  | Coffee Break I 09:50-10:20  |   |   | Coffee Break I 09:50-10:20  |  |                                  |  |
| 10:20-11:00 |  |  | Keynote Speech<br>Dr. Downon SHUN<br>(KIER, Korea)                  | B1<br>Modeling/CFD/<br>Advanced Diagnostics<br>I                   | C1<br>Combustion<br>I                                      | A4<br>FB's and CFB's Design<br>and Operational<br>Experience<br>IV      | B4<br>Modeling/CFD/<br>Advanced Diagnostics<br>III                  | C4<br>Combustion<br>II                                      | A7<br>FB's and CFB's Design<br>and Operational<br>Experience<br>VI  | B7<br>Modeling/CFD/<br>Advanced Diagnostics<br>V                     | C7<br>Combustion<br>III          |  |
| 11:00-11:30 |  |  | A1<br>FB's and CFB's Design<br>and Operational<br>Experience<br>I   |  |  |   |   |   |   |  |                                  |  |
| 11:30-12:00 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 12:00-13:00 |  |  | Lunch Break I 12:00-13:00   |  |  | Lunch Break I 12:00-13:00   |   |   | Lunch Break I 12:00-13:00   |  |                                  |  |
| 13:00-13:30 |  |  | A2<br>FB's and CFB's Design<br>and Operational<br>Experience<br>II  | B2<br>Modeling/CFD/<br>Advanced Diagnostics<br>II                  | C2<br>Gasification and<br>Pyrolysis<br>I                   | A5<br>FB's and CFB's Design<br>and Operational<br>Experience<br>V       | B5<br>Modeling/CFD/<br>Advanced Diagnostics<br>IV                   | C5<br>Gasification and<br>Pyrolysis<br>II                   | A8<br>FB's and CFB's Design<br>and Operational<br>Experience<br>VII | B8<br>Fundamentals:<br>Particulate Solids and<br>Fluidization<br>III | C8<br>Ash and Spent Solids<br>I  |  |
| 13:30-14:00 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 14:00-14:40 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 14:40-15:00 |  |  | Coffee Break I 14:40-15:00  |  |  | Coffee Break I 14:40-15:00  |   |   | Coffee Break I 14:40-15:00  |  |                                  |  |
| 15:00-15:30 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 15:30-16:00 |  |  | A3<br>FB's and CFB's Design<br>and Operational<br>Experience<br>III | B3<br>Fundamentals:<br>Particulate Solids and<br>Fluidization<br>I | C3<br>CO <sub>2</sub> Capture and<br>Chemical Looping<br>I | A6<br>Emissions and<br>Environmental Impact<br>I                        | B6<br>Fundamentals:<br>Particulate Solids and<br>Fluidization<br>II | C6<br>CO <sub>2</sub> Capture and<br>Chemical Looping<br>II | A9<br>Emissions and<br>Environmental Impact<br>II                   | B9<br>Gasification and<br>Pyrolysis<br>III                           | C9<br>Ash and Spent Solids<br>II |  |
| 16:00-16:30 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 16:30-17:00 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 17:00-17:30 |  |  |   |  |  | Poster Session<br>17:00-18:00 (Lobby)                                   |   | FBC<br>Steering Committee<br>Meeting<br>17:00-18:00         |   |  |                                  |  |
| 17:30-18:00 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 18:00-18:30 | Break  |  |   |  | Break  |   |   |   |   |  |                                  |  |
| 18:30-19:00 |  |  |   |  |  |   |   |   |   |  |                                  |  |
| 19:00-      | Welcome<br>Reception<br>(Orchid Room,<br>19F)  |  |   |  | Banquet  |   |   |   |   |  |                                  |  |

Technical  
Tour

**DAY 1 - MAY 14 (MON), 2018**

| SESSION CODE & TIME |             | CONTENTS  | Room                  |
|---------------------|-------------|---|-----------------------|
| 08:00~17:00         |             | Registration  | Lobby (2F)            |
| 08:30~09:00         |             | <b>OPENING CEREMONY</b>   | Grand Ballroom (2F)   |
| 09:00~09:50         |             | <b>PLENARY LECTURE 1</b><br>Fluidized Bed Technologies for Solar Fuel Applications<br>▶ Prof. Alberto Gómez-Barea (University of Seville, Spain)  | Grand Ballroom (2F)   |
| 09:50~10:20         |             | Coffee Break  | Lobby (2F)            |
| 10:20~10:50         |             | <b>KEYNOTE SPEECH</b><br>Coal Power Trends in Asian market and CFBC prospect<br>▶ Dr. Dowon SHUN (Korea Institute of Energy Research, Korea)  | Grand Ballroom A (2F) |
| 10:50~12:10         |             | <b>A1 : FB's and CFB's Design and Operational Experience I</b><br>(Chair: Dr. Myung Won Seo / Korea Institute of Energy Research, Korea)  | Grand Ballroom A (2F) |
| A 1-1               | 10:50~11:10 | Analysis on the safety of water wall in supercritical CFB boiler with sudden electricity failure<br>▶ DENG Boyu (Presenter), ZHANG Man, LYU Junfu, LI Shaohua, YANG Hairui  |                       |
| A 1-2               | 11:10~11:30 | Material solutions in FBC boilers with challenging fuels<br>▶ Mikko Uusitalo (Presenter), Hanna Kinnunen, Tero Luomaharju   |                       |
| A 1-3               | 11:30~11:50 | The Simulation of the Particle Movement under Continuous Feeding and Discharging in a CFB Dense Zone<br>▶ Xian Zhang, Rongcun Ge, Runxia Cai, Shouyu Zhang, Man Zhang, Hairui Yang, Junfu Lyu (Presenter)   |                       |
| A 1-4               | 11:50~12:10 | Mitigation of Superheater Corrosion with Addition of Ammonium Sulphate in a BFB boiler Firing Demolition Wood<br>▶ Håkan Kassman (Presenter), Pamela Henderson  |                       |
| 10:20~12:00         |             | <b>B1 : Modeling/CFD/Advanced Diagnostics I</b><br>(Chair: Dr. Hairui Yang / Tsinghua University, China)  | Grand Ballroom B (2F) |
| B 1-1               | 10:20~10:40 | Influence of Circular Fins Mounted on the Inner Surface of the Cyclone Separator on Fluid Dynamic Characteristics<br>▶ Mahesh Dasar, Ranjit S Patil (Presenter)   |                       |
| B 1-2               | 10:40~11:00 | CPFD simulation of gas-solid flow and heat transfer behaviors in an external heat exchanger<br>▶ Runxia Cai (Presenter), Rongcun Ge, Man Zhang, Hairui Yang, Junfu Lyu  |                       |
| B 1-3               | 11:00~11:20 | Model-based process control for emission reduction during biomass combustion in fluidized bed boilers<br>▶ Daniel Bernhardt (Presenter), Michael Beckmann   |                       |
| B 1-4               | 11:20~11:40 | Comparative Study of Homogenous and Sub-grid Drag Models in Simulation of Fluidized Beds Containing Geldart A & B Particles<br>▶ Mohamed Sobhi ALAGHA, Pal SZENTANNAI (Presenter)   |                       |
| B 1-5               | 11:40~12:00 | Numerical study of repose angle using computation particle fluid dynamic simulation<br>▶ Woo Chang Sung (Presenter), Seok woo Chung, Jong sun Jung, Dong Hyun Lee   |                       |
| 10:20~12:00         |             | <b>C1 : Combustion I</b><br>(Chair: Prof. Man Zhang / Tsinghua University, China)   | Chardonnay Room (B1F) |
| C 1-1               | 10:20~10:40 | Study of co-combustion of coking coal in a pilot scale CFB combustor<br>▶ Kyoungil Park (Presenter), Jong-Min Lee, Dong-Won Kim, Gyu-Hwa Lee, Yong Kang   |                       |
| C 1-2               | 10:40~11:00 | Combustion characteristics of a single lignite particle in a fluidized bed under pressurized oxy-combustion condition<br>▶ Lin Li, Lunbo Duan (Presenter), Yuanqiang Duan, Shuai Tong, Changsui Zhao  |                       |
| C1-3                | 11:00~11:20 | Combustion Characteristics of Coal Rich of Aluminum in Fluidized Bed<br>▶ Man Zhang, Shahong Zhu (Presenter), Zirong Li, Junmin Sun, Hairui Yang  |                       |
| C 1-4               | 11:20~11:40 | Influence of Preliminary Heat Treatment of Biofuel (Torrefaction Process) on the Combustion Process in Fluidized bed<br>▶ Dmitry Klimov (Presenter), Rafail Isemin, Sergey Kuzmin, Oleg Milovanov, Aleksander Mikhalev, Valentin Konyakhin, Yurii Teplitskii Evgenii Pitsukha, Norbert Kienzl, Christoph Strasser |                       |
| C 1-5               | 11:40~12:00 | Barracuda simulation of a CFBC test rig: comparison with experimental results<br>▶ Sebastian Krusch (Presenter), Viktor Scherer   |                       |
| 12:00~13:00         |             | Lunch Break   |                       |
| 13:00~14:40         |             | <b>A2 : FB's and CFB's Design and Operational Experience II</b><br>(Chair: Prof. Franz Winter / TU-Wien, Austria)   | Grand Ballroom A (2F) |
| A 2-1               | 13:00~13:20 | Operation Experience of Biomass CFB in Sweden and Outlook on Japanese and Korean Projects<br>▶ Sebastian Kaiser (Presenter), Helmut Anderl  |                       |
| A 2-2               | 13:20~13:40 | Mechanism Analysis of and Solutions to Gas Solid Flow Non-uniformity Problem of One 330 MW CFB Boiler<br>▶ Yi Zhang (Presenter), Man Zhang, Lu Shan, Hairui Yang, Junfu Lyu, Guangxi Yue  |                       |
| A 2-3               | 13:40~14:00 | Coke activation in fluidized beds with various operating conditions<br>▶ Keon Bae (Presenter), Gi Don Nam, Dong Hyun Lee  |                       |
| A 2-4               | 14:00~14:20 | Research of gas-solid flow in standpipe of CFB and measurement of circulation rate<br>▶ Xiandong Liu (Presenter), Man Zhang, Junfu Lyu, Hairui Yang   |                       |

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| A 2-5       | 14:20~14:40 | Design and Operation of a Bubbling Fluidized Bed for Sorption Enhanced Reforming (SER) of Hydrogen with CO <sub>2</sub> Removal<br>▶ Ganesan Subbaraman (Presenter), Jeff A. Mays  |                       |
| 13:00~14:40 |             | <b>B2 : Modeling/CFD/Advanced Diagnostics II</b><br>(Chair: Prof. Byungho Song / Kunsan National University, Korea)  | Grand Ballroom B (2F) |
| B 2-1       | 13:00~13:20 | Mass Balance Study of a 550 MW Supercritical CFB Boiler with PAPSD Method<br>▶ Dongfang Li, Minwoo Kim, Seungmo Kim, Chung-hwan Jeon (Presenter), Kijung Sung, Hairui Yang, Xiwei Ke, Runxia Cai, Man Zhang  |                       |
| B 2-2       | 13:20~13:40 | A comprehensive model for an ultra/supercritical CFB boiler and its prediction of NO <sub>x</sub> , N <sub>2</sub> O for a 660 MW CFB boiler<br>▶ Yangjun Wei (Presenter), Leming Cheng, Jieqiang Ji, Li Nie, Linjie Xu, Fan Feng, Qinhui Wang, Mengxiang Fang |                       |
| B 2-3       | 13:40~14:00 | Design and analysis of load change response of CFB power plants<br>▶ Jenő Kovács (Presenter), István Selek   |                       |
| B 2-4       | 14:00~14:20 | Thermal Performance Optimization of a 660MW Ultra-Supercritical CFB Boiler Unit<br>▶ Shahong Zhu (Presenter), Man Zhang, Hairui Yang, Junfu Lyu, Guangxi Yue   |                       |
| B 2-5       | 14:20~14:40 | Tube leakage detection – an additional digital tool to minimize boiler downtime and reduce maintenance costs<br>▶ Eero Hälikkää, Teri Hiltunen, Edgardo Coda Zabeta (Presenter)  |                       |
| 13:00~14:40 |             | <b>C2 : Gasification and Pyrolysis I</b><br>(Chair: Dr. Stylianos Flegkas / TU Wien, Austria)  | Chardonnay Room (B1F) |
| C 2-1       | 13:00~13:20 | Influence of Operational Parameters on Syngas Composition in Fluidized Bed Gasification – an Experimental Investigation<br>▶ Jens Peters (Presenter), Christian Heinze, Jan May, Jochen Ströhle, Bernd Epple   |                       |
| C 2-2       | 13:20~13:40 | Sorption Enhanced Gasification: Process validation and investigations on the syngas composition in a 200 kW <sub>th</sub> dual fluidized bed facility<br>▶ Selina Hafner (Presenter), Reinhold Spörl, Günter Scheffknecht                                      |                       |
| C 2-3       | 13:40~14:00 | Experimental study for fast pyrolysis of waste tire in a conical spouted bed Yield and quality of pyrolysis oil<br>▶ Byeong Kyu Lee (Presenter), Hoon Chae Park, Mukesh Upadhyay, Hang Seok Choi   |                       |
| C 2-4       | 14:00~14:20 | Kinetic study on lignite char gasification with CO <sub>2</sub> and H <sub>2</sub> O in a fluidized bed reactor<br>▶ Shuai Tong (Presenter), Lin Li, Lunbo Duan, Changsui Zhao, Edward John Anthony  |                       |
| C 2-5       | 14:20~14:40 | Simulation of the Transient Response of a Fluidized Bed Gasifier for Hybridized Concentrated Solar Thermal Power Plant<br>▶ M. Suárez-Almeida (Presenter), J. Salinero, A.F. Ghoniem, B. Leckner, A. Gómez-Barea   |                       |
| 14:40~15:00 |             | Coffee Break   |                       |
| 15:00~16:40 |             | <b>A3 : FB's and CFB's Design and Operational Experience III</b><br>(Chair: Dr. Anita Pettersson / University of Borås, Sweden)  | Grand Ballroom A (2F) |
| A 3-1       | 15:00~15:20 | Design and Operation of the Double-Cylinder Rotary Ash Cooler for a CFB Boiler<br>▶ Huiwen Xiao (Presenter), Yang Zhang, Runxia Cai, Boheng Tong, Chengliang Liu, Lin Chen, Xiaoyu Zhang, Xiujian Lei, Qing Liu, Man Zhang, Hairui Yang, Junfu Lyu             |                       |
| A 3-2       | 15:20~15:40 | Hydrocracking of heavy-oil with dispersed catalyst in a slurry bubble column reactor<br>▶ Sung Woo Jeong (Presenter), Kang Seok Go, Yong Ku Kim, Woo Hyun Kim, Kwang Ho Kim, Nam Sun Nho   |                       |
| A 3-3       | 15:40~16:00 | Current developments of large-size/supercritical CFB technology and its developing trends<br>▶ Leming Cheng (Presenter), Jieqiang Ji, Qinhui Wang, Yangjun Wei, Mengxiang Fang, Zhongyang Luo, Mingjiang Ni, Kefa Cen  |                       |
| A 3-4       | 16:00~16:20 | The first year experience of once through CFB boiler operation of 330 MWe unit<br>▶ G. Ryabov (Presenter), D. Kuchmistrov, E Antonenko, I. Krutitskiy, O. Folomeev, D. Melnikov, A. Beliaev  |                       |
| A 3-5       | 16:20~16:40 | Overview of the Samcheok Green Power 4 x 550 MWe Supercritical Circulating Fluidized-Bed Steam Generator Project and Its First Years of Operation<br>▶ Sang Ho Lee, Timo Jäntti (Presenter), Juhani Burke, Riku Parkkonen, Kalle Nuortimo                      |                       |
| 15:00~16:40 |             | <b>B3 : Fundamentals: Particulate Solids and Fluidization I</b><br>(Chair: Prof. Sung Won Kim / Korea National University of Transportation, Korea)  | Grand Ballroom B (2F) |
| B 3-1       | 15:00~15:20 | The investigation of mass flux profile and separation of binary mixture of ash and metal oxide for chemical looping combustion of solid fuels<br>▶ G. Ryabov (Presenter), O Folomeev, I. Dolgushin   |                       |
| B 3-2       | 15:20~15:40 | Estimation and Verification on the Apparent Viscosity Measurements of Gas-solid Two-phase Flow<br>▶ Shujie Chen (Presenter), Yang Zhang, Runxia Cai, Hairui Yang, Hai Zhang, Hui Li, Junfu Lyu   |                       |
| B 3-3       | 15:40~16:00 | Detecting particle size change in gas-solid fluidized beds by cross recurrence and recurrence analysis<br>▶ Hooman Ziaei-Halimejani, Reza Zarghami (Presenter), Navid Mostoufi   |                       |
| B 3-4       | 16:00~16:20 | Investigation of the Hydrodynamics of a 1 MW <sub>th</sub> Circulating Fluidized Bed Pilot Plant<br>▶ A. Daikeler (Presenter), J. Ströhle, B. Epple  |                       |
| B 3-5       | 16:20~16:40 | Bubbling fluidization of residual biomasses in a binary system<br>▶ Louis Edwards Cáceres-Martínez (Presenter), Diana Carolina Guío-Pérez, Sonia Lucía Rincón-Prat   |                       |
| 15:00~16:40 |             | <b>C3 : CO<sub>2</sub> Capture and Chemical Looping I</b><br>(Chair: Prof. Leena Hupa / Abo Akademi University, Finland)   | Chardonnay Room (B1F) |

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| <b>C 3-1</b> | 15:00~15:20 | Increased load flexibility of the Calcium Looping CO <sub>2</sub> capture process with a bubbling/turbulent fluidized bed carbonator<br>▶ J. Moreno, R. Spörl (Presenter), G. Scheffknecht  |
| <b>C 3-2</b> | 15:20~15:40 | Reaction Pathways of Unburned Char, NO <sub>x</sub> , and N <sub>2</sub> O in Carbonator of Calcium Looping Process<br>▶ Tadaaki Shimizu (Presenter), Kento Ito, Ryo Hoshito, Heizo Kato, Osamu Hara, Jun Akutsu, Minoru Koarashi, Shizuka Wada, Liuyun Li                              |
| <b>C 3-3</b> | 15:40~16:00 | Model Experiments of Calcium Looping Process using a Two-Stage Bubbling Fluidized Bed Reactor System with Continuous Sorbent Feed<br>▶ Tadaaki Shimizu (Presenter), Shizuka Wada, Takehiko Kobayashi, Heizo Kato, Osamu Hara, Minoru Koarashi, Liuyun Li, Ewelina Ksepko, Marcin Sajdak |
| <b>C 3-4</b> | 16:00~16:20 | Pilot scale demonstration of CO <sub>2</sub> capture by Calcium Looping under cement plant specific conditions<br>▶ Matthias Hornberger (Presenter), Reinhold Spörl, Günter Scheffknecht  |
| <b>C 3-5</b> | 16:20~16:40 | Methane, Lignite and Bituminous Coal Conversion in a Two-Stage Fuel Reactor System for Chemical Looping Combustion<br>▶ Johannes Haus, Johannes Wilke, Ernst-Ulrich Hartge (Presenter), Joachim Werther, Stefan Heinrich  |

**DAY 2 - MAY 15 (TUE), 2018**

| SESSION CODE & TIME |             | CONTENTS  | Room                  |
|---------------------|-------------|---|-----------------------|
| 08:00~17:00         |             | Registration  | Lobby (2F)            |
| 09:00~09:50         |             | <b>PLENARY LECTURE 2</b><br>The Update and the Future of CFB Combustion in China<br>▶ Prof. Yue, Guangxi (Tsinghua University, China)   | Grand Ballroom (2F)   |
| 09:50~10:20         |             | Coffee Break  | Lobby (2F)            |
| 10:20~12:00         |             | <b>A4 : FB's and CFB's Design and Operational Experience IV</b><br>(Chair: Prof. Christoph Pfeifer / University of Natural Resources and Life Sciences, Austria)  | Grand Ballroom A (2F) |
| A 4-1               | 10:20~10:40 | The Design of Four Cyclones in the 660MW High Efficiency Ultra-supercritical Circulating Fluidized Bed Boiler<br>▶ Weijia Zheng (Presenter), Man Zhang, Junfu Lyu, Qing Liu, Hairui Yang  |                       |
| A 4-2               | 10:40~11:00 | Controlling vanadium induced corrosion in CFB boilers firing oil refinery residues<br>▶ Vesna Barišić, Kyösti Vänskä, Juha Sarkki, Timo Eriksson (Presenter)  |                       |
| A 4-3               | 11:00~11:20 | Thermal-hydraulic analysis and operation performance of the evaporator system of a 350 MWe supercritical CFB boiler<br>▶ Guoli Tang (Presenter), Yuxin Wu, Junfu Lyu, Zhouhang Li, Qing Liu, Feng Xiao, Wenwen Jiang, Pengbo Xu                               |                       |
| A 4-4               | 11:20~11:40 | Donghae Bio-Thermal Power Plant Unit #2 Has Accomplished Silver LTTF<br>▶ Chang Sup Sim (Presenter)   |                       |
| A 4-5               | 11:40~12:00 | Solid circulation in the CFB furnace in a power plant: Effects of fuel combustion and wall heat transfer<br>▶ Seongil Kim (Presenter), Sangmin Choi   |                       |
| 10:20~12:00         |             | <b>B4 : Modeling/CFD/Advanced Diagnostics III</b><br>(Chair: Dr. Daniel Bernhardt / Chair of Energy Process Engineering, Germany)   | Grand Ballroom B (2F) |
| B 4-1               | 10:20~10:40 | Development and Validation of a Three-Dimensional Eulerian CFD Model for Coal Gasification in a Fluidized Bed<br>▶ Jan May (Presenter), Christian Heinze, Jens Peters, Jochen Ströhle, Bernd Epple  |                       |
| B 4-2               | 10:40~11:00 | Modelling of Sorption-enhanced Biomass Gasification in Dual Fluidized Bed Process<br>▶ Jouni Ritvanen (Presenter), Antti Pitkääoja, Simo Sepponen, Timo Hyppänen  |                       |
| B 4-3               | 11:00~11:20 | Numerical Investigations on the Influence of Heterogeneous Reactions on the Hydrodynamics of Bubbling Fluidized Bed Gasifiers<br>▶ Philip Rößger (Presenter), Andreas Richter, Bernd Meyer  |                       |
| B 4-4               | 11:20~11:40 | A heat transfer corrected isothermal model for CFD modeling of biomass devolatilization in fluidized beds<br>▶ Hao Luo (Presenter), Hao Wu, Weigang Lin, Kim Dam-Johansen   |                       |
| B 4-5               | 11:40~12:00 | Numerical simulation of a dense flow cyclone using the kinetic theory of granular flow in dense discrete phase model<br>▶ In Sik Hwang (Presenter), Jungho Hwang  |                       |
| 10:20~12:00         |             | <b>C4 : Combustion II</b><br>(Chair: Dr. Yerbol Sarbassov / Nazarbayev University, Kazakhstan)  | Chardonnay Room (B1F) |
| C 4-1               | 10:20~10:40 | Experimental study on the load response rate and the performance of the dynamic co-combustion of CFB coal and pulverized coal with higher heat value in circulating fluidized bed boiler<br>▶ Su-xia Ma (Presenter), Xiong-feng Pan, Zhong-yuan Liu, Jun Chen |                       |
| C 4-2               | 10:40~11:00 | Combustion of High Alkali Biomass in CFB Boilers<br>▶ Viswamoorthy Raju, Sonja Enestam (Presenter), Hanna Kinnunen, Jaakko Tamminen, Juha Roppo, Takahiro Utsumi  |                       |
| C 4-3               | 11:00~11:20 | Combustion of methane in a bubbling fluidized bed with oxygen carrier aided combustion (OCAC)<br>▶ Viktor STENBERG (Presenter), Magnus Rydén, Tobias Mattisson, Anders Lyngfelt   |                       |
| C 4-4               | 11:20~11:40 | Integrated fluidized bed combustor and Stirling engine for micro-scale cogeneration<br>▶ Riccardo Chirone, Francesco Saverio Marra, Francesco Miccio, Michele Miccio (Presenter), Roberto Solimene, Massimo Urciuolo  |                       |
| C 4-5               | 11:40~12:00 | Temperature and Conversion of Char during Oxy-Fuel Combustion in Fluidized Bed: Influence of CO <sub>2</sub> Concentration at High O <sub>2</sub> Concentration<br>▶ J. Salinero, A. Gomez-Barea (Presenter), A. Berdugo, P. Haro, B. Leckner                 |                       |
| 12:00~13:00         |             | Lunch Break   |                       |
| 13:00~14:40         |             | <b>A5 : FB's and CFB's Design and Operational Experience V</b><br>(Chair: Prof. Fabrizio Scala / University of Naples "Federico II", Italy)   | Grand Ballroom A (2F) |
| A 5-1               | 13:00~13:20 | Testing of new materials to combat superheater corrosion in a waste fired CFB boiler<br>▶ M.D. Paz (Presenter), T. Jonsson, J. Liske  |                       |
| A 5-2               | 13:20~13:40 | Optimized study on operating performance of a 600MW supercritical fluidized bed boiler<br>▶ Xiaofeng Lu (Presenter), XiuJian Lei, Quanhai Wang, Silin Zhou, Jianbo Li, Zhang wenjin, Xu Jie, Xiong Xie, Yan Jin, Changxu Liu, Ye Chen                         |                       |

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|--------------------|-------------|---|------------------------------|
| <b>A 5-3</b>       | 13:40~14:00 | CFB flexible operation to enable the transition to renewable energy sources with maximum profitability<br>▶ Ari Kettunen (Presenter), Vesna Barišić, Edgardo Coda Zabetta, Jenő Kovács  |                              |
| <b>A 5-4</b>       | 14:00~14:20 | Experimental Study on Gas-solid Diffusion Characteristics in the Furnace of a 600 MW Supercritical CFB Boiler<br>▶ Jin Yan (Presenter), Xiaofeng Lu, Quanhai Wang, Jianbo Li, Xujian Lei, Xiong Zheng, Xuchen Fan, Changxu Liu, Zhen Xu, Sicong Sun   |                              |
| <b>A 5-5</b>       | 14:20~14:40 | The Selection of Fluidized Bed for CO <sub>2</sub> Methanation System in Power-to-Gas technology<br>▶ Myung Won Seo (Presenter), Won Chul Cho, Kang Seok Go, Do Yeon Lee, Hyun Seok Cho, Chang Hee Kim, Sung Min Yoon, Jae Ho Kim, Yong Ku Kim, Ho Jung Ryu   |                              |
| <b>13:00~14:40</b> |             | <b>B5 : Modeling/CFD/Advanced Diagnostics IV</b><br>(Chair: Prof. Bernd Epple / Technical University of Darmstadt, Germany)   | <b>Grand Ballroom B (2F)</b> |
| <b>B 5-1</b>       | 13:00~13:20 | Numerical simulation and validation of coarse-grained DDPM-EMMS modeling approach for 3D semi-industrial scale CFB reactor<br>▶ Nan Zhang (Presenter), Muhammad Adnan, Wei Wang   |                              |
| <b>B 5-2</b>       | 13:20~13:40 | Study of Heat Transfer Mechanism in Granular Thermal Energy Storage<br>▶ Mohamed Sobhi ALAGHA, Pal SZENTANNAI (Presenter)   |                              |
| <b>B 5-3</b>       | 13:40~14:00 | The Role of Dynamic Simulation in Detailed Design of a Commercial CFB Boiler<br>▶ Timo Yli-Fossi (Presenter), Ville Ylä-Outinen, Matti Vilkkö   |                              |
| <b>B 5-4</b>       | 14:00~14:20 | Numerical Simulation of Gas-solid Flow in a Circulation Fluidized Bed Based on Euler-Granular and DDPM-KTGF model<br>▶ Quanhai Wang (Presenter), Yi Zhang, Jianbo Li, Yan Jin, Xiaofeng Lu  |                              |
| <b>B 5-5</b>       | 14:20~14:40 | Fluid-thermal-stress Dynamics Model of a Drum-boiler in a Circulating Fluidized Bed Combustor<br>▶ Xuandai Ngo (Presenter), Byungho Song, Dowon Shun, Jaehyeok Park, Jaegoo Lee   |                              |
| <b>13:00~14:40</b> |             | <b>C5 : Gasification and Pyrolysis II</b><br>(Chair: Dr. Hanping CHEN / Huazhong University of Science and Technology, China)   | <b>Chardonnay Room (B1F)</b> |
| <b>C 5-1</b>       | 13:00~13:20 | Chemical looping gasification in a 2-4 MW <sub>th</sub> dual fluidized bed gasifier<br>▶ Sébastien Pissot (Presenter), Teresa Berdugo Vilches, Jelena Maric, Martin Seemann   |                              |
| <b>C 5-2</b>       | 13:20~13:40 | Suitability of K-feldspar as Alternative Bed Material in Dual Fluidized Bed Steam Gasification in Combination with Ash-Rich Feedstocks<br>▶ Katharina Wagner (Presenter), Anna Magdalena Mauerhofer, Matthias Kuba, Hermann Hofbauer  |                              |
| <b>C 5-3</b>       | 13:40~14:00 | Valorization of orange peel residues via fluidized bed torrefaction: comparison between different bed materials<br>▶ Paola Brachi (Presenter), Riccardo Chirone, Francesco Miccio, Michele Miccio, Giovanna Ruoppolo  |                              |
| <b>C 5-4</b>       | 14:00~14:20 | Co-combustion of Semi-coke and Pyrolysis Gases in a High-throughput Circulating Fluidized Bed<br>▶ Timo Hensler (Presenter), Andreas Wirtz, Christian Binder, Hermann Sieger, Indrek Aarna, Andreas Orth  |                              |
| <b>C 5-5</b>       | 14:20~14:40 | Shubarkol coal pyrolysis in a wire mesh reactor, production of semi-coke in an atmospheric circulating fluidized bed reactor and its integration with a thermal power plant<br>▶ Diyar Tokmurzin (Presenter), Desmond Adair, Myung Won Seo, Berik Aiyymbetov, Kalkaman Suleymenov, Yerbol Sarbassov |                              |
| <b>14:40~15:00</b> |             | Coffee Break  |                              |
| <b>15:00~16:40</b> |             | <b>A6 : Emissions and Environmental Impact I</b><br>(Chair: Dr. Uen do Lee / Korea Institute of Industrial Technology, Korea)   | <b>Grand Ballroom A (2F)</b> |
| <b>A 6-1</b>       | 15:00~15:20 | Mercury Speciation in a 50 kW <sub>th</sub> Circulating Fluidized Bed Combustor under an O <sub>2</sub> /CO <sub>2</sub> Atmosphere<br>▶ Hui Wang (Presenter), Shen Wang, Zhanfeng Ying, Yufeng Duan  |                              |
| <b>A 6-2</b>       | 15:20~15:40 | Towards optimization of multi-pollutant emissions control – CFBS pilot tests in 1 MW <sub>th</sub> scale<br>▶ Mariana Carvalho, Jens Peters, David Krause, Jochen Ströhle, Bernd Epple, Antti Rokka, Vesna Barišić, Timo Eriksson (Presenter)   |                              |
| <b>A 6-3</b>       | 15:40~16:00 | The Theoretical Analysis and Industrial Practices of Ultra-low NO <sub>x</sub> Emission for CFB Boilers<br>▶ Ke Xiwei (Presenter), Cai Runxia, Zhang Man, Yang Hairui, Wu Yuxin, Zhang Hai, Lyu Junfu   |                              |
| <b>A 6-4</b>       | 16:00~16:20 | Characterization of Emissions from Oil Shale Oxy-fuel CFB Firing<br>▶ Alar Konist (Presenter), Dmitri Neshumayev, Oliver Järvi, Lauri Loo, Marek Maasikmets   |                              |
| <b>A 6-5</b>       | 16:20~16:40 | Simultaneous removal of NO and SO <sub>2</sub> with hydrogen peroxide catalyzed by Alkali-Magnetic modified fly ash<br>▶ Bingchuan Yang (Presenter), Suxia ma, Rongji Cui, Shicheng Li, Jie Wang  |                              |
| <b>15:00~16:40</b> |             | <b>B6 : Fundamentals: Particulate Solids and Fluidization II</b><br>(Chair: Dr. Pal Szentannai / Budapest University of Technology and Economics, Hungary)  | <b>Grand Ballroom B (2F)</b> |
| <b>B 6-1</b>       | 15:00~15:20 | Investigation into Gas-Solid Flow Characteristics in a Parallel Circulating Fluidized Bed Combustion System for Burning High Alkali Zhundong lignite<br>▶ Jianbo Li (Presenter), Zhuo Liu, Zhuo Lv, Quanhai Wang, Xiaofeng Lu   |                              |
| <b>B 6-2</b>       | 15:20~15:40 | Experimental study on gas-solid flow characteristics in a 60-meter-high CFB rectangular riser<br>▶ Sicong Sun (Presenter), Xiaofeng Lu, Quanhai Wang, Jianbo Li, Jie Xu, Zhen Xu  |                              |

|                    |             |   |                                  |
|--------------------|-------------|---|----------------------------------|
| <b>B 6-3</b>       | 15:40~16:00 | Study of Flow Characteristic of Clusters in Circulating Fluidized Bed<br>▶ YIN Shang-yi (Presenter), LU Ping, CHEN Yu-hang  |                                  |
| <b>B 6-4</b>       | 16:00~16:20 | Particle Cluster Identification and Characterization in the Circulating Fluidized Bed Riser<br>▶ CHEN Yu-hang (Presenter), YIN Shang-yi , LU Ping   |                                  |
| <b>B 6-5</b>       | 16:20~16:40 | Transition from Bubbling to Turbulent Fluidization for Geldart's Group B Particles<br>▶ Tom Wyrwat (Presenter), Ernst-Ulrich Hartge, Mahdi Yazdanpanah, Stefan Heinrich   |                                  |
| <b>15:00~16:20</b> |             | <b>C6 : CO<sub>2</sub> Capture and Chemical Looping II</b><br>(Chair: Prof. Tadaaki Shimizu / Niigata University, Japan)  | <b>Chardonnay Room<br/>(B1F)</b> |
| <b>C 6-1</b>       | 15:00~15:20 | Development Chemical Looping Coal Combustion on NEDO project in Japan<br>▶ Yasuhiro Yamauchi, Takeshi Amari, Yutaka Takeda (Presenter)  |                                  |
| <b>C 6-2</b>       | 15:20~15:40 | Selective CO <sub>2</sub> capture by calcium looping in fluidised bed reactors in the presence of steam and sulphur dioxide<br>▶ Antonio Coppola, Alessandro Esposito, Fabio Montagnaro, Fabrizio Scala (Presenter), Piero Salatino |                                  |
| <b>C 6-3</b>       | 15:40~16:00 | Emission characteristics in a 10kW <sub>th</sub> pressurized oxy-fuel fluidized bed with continuous coal feeding<br>▶ Yuanqiang Duan, Lunbo Duan (Presenter), Jia Wang, Lin Li, Changsui Zhao                                       |                                  |
| <b>C 6-4</b>       | 16:00~16:20 | Calcium looping with simultaneous capture of CO <sub>2</sub> and SO <sub>2</sub> from a coal-based combustion power plant:<br>a preliminary techno-economic analysis<br>▶ Antonio Coppola (Presenter), Fabrizio Scala               |                                  |
| <b>17:00~18:00</b> |             | <b>POSTER SESSION</b>   | <b>Lobby<br/>(2F)</b>            |
| <b>17:00~18:00</b> |             | <b>FBC Steering Committee Meeting</b>   |                                  |
| <b>19:00~21:00</b> |             | <b>BANQUET</b>  | <b>Grand Ballroom<br/>(2F)</b>   |

**DAY 3 - MAY 16 (WED), 2018**

| SESSION CODE & TIME |             | CONTENTS   | Room                  |
|---------------------|-------------|--|-----------------------|
| 08:00~17:00         |             | Registration   | Lobby (2F)            |
| 09:00~09:50         |             | <b>PLENARY LECTURE 3</b><br>FINEX® with multi-stage fluidized bed for iron ore reduction, Lab to Commercial<br>▶ Dr. Sang Ho Lee (POSCO, Korea)  | Grand Ballroom (2F)   |
| 09:50~10:20         |             | Coffee Break   | Lobby (2F)            |
| 10:20~12:00         |             | <b>A7 : FB's and CFB's Design and Operational Experience VI</b><br>(Chair: Dr. Dennis Lu / CanmetENERGY, Canada)   | Grand Ballroom A (2F) |
| A 7-1               | 10:20~10:40 | Dangjin Bio I plant operational experience<br>▶ Pasi Petra, Sang-iae Cho, Timo Eriksson, Aki Pyykkönen, Timo Jäntti (Presenter)  |                       |
| A 7-2               | 10:40~11:00 | Combustion adjustment test of a 240 t/h CFB boiler<br>▶ Xuemin LIU (Presenter), Guoli QI, Songsong ZHANG, Jian GUAN, Yongqiang CHANG, Zhongwei WANG  |                       |
| A 7-3               | 11:00~11:20 | The design and scale-up of fluidized bed reduction system for FINEX® process<br>▶ Myoung-Kyun Shin (Presenter), Chang-Kuk Ko, Woon-Jae Lee   |                       |
| A 7-4               | 11:20~11:40 | The Coal-fired CFB Steam Generator Using Recovery Wastewater for Heavy Oil Recovery<br>▶ Junping Gu (Presenter), Yuxin Wu, Junfu Lyu, Ping Wu, Man Zhang, Liping Wu, Hairui Yang   |                       |
| A 7-5               | 11:40~12:00 | Calcining in Circulating Fluidized Bed Systems – Industrial Practice and new Applications<br>▶ Edgar Gasafi (Presenter), Linus Perander, Theodor Beisheim  |                       |
| 10:20~12:00         |             | <b>B7 : Modeling/CFD/Advanced Diagnostics V</b><br>(Chair: Prof. Hang Seok Choi / Yonsei University, Korea)  | Grand Ballroom B (2F) |
| B 7-1               | 10:20~10:40 | Simulation Study of the Bubble Behavior in Fluidized Bed Reactors with Internal Horizontal Tubes and their effect on Thermochemical Heat Storage Systems<br>▶ Stylianos Flegkas (Presenter), Felix Birkelbach, Franz Winter, Markus Haider, Andreas Werner   |                       |
| B 7-2               | 10:40~11:00 | Burying Thermocouples Using Deposited Metal for Tube-wall Temperature Measurements in Circulating Fluidized Bed Boilers<br>▶ Yuge Yao (Presenter), Runxia Cai, Yang Zhang, Man Zhang, Hairui Yang, Junfu Lyu   |                       |
| B 7-3               | 11:00~11:20 | Two-Fluid and Euler-Lagrange/DEM Model for the Simulation of CO2 Capture Processes<br>▶ Falah Alobaid (Presenter), Alexander Stroh, Jan May, Jens Peters, Christian Heinze and Bernd Epple   |                       |
| B 7-4               | 11:20~11:40 | A dynamic model for gas-solid hydrodynamic in CFB boiler<br>▶ SHAN Lu, ZHANG Man, ZHANG Yi, LIU Chengliang, YANG Hairui (Presenter)  |                       |
| B 7-5               | 11:40~12:00 | Effect of outlet pressure difference on particles behavior in the FINEX fluidized bed reactor coupled with multiple cyclones<br>▶ Kwonwoo Jang (Presenter), Shi-Kyung Yoon, Kang Y. Huh  |                       |
| 10:20~12:00         |             | <b>C7 : Combustion III</b><br>(Chair: Dr. Dmitry Klimov / Clean Energy, Russian Federation)  | Chardonnay Room (B1F) |
| C 7-1               | 10:20~10:40 | A study into the combustion process of Acacia mearnsii (black wattle) in a circulating fluidized bed<br>▶ Monika Kosowska-Golachowska, Adam Luckos (Presenter), Aneta Magdziarz, Krzysztof Wolski  |                       |
| C 7-2               | 10:40~11:00 | Basic scheme and numerical simulation of 35 t/h boiler with low-volatile semi-coke<br>▶ Jianguo Zhu (Presenter), Chengbo Man, Ziqu Ouyang, Jingzhang Liu, Fang Niu, Shiyuan Li   |                       |
| C 7-3               | 11:00~11:20 | Combustion Characterization of Refuse Derived Fuel From Municipal Solid Waste From Astana City. Thermogravimetric and Tube Furnace Analysis<br>▶ Yerbol Sarbassov (Presenter), Berik Aiyymbetov, Diyar Tokmurzin, Almira Yagofarova, Bexultan Abylkhani, Christos Venetis, Vassilis Inglezakis, Edward J Anthony |                       |
| C 7-4               | 11:20~11:40 | Thermodynamic Investigation of Selected Metal Sulfates for Controlling Fouling and Slagging During Combustion<br>▶ Fiseha Tesfaye (Presenter), Mykola Moroz, Daniel Lindberg, Leena Hupa, In-Ho Jung   |                       |
| C 7-5               | 11:40~12:00 | Development of Oxy-CFB combustion technology for CO <sub>2</sub> capture<br>▶ Jihong Moon (Presenter), Tae-Young Mun, Sung-Ho Jo, Myung Won Seo, Nguyen Hoang Khoi, Sung Jin Park, Ho Won Ra, Sung-Min Yoon, Jae-Goo Lee   |                       |
| 12:00~13:00         |             | Lunch Break  |                       |
| 13:00~14:40         |             | <b>A8 : FB's and CFB's Design and Operational Experience VII</b><br>(Chair: Prof. Loli Paz / Chalmers University of Technology, Sweden)  | Grand Ballroom A (2F) |
| A 8-1               | 13:00~13:20 | Supercritical 300 MW class CFB Boiler for low grade coal<br>▶ Gerd Heiermann (Presenter), Damian Goral, Frank Leuschke   |                       |
| A 8-2               | 13:20~13:40 | Performance Evaluation of a 60 ton/h CFB Boiler for Solid Refuse Fuel<br>▶ Doyeon Lee, Jeong seon Shin, Jae hyeok Park, Dal-Hee Bae, Dowon Shun (Presenter)  |                       |
| A 8-3               | 13:40~14:00 | A Novel Method to Detect Hydrate formation and Deliquescence of Salts and Deposits Related to Low-Temperature Corrosion in FBC<br>▶ Emil Vainio (Presenter), Elisa Hupa, Markus Engblom, Juho Lehmusto, Daniel Lindberg  |                       |



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| <b>A 8-4</b>       | 14:00~14:20 | Correlation between field and laboratory exposures for boiler corrosion test<br>– mechanistic study of chlorine induced corrosion<br>▶ M.A. Olivas-Ogaz (Presenter), M.D. Paz, T. Jonsson, J. Liske  |                              |
| <b>A 8-5</b>       | 14:20~14:40 | Performance test of Operating Conditions of Circulating Fluidized Bed (CFB) Boiler Component:<br>A Computational Fluid Dynamics Study<br>▶ In Sik Hwang (Presenter), Jongmin Lee, Dongwon Kim, Jungho Hwang  |                              |
| <b>13:00~14:40</b> |             | <b>B8 : Fundamentals: Particulate Solids and Fluidization III</b><br>(Chair: Prof. Emil Vainio / Åbo Akademi University, Finland)  | <b>Grand Ballroom B (2F)</b> |
| <b>B 8-1</b>       | 13:00~13:20 | CFD Simulations of Segregation in Binary Fluidized Beds Composed of Geldart B Particles<br>▶ Mohamed Sobhi ALAGHA, Pal SZENTANNAI (Presenter)  |                              |
| <b>B 8-2</b>       | 13:20~13:40 | Determination of the Apparent Viscosity of Dense Gas-Solids Emulsion by Magnetic Particle Tracking<br>▶ Anna Köhler (Presenter), David Pallarès, Filip Johnsson  |                              |
| <b>B 8-3</b>       | 13:40~14:00 | High-temperature erosion studies of boiler materials<br>▶ Emil Vainio, Topias Mannisto, Leena Hupa (Presenter), Edgardo Coda Zabetta, Kyösti Vänskä  |                              |
| <b>B 8-4</b>       | 14:00~14:20 | CFD Modeling of Binary Particle Mixing within a Fluidized Bed:<br>Extending a Bubble Based EMMS Model to Multi-particles System<br>▶ Liping Wei (Presenter), Youjun Lu   |                              |
| <b>B 8-5</b>       | 14:20~14:40 | Increasing Gas–Solids Mass Transfer in Fluidized Beds by Application of Fluidized–Packed Beds<br>– a Feasibility Study<br>▶ Aronsson, J. (Presenter), Pallarès, D., Rydén, M., Lyngfelt, A.  |                              |
| <b>13:00~14:40</b> |             | <b>C8 : Ash and Spent Solids I</b><br>(Chair: Dr. Patrik Yrjas / Åbo Akademi University, Finland)  | <b>Chardonnay Room (B1F)</b> |
| <b>C 8-1</b>       | 13:00~13:20 | Modeling Study of Combustion Process of Oil shale semi coke in a Circulating Fluidized Bed Boiler<br>▶Yiqun Huang (Presenter), Man Zhang, Junfu Lyu, Hairui Yang, Guangxi Yue  |                              |
| <b>C 8-2</b>       | 13:20~13:40 | Mechanism study on deposition on convective heating surfaces in biomass-fired CFB boilers<br>▶ Hang Shi (Presenter), Yuxin Wu, Man Zhang, Hairui Yang, Junfu Lyu   |                              |
| <b>C 8-3</b>       | 13:40~14:00 | Simultaneous removal of NO <sub>x</sub> and SO <sub>2</sub> with H <sub>2</sub> O <sub>2</sub> via a Fenton process under the modified magnetic spheres catalyst from fly ash: Effect of modification methods<br>▶ Rongji Cui (Presenter), Bingchuan Yang, Shicheng Li, Jie Wang, Suxia Ma |                              |
| <b>C 8-4</b>       | 14:00~14:20 | Effects of Bed Material Type and Fuel Ash Composition on Layer Formation and Bed Agglomeration in Thermo-chemical Conversion of Biomass and Waste Streams in Fluidized Beds<br>▶ Nils Skoglund (Presenter), Matthias Kuba, Dan Boström, Marcus Öhman                                       |                              |
| <b>C 8-5</b>       | 14:20~14:40 | Leachability of potassium from ilmenite used as bed material during OCAC<br>▶ Angelica Corcoran (Presenter), Fredrik Lind, Henrik Thunman, Pavleta Knutsson  |                              |
| <b>14:40~15:00</b> |             | Coffee Break   |                              |
| <b>15:00~16:40</b> |             | <b>A9 : Emissions and Environmental Impact II</b><br>(Chair: Prof. Alar Konist / Tallinn University of Technology, Estonia)  | <b>Grand Ballroom A (2F)</b> |
| <b>A 9-1</b>       | 15:00~15:20 | An Application of Molten Tin for Refining SF <sub>6</sub> Generated from Semiconductor and Display Manufacturing<br>▶ Ji-Won Hwang (Presenter), Soo-Hwa Jeong, Young-Doo Kim, Byung-Ryeul Bang, Uen-Do Lee   |                              |
| <b>A 9-2</b>       | 15:20~15:40 | Experimental study on combustion and pollutant control of extremely low calorific oil shale semi-coke in fluidized bed system<br>▶ Yu Yang (Presenter), Xiaofeng Lu, Fang Han, Mingfu Bao, Quanhai Wang, Jianbo Li, Zhuo Liu   |                              |
| <b>A 9-3</b>       | 15:40~16:00 | Particle Size Distribution and Enrichment of Metal Components in Fly Ash from Waste Sludge Combustion in Air and Oxy Conditions using Circulating Fluidized Bed<br>▶ Ha-Na Jang (Presenter), Jeong-Hun Kim, Jin-Ho Sung, Heung-Min Yoo, Hang Seok Choi, Yong-Chil Seo                      |                              |
| <b>A 9-4</b>       | 16:00~16:20 | Experimental study of NO and N <sub>2</sub> O removal in CFB boiler: effects of sodium additives and fly ash<br>▶ Xinjie Liao (Presenter), Shihong Zhang, Jingai Shao, Teng Shen, Haiping Yang, Xianhua Wang, Hanping Chen   |                              |
| <b>A 9-5</b>       | 16:20~16:40 | Research on the Economy of Desulfurization and Denitration for a 350MW Supercritical CFB Boiler<br>▶ XIN Shengwei (Presenter), CHEN Ying, HU Changhua, ZHANG Jiansheng   |                              |
| <b>15:00~16:40</b> |             | <b>B9 : Gasification and Pyrolysis III</b><br>(Chair: Prof. Xiaofeng Lu / Chongqing University, China)   | <b>Grand Ballroom B (2F)</b> |
| <b>B 9-1</b>       | 15:00~15:20 | Potassium induced defluidization in a lab-scale fluidized bed reactor<br>▶ Bozidar Anicic (Presenter), Weigang Lin, Hao Wu, Kim Dam-Johansen   |                              |
| <b>B 9-2</b>       | 15:20~15:40 | Development of 20TPD Rice Husk Bubbling Fluidized Bed Gasifier for Distributed Power Generation System<br>▶ Sung Jin Park (Presenter), Seong Hye Son, Ho Won Ra, Sang Jun Yoon, Tae young Mun, Ji Hong Moon, Sung Min Yoon, Young Ku Kim, Jae Ho Kim, Jae Goo Lee, Myung Won Seo           |                              |
| <b>B 9-3</b>       | 15:40~16:00 | Investigation of Reaction Process in a Dual Fluidized Bed Gasifier<br>▶ Yosuke Tsuboi (Presenter), Yasuzo Kumagai, Toshiyuki Suda, Jun-ichiro Hayashi  |                              |
| <b>B 9-4</b>       | 16:00~16:20 | Air gasification of PE in a new-type three-stage gasifier with in-situ regeneration of activated carbon used as tar removal agent<br>▶ Yong-Sung Jeong (Presenter), Joo-Sik Kim  |                              |
| <b>B 9-5</b>       | 16:20~16:40 | Production of oil with a low level Cl from the two-stage pyrolysis of plastic mixture<br>▶ Ki-Bum Park (Presenter), Joo-Sik Kim  |                              |

| 15:00~16:40  |             | <b>C9 : Ash and Spent Solids II</b><br>(Chair: Prof. Su-xia Ma / Taiyuan University of Technology, China)  | <b>Chardonnay Room<br/>(B1F)</b> |
|--------------|-------------|--|----------------------------------|
| <b>C 9-1</b> | 15:00~15:20 | Experimental and Modeling Approaches to Simulate Temperature-Gradient Induced Intradeposit Chemical Processes with Implications for Biomass Boiler Corrosion<br>▶ Daniel Lindberg (Presenter), Jonne Niemi, Markus Engblom, Tor Laurén, Patrik Yrjas, Mikko Hupa |                                  |
| <b>C 9-2</b> | 15:20~15:40 | Influence of fuel pre-treatments on ash-forming elements and implications on corrosion<br>▶ Patrik Yrjas (Presenter), Michiel Carbo, Arno Janssen, Pedro Abelha, Timo Leino, Leena Hupa  |                                  |
| <b>C 9-3</b> | 15:40~16:00 | Role of K and Ca for catalytic activation of bed material during biomass gasification<br>▶ Robin Faust (Presenter), Jelena Maric, Teresa Berdugo Vilches, Britt-Marie Steenari, Martin Seemann, Pavleta Knutsson   |                                  |

## POSTER SESSION

| Code  | Title   | Author(s)   |
|-------|---|---|
| PS 1  | Application and Operating Experience of High Sulfur Fuels in Circulating Fluidized Bed Boilers  | Kyu Jong Kim (Presenter), Daehee Kim, Jung Rae Kim, Kyung Mo Lee, Jeong Mok Park  |
| PS 2  | Study on Heat Absorption Distribution Characteristics of the Heating Surfaces of Supercritical CFB Boiler   | Hu Wang (Presenter), Shengwei Xin, Changhua Hu  |
| PS 3  | Performance Analysis of Cyclone and Fluidized Bed External Heat Exchanger through Barracuda Simulation  | Jongmin Lee (Presenter), Dongwon Kim, Kyoungil Park, Sangmi Kim   |
| PS 4  | Emission Characteristics of Sewage Sludge, Coal, Wood Pellet, and their Blends in a Fluidized Bed Reactor   | Hyungjun Ahn (Presenter), Donghee Kim, Youngjae Lee, Won Yang   |
| PS 5  | In-Situ Direct Desulfurization of Limestones under Oxy-Circulating Fluidized Bed Combustion Conditions  | Ye Bin Kim (Presenter), You Ra Gwak, Sang In Keel, Jin Han Yun, See Hoon Lee  |
| PS 6  | Evaluation of clay catalysts for biomass fluid catalytic cracking gasification  | SUN Yan (Presenter), SUDO Yuta, Imron Masfuri, Novio Valentino, Atti Sholiha, NODA Reiji                                  |
| PS 7  | Fast pyrolysis of palm kernel cake in a fluidized bed reactor: Experiment and simulation estimation using Aspen Plus  | Jaeyong Jeong (Presenter), Eunhye Song, Uendo Lee, Soohwa Jeong   |
| PS 8  | A study on solid refuse fuel gasification characteristics in downdraft fixed bed and bubbling fluidized bed reactors  | Se-Won Park (Presenter), Yong-Chil Seo, Sang-Yeop Lee, Yeon-Ouk Jeong, Gun-Ho Han   |
| PS 9  | Application of DAEM in pyrolysis of a typical Chinese sub-bituminous Zhundong coal  | Guodong Jiang (Presenter), Liping Wei,  |
| PS 10 | Hydrodynamics of Vertically Aligned Carbon Nanotube Particles in a Fluidized Bed  | Min Ji Lee, Sae Han Park, Sung Won Kim (Presenter)  |
| PS 11 | Study of the Kinetics of the Heterogeneous Sulfation of Alkali Chloride in Oxy-fuel Combustion Flue Gas Atmosphere  | Wei Li (Presenter), Dianbin Liu, Shiyuan Li   |
| PS 12 | Influence of Operating Parameters on NO and N <sub>2</sub> O Emissions at High Oxygen Concentration in a 1MWth Pilot-scale Oxy-fuel Circulating Fluidized Bed | Shiyuan Li, Mingxin Xu (Presenter), Wei Li  |
| PS 13 | Properties of Solids Flow into a Bubbling Bed in an Inclined Standpipe  | Yoo Sube Won (Presenter), Daewook Kim, Jeong-Hoo Choi, Sung-Ho Jo, Ho-Jung Ryu, Chang-Keun Yi                             |
| PS 14 | CPFD simulation to evaluate the flow characteristics in a 500 MW CFB  | Kang-Min Kim (Presenter), Hyun-Seok Oh, Gyu-Bo Kim, Chung-Hwan Jeon, Ki-Jung Sung, Seok-Gi Ahn,                           |
| PS 15 | The oil-shale 1.5D combustion model for circulating fluidized bed (CFB) boilers   | Dmitri Neshumayev (Presenter), Tõnu Pihu, Alar Konist, Andres Siirde  |
| PS 16 | Operation data based model of CFB boiler under full working conditions  | Guo Zhanghang (Presenter), Xue Yali, Liu Pei, Li Zheng  |
| PS 17 | Dynamic Simulation Model of Combustion System of CFB Boilers  | Wu Haihang (Presenter), Xue Yali, Guo Zhanghang, Wang Zhe, Li Zheng   |
| PS 18 | Computational analysis of 2MW Oxy-CFB boiler  | You Ra Gwak (Presenter), Ye Bin Kim, Ho Seong Kim, Sang In Keel, Jin Han Yun, See Hoon Lee                                |
| PS 19 | The experiment of classification and drying of coking coal and CPFD simulation of gas-solid flow in a pilot-scale fluidized bed dryer                         | Qi Chen (Presenter), Daqian Wang, Huihui Liu, Kuo Zeng, Haiping Yang, Shihong Zhang, Hanping Chen, Junfang Bao, Peng Chen |
| PS 20 | Influence of numerical parameters on hydrodynamics and biomass fast pyrolysis in a circulating fluidized bed reactor: Using CFD simulation                    | Mukesh Upadhyay (Presenter), Hoon Chae Park, Jae Gyu Hwang, Yong-Chil Seo, Hang Seok Choi                                 |
| PS 21 | Techno-economic analysis of biooil production from sawdust using fast pyrolysis fluidized-bed   | Chang-Ho Oh, Young-il Lim (Presenter)   |