



# THIRTY - THIRD ANNUAL INTERNATIONAL PITTSBURGH COAL CONFERENCE

University of Pittsburgh - Swanson School of Engineering

## FINAL PROGRAM

COAL - ENERGY, ENVIRONMENT AND  
SUSTAINABLE DEVELOPMENT



August 8 - 12, 2016  
Cape Town, SOUTH AFRICA  
Cape Town International Convention Center



University of Pittsburgh  
Swanson School of Engineering



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**WELCOME!**

On behalf of the Conference Advisory Board, Conference Committees, and the University of Pittsburgh we welcome you to the Thirty-Third Annual International Pittsburgh Coal Conference held August 8 - 12, 2016 at the Cape Town International Convention Center in Cape Town, South Africa. The Conference is hosted by the University of Pittsburgh.

The theme of this year's conference is "Coal - Energy, Environment and Sustainable Development" which covers a wide spectrum of important topics on coal technology, synfuel and environmental issues. The topics cover energy and environmental issues and technologies related to coal and its byproducts. Over 200 technical papers and posters will be presented throughout the conference. The Poster Sessions will be held on Wednesday, August 10 from 17:30 - 19:30. For detailed information on technical sessions, papers and speakers, please turn to page 6 in the Technical Program.

The invited Plenary Speakers include: Grace M. Bochenek, Director, National Energy Technology Laboratory, Department of Energy, USA; Wang Hongqiao, Vice President, China National Coal Association, CHINA; Robert Jeffrey, Managing Director and Senior Economist, Econometrix, SOUTH AFRICA and Rosemary Falcon, Professor, School of Chemical and Metallurgical Engineering, University of the Witwatersrand, SOUTH AFRICA; Aleksander Sobolewski, Institute For Chemical Processing of Coal, POLAND; Xiangzeng Wang, Senior Vice President, Shaanxi Yanchang Petroleum Group Company, CHINA; Paul de Mattos, Managing Director, Clarke Energy, SOUTH AFRICA; Satya P. Chauhan, Senior Program Director, Battelle Columbus Operations, USA; and Johan Brand, Managing Director, Africary, SOUTH AFRICA.

We express our sincere gratitude to the contributors for their support and involvement, to all the authors and co-authors of the technical papers and to all the members of the Program Committee, Awards Committee, International Committee and Membership Committee. Special thanks go to all session chairs, speakers and international delegates for their contributions to the 2016 technical program.

As the chair of the Advisory Board of the Conference, I deeply appreciate your participation and interest in this year's Conference and we invite you to join us next year for the Thirty-Fourth Annual International Pittsburgh Coal Conference, which will be held in Pittsburgh, PA from September 5 - 8, 2017.

Sincerely,



Richard Winschel, Chair  
CONSOL Energy Inc., Pittsburgh, PA, USA

**CONFERENCE REGISTRATION**

On-Site Registration will begin Tuesday, August 9, from 15:00 - 18:00 and continues Wednesday, Thursday, from 7:00 - 15:30, and Friday from 7:00 until 10:00.

**Please check in even if you have Pre-Registered!**

**PITT AWARD**

*The Award for Innovation in Coal Conversion* was founded by the Chemical and Petroleum Engineering Department, University of Pittsburgh in 1983 with industrial support. Since 1992, it has been fully funded by CONSOL Energy Inc.

**The International Pittsburgh Coal Conference**

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CONFERENCE ORGANIZER:  
Mrs. Heidi M. Peck

University of Pittsburgh  
Swanson School of Engineering  
940 Benedum Hall  
Pittsburgh, PA 15261 USA  
Tel: +1-412-624-7440  
FAX: +1-412-624-1480  
Email: [ipcc@pitt.edu](mailto:ipcc@pitt.edu)  
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## CONFERENCE OVERVIEW

### MONDAY, AUGUST 8, 2016

Technical Tour - Johannesburg	06:45 - 17:30
Technical Tour - Cape Town	07:15 - 13:00

### TUESDAY, AUGUST 9, 2016

Vineyard Tour, Cape Town	08:15 - 13:00
Registration	15:00 - 18:00
Welcome Cocktail Reception	17:30 - 19:30

### WEDNESDAY, AUGUST 10, 2016

Registration	07:00 - 15:30
Opening Session	08:30 - 08:45
Plenary Session – 1	08:45 - 10:30
Concurrent Tech. Sessions	10:50 - 12:30
Conference Lunch	12:30 - 13:30
Concurrent Tech. Sessions	13:30 - 17:10
Poster Session	17:30 - 19:30

### THURSDAY, AUGUST 11, 2016

Registration	07:00 - 15:30
Opening Session	08:30 - 08:45
Plenary Session – 2	08:45 - 10:30
Concurrent Tech. Sessions	10:50 - 12:30
Conference Lunch	12:30 - 13:30
Concurrent Tech. Sessions	13:30 - 17:10
Gala Dinner	18:30 - 21:30

### FRIDAY, AUGUST 12, 2016

Registration	07:00 - 10:00
Opening Session	08:30 - 08:45
Plenary Session – 3	08:45 - 10:00
Concurrent Tech. Sessions	10:20 - 12:00
Awards Lunch	12:30 - 13:30
Advisory Board Meeting	17:00 - 19:00

## PLENARY SPEAKERS

### WEDNESDAY, AUGUST 10, 2016

#### **Dr. Grace M. Bochenek**

Director, National Energy Technology Laboratory,  
Department of Energy, USA

**“Defining the Future – The Imperative of  
Coal Research”**

#### **Mr. Wang Hongqiao**

Vice President

China National Coal Association, CHINA

**“Current Situation and Prospect of Coal Industry in  
China”**

#### **Mr. Robert Jeffrey**

Managing Director and Senior Economist  
Econometrix, SOUTH AFRICA

**“Energy and its Effect on Economic Growth - The Role  
of Coal and Gas in the Future Economic Environment”**

### THURSDAY, AUGUST 11, 2016

#### **Dr. Aleksander Sobolewski**

Institute For Chemical Processing of Coal, POLAND

**“Coal Gasification in Poland - Perspectives and Key  
Driving Forces”**

#### **Dr. Xiangzeng Wang**

Senior Vice President

Shaanxi Yanchang Petroleum Group Company, CHINA

**“Cleaner Coal and Greener Oil Production: An  
Integrated CCUS Approach by the  
Yanchang Petroleum Group”**

#### **Mr. Paul de Mattos**

Managing Director, Clarke Energy, SOUTH AFRICA

**“The Future of Electricity Production from Coal and  
Gas”**

### FRIDAY, AUGUST 12, 2016

#### **Dr. Satya P. Chauhan**

Senior Program Director

Battelle Columbus Operations, USA

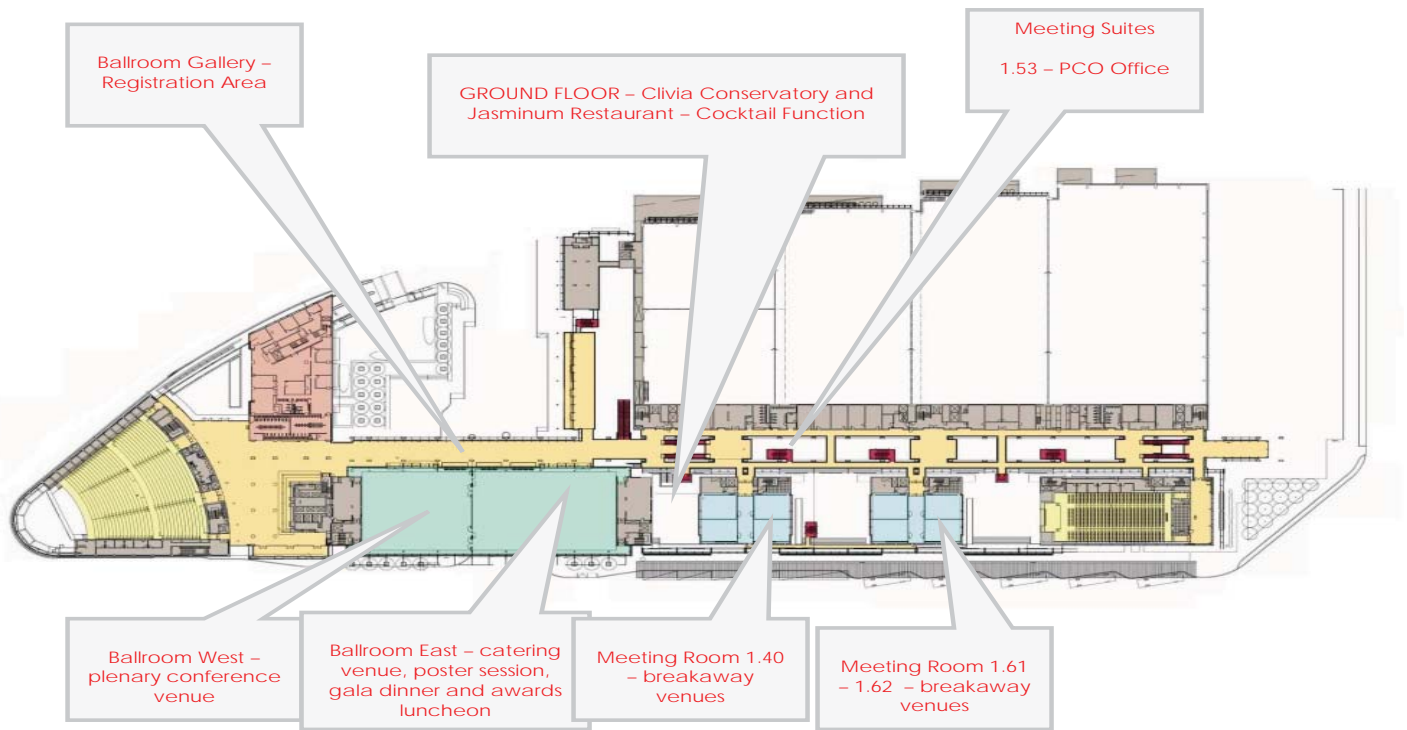
**“Scale-Up of Battelle’s Direct Coal-To-Liquids (CTL)  
Process for Jet Fuel Using Biomass-Derived Solvents”**

#### **Mr. Johan Brand**

Managing Director, Africary, SOUTH AFRICA

**“Environment Coal, Energy, and CCS Potential in South  
Africa - A Review”**

Monday, August 8, 2016						
6:45-17:30	Technical Tour – Eskom Lethabo and Sasol Secunda Plant Bus Tour, Gauteng (Johannesburg)					
7:15-13:00	Technical Tour – Koeberg Power Plant, Cape Town					
Tuesday, August 9, 2016						
8:15-13:00	Vineyard Tour, Cape Town					
15:00-18:00	Registration - Outside Ballroom					
17:30-19:30	Welcome Cocktail Reception - Clivia Conservatory & Jasminum Restaurant					
Wednesday, August 10, 2016						
7:00-15:30	Registration - Outside Ballroom					
8:30-8:45	Opening Session – West Ballroom					
8:45-10:30	Plenary Session – West Ballroom					
10:30-10:50	Morning Tea					
ROOM	West Ballroom	Room 1.41 and 1.42	Room 1.43	Room 1.44	Room 1.61	Room 1.62
	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
10:50-12:30	Clean Coal Demonstration and Commercial Projects - 1	Combustion Technologies 1	Carbon Management - 1	Coal Science - 1	Gasification Technologies: Gas Cleanup	Coal Mining and Beneficiation - 1
12:30-13:30	Conference Lunch - East Ballroom					
	Session 7	Session 8	Session 9	Session 10	Session 11	Session 12
13:30-15:10	Clean Coal Demonstration and Commercial Projects - 2	Combustion Technologies - 2	Carbon Management - 2	Coal Science - 2	Gasification Technologies: UCG - 1	Coal Mining and Beneficiation - 2
15:10-15:30	Afternoon Tea					
	Session 13	Session 14	Session 15	Session 16	Session 17	Session 18
15:30-17:10	Clean Coal Demonstration and Commercial Projects - 3	Combustion Technologies - 3	Carbon Management - 3	Coal Science - 3	Gasification Technologies: General - 1	Coal Mining and Beneficiation - 3
17:30-19:30	Poster Session with Wine Tasting - East Ballroom					
Thursday, August 11, 2016						
7:00-15:30	Registration - Outside Ballroom					
8:30-8:45	Opening Session – West Ballroom					
8:45-10:30	Plenary Session – West Ballroom					
10:30-10:50	Morning Tea					
ROOM	West Ballroom	Room 1.41 and 1.42	Room 1.43	Room 1.44	Room 1.61	Room 1.62
	Session 19	Session 20	Session 21	Session 22	Session 23	
10:50-12:30	Clean Coal and Gas to Fuels: Catalytic Study - 1	Sustainability and Environment - 1	Shale and Coal Bed Gas - 1	Coal Science - 4	Gasification Technologies: General - 2	
12:30-13:30	Conference Lunch - East Ballroom					
	Session 24	Session 25	Session 26	Session 27	Session 28	
13:30-15:10	Clean Coal and Gas to Fuels: New Technologies	Sustainability and Environment - 2	Gasification Technologies: UCG - 2	Coal Science - 5	Gasification Technologies: Modeling - 1	
15:10-15:30	Afternoon Tea					
	Session 29	Session 30	Session 31	Session 32	Session 33	
15:30-17:10	Clean Coal and Gas to Fuels: Catalytic Study - 2	Sustainability and Environment - 3	Gasification Technologies: General - 4	Coal Science - 6	Gasification Technologies: General - 3	
18:30-21:30	Gala Dinner - East Ballroom					
Friday, August 12, 2016						
7:00-10:00	Registration - Outside Ballroom					
8:30-8:45	Opening Session – West Ballroom					
8:45-10:00	Plenary Session – West Ballroom					
10:00-10:20	Morning Tea					
ROOM	West Ballroom	Room 1.41 and 1.42	Room 1.43	Room 1.44	Room 1.61	Room 1.62
	Session 34	Session 35	Session 36			
10:20-12:00	Clean Coal and Gas to Fuels: Processing	Gasification Technologies: Modeling - 2	Gasification Technologies: General - 5			
12:30-13:30	Awards Luncheon - East Ballroom					
17:00-19:00	Advisory Board Meeting - Cullinan Hotel					



**First Floor**

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## EXHIBITORS

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## SESSION MEETING ROOMS

### **West Ballroom**

Sessions 1, 7, 13, 19, 24, 29, 34

### **Room 1.41 and 1.42**

Sessions 2, 8, 14, 20, 25, 30, 35

### **Room 1.43**

Sessions 3, 9, 15, 21, 26, 31, 36

### **Room 1.44**

Sessions 4, 10, 16, 22, 27, 32

### **Room 1.61**

Sessions 5, 11, 17, 23, 28, 33

### **Room 1.62**

Sessions 6, 12, 18

## **Registration**

Foyer outside Ballroom

## **Tuesday Welcome Cocktail Reception**

Clivia Conservatory & Jasminum  
Restaurant

## **Opening Session**

West Ballroom

## **Plenary Session**

West Ballroom

## **Conference Luncheons**

East Ballroom

## **Poster Presentations**

East Ballroom

## **Exhibits**

Ballroom

## ORAL SESSIONS

### Wednesday, August 10

#### SESSION 1 CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS - 1

*John Bunt and Thomas Sarkus*

**The Value of Fuel Flexible Circulating Fluidized Bed Technology**, Robert Giglio, Antonio Castilla Oliver, Amec Foster Wheeler, USA

**Application Update of OMB CWS Gasification Process**, Guangsuo Yu, Qinghua Guo, Xueli Chen, Yifei Wang, Zhenghua Dai, Haifeng Liu, Fuchen Wang, Xin Gong, ECUST, CHINA

**Ohio Valley University's Alternative Clean Energy Facility**, Marcus Wiley, TCG Global, LLC, USA

**SES SGT Commercial & Operation Plant Updates**, Francis Lau, Synthesis Energy Systems, USA

#### SESSION 2 COMBUSTION TECHNOLOGIES - 1

*Mohsen Alimandegari and Johan van Dyk*

**CFD Simulation of an Industrial Wet Flue Gas Desulfurization Spray Tower: A Comprehensive Model with Special Attention Devoted to the Modeling of Absorption and Chemical Reactions**, Raymond Everson, Arif Arif, Hein W.J.P. Neomagus, Dawie Branken, North-West University, SOUTH AFRICA

**Optimization of Coal and Combustion Air Distribution for 500 MW Tangential Coal-Fired Plant**, Kitae Kang, Korea Southern Power (KOSPO) CO., Ltd, KOREA

**NLP/MINLP for Modeling and Optimization of Lignite Pyrolysis Process**, Wengying Li, Yi Huang, Qun Yi, Minhui Gong, Guosheng Wu, Taiyuan University of Technology, CHINA

#### SESSION 3 CARBON MANAGEMENT - 1

*Esta van Heerden and John Duddy*

**Status of the Carbon Capture International Test Center Network**, Roxann Laird, Southern Company Services, USA

**Status of Technology Development at the National Carbon Capture Center**, Roxann Laird, Southern Company Services, USA

**Performing a Push-Pull Test in a Shallow Aquifer to Assess Impacts of CO<sub>2</sub> and Impurities Leakage on Freshwater Quality**, Stéphane Lafortune, Philippe Gombert, Zbigniew Pokryszka, INERIS, FRANCE; Maria del Camino Martin Torre, Universidad de Cantabria, SPAIN

**Geological Carbon Sequestration and its Influence on Subsurface Microbial Diversity and Metabolic Carbon Cycling**, Mariana Erasmus, Esta van Heerden, University of the Free State, SOUTH AFRICA; Tullis Onstott, Princeton University; Mary DeFlaun, Geosyntec Consultants; Tommy Phelps, University of Tennessee, USA

#### SESSION 4 COAL SCIENCE - 1

*Frans Waanders and Daniel Roberts*

**Physical and Chemical Characteristics of Coke by using Ash-Free Coal as Binder**, Gyeong-Min Kim, Kevin Yohanes Lisandy, Jin-Ho Kim, Chung-Hwan Jeon, Pusan National University, KOREA

**The Influence of K<sub>2</sub>CO<sub>3</sub> on the Swelling and Caking Behavior of Large South African Coal Particles**, S. Coetzee, H.W.J.P. Neomagus, J.R. Bunt, North-West University, SOUTH AFRICA

**Time of Flight Secondary Ion Mass Spectrometry and High-Resolution Transmission Electron Microscopy/Energy Dispersive Spectroscopy: A Study of the Distribution of Hazardous Elements in Coal Ashes**, Diego de Medeiros, Marcos L.S. Oliveira, Bianca D. Lima, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**Investigation of Solvent Crystallization Process of Anthracene**, Wenyong Li, Xiaoxiao Ding, Cuiping Ye, Mingming Fan, Hai Mu, Jie Feng, Taiyuan University of Technology, CHINA

**Pyrolysis Product Evaluation and Prediction From Coals of Different Rank**, Gustav Pretorius, J.R. Bunt, North-West University, SOUTH AFRICA; M. Gräbner, Air Liquide, GERMANY

#### SESSION 5 GASIFICATION TECHNOLOGIES: GAS CLEANUP

*Shehzaad Kauchali and Francis Lau*

**Improving Response Rates of Acid Gas Absorber Columns**, Chris Higman, Higman Consulting GmbH; Bernd Epple, Christain Heinze, TU Darmstadt, GERMANY; Jose Marasigan, EPRI, USA

**Thermodynamic Possibilities and Constraints for the Regeneration of Spent Solid H<sub>2</sub>S Sorbents Based on Ce-, La-, and Zn-Oxides**, Karel Svoboda, Miloslav Hartman, Institute of Chemical Process Fundamentals of the CAS; Jindřich Leitner, Jiří Brynda, Sjarhei Skoblia, University of Chemistry and Technology Prague, CZECH REPUBLIC; Yau-Pin Chyou, Yi-Shun Chen, Institute of Nuclear Energy Research, TAIWAN

**Particle Fragmentation Behavior in a Bench Scale Entrained-Flow Coal-Water Slurry Gasifier**, Qinghua Guo, Guangsuo Yu, Yifei Wang, Xin Gong, East China University of Science and Technology, CHINA

#### SESSION 6 COAL MINING AND BENEFICIATION - 1

*Tarunjit Butalia*

**The Product Yield Problem and the History and Future of Washability Analysis**, Herman Dorland, Nicola Wagner, Xitshembiso Makukule, University of Johannesburg, SOUTH AFRICA

**Estimation of Moisture Dynamics within a Composite Coal Stockpile**, Kyle Enslin, Chris van Alphen, Eskom; Walter Schmitz, University of Witwatersrand, SOUTH AFRICA

**Seal Design Investigations for Omerler Underground Coal Mine in Turkey**, C. Atilla Ozturk, Abdullah Fisne, Istanbul Technical University; Mustafa Ozdingis, Sahika Yurek, Kıvanc Het, Turkish Coal Enterprises, TURKEY

#### SESSION 7 CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS - 2

*John Bunt and Thomas Sarkus*

**The Future of Coal**, Farid A. Malik, Forman Christian College (American University), PAKISTAN

**Status Update on the Kemper County IGCC Project**, Diane Revay Madden, DOE/NETL; Tim Pinkston, Southern Company, USA

**ITEA CCS Flameless Pressurized Oxy-Combustion: The Strategic Role of Intermediate Scale (50 MWth) Demonstration Units, Tailored on Local Quality and Low Rank Coals in Each Major Geographic Area, to Mature Technology in View of Industrial Exploitation**, Massimo Malavasi, ITEA S.p.a., ITALY

**Shenhua Coal Refining Technology Development**, Cliff Y. Guo, National Institute of Clean-and-low-carbon Energy, CHINA

#### SESSION 8 COMBUSTION TECHNOLOGIES - 2

*Mohsen Alimandegari and Johan van Dyk*

**Fuel Additive Efficient Coal Combustion Technology**, Marc Ottolini, International Innovative Technologies Ltd.; William Nimmo, Syed Sheraz Daood, University of Sheffield, UNITED KINGDOM

**Impact of Biomass Co-Firing with Unreactive Coals in Pulverised Fuel**, C. Bridge, C. Snape, University of Nottingham; C. J. Waldron, GE Power, UNITED KINGDOM

**Effects of Temperature on Physico-Chemical Characteristics Evolution of Rice Husk Char under Reburning Conditions**, Jiateng Shi, Xinyi Yin, Ping Lu, Nanjing Normal University, CHINA

**Low NO<sub>x</sub> Coal Burner Temperature Profile Evaluation**, Dewan Smit, Sandile Peta, Eskom; Walter Schmitz, Reshndren Naidoo, University of Witwatersrand, SOUTH AFRICA

#### SESSION 9 CARBON MANAGEMENT - 2

*Esta van Heerden and John Duddy*

**Acid Gas Control by Dry Sorbent Injection in Air and Oxy-Fuel Combustion**, Reinhold Spörl, Reyhane Youssefi, Jörg Maier, Günter Scheffknecht, Institute of Combustion and Power Plant Technology - IFK, University of Stuttgart, GERMANY

**Introduction to the Wyoming Integrated Test Center**, Jason Begger, Wyoming Infrastructure Authority, USA

**Adsorption Characteristics of Bituminous Coal Seams in Zonguldak Basin**, Olgun Esen, Samet Can Ozer, Abdullah Fisne, Istanbul Technical University, TURKEY

#### SESSION 10 COAL SCIENCE - 2

*Nikki Wagner and Daniel Roberts*

**Determination of Rare Earth Elements (REE's) in Coals and their Associated Ash Products from Selected Localities in South Africa**, Matiane R. Arnold, Nikki Wagner, University of Johannesburg, SOUTH AFRICA

**Rare Earth Elements from Coal and Coal By-Products**, Mary Anne Alvin, DOE/NETL, USA

**Multifaceted Nanominerals and Ultrafine Particles in Phosphogypsum: A By-Product of Coal Cleaning Rejects**, Felipe B. de Leão, Centro Universitário La Salle and Universidade Federal do Rio Grande do Sul; Silvio R. Taffarel, Bianca D. Lima, Luis F. O. Silva, Centro Universitário La Salle; Carlos H. Sampaio, Universidade Federal do Rio Grande do Sul, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**Briquetting of Disk-Pelletized Fine Coal**, Darrell Taulbee, Robert Hodgen, University of Kentucky Center for Applied Energy Research, USA

## SESSION 11 GASIFICATION TECHNOLOGIES: UCG - 1

*Shehzaad Kauchali and Francis Lau*

**UCG – Unlocking Southern-Africa’s Coal Potential: Update on the Africary’s Theunissen Underground Coal Gasification (TUCG) Project in South-Africa**, JF Brand, JC van Dyk, Africary, SOUTH AFRICA

**The Queensland Underground Coal Gasification Pilots 2008-2016 – Evidence Based Assessment and Lessons in Government and Public Relations**, Cliff Mallett, Carbon Energy Limited, AUSTRALIA

**Leaching of Metals From Post-Underground Coal Gasification Cavity Residues**, Krzysztof Stańczyk, Aleksandra Strugała-Wilczek, Central Mining Institute, POLAND

**Coupled Thermo-Chemical-Mechanical Modelling of Cavity Growth and Farfield Geomechanical Assessment in Underground Coal Gasification**, Sevetk Durucan, Ana Korre, Epameinondas Andrianopoulos, Guangyao Si, Ji-Quan Shi, Royal School of Mines, Imperial College London; Sebastian Franzsen, Seamwell International Ltd., UNITED KINGDOM

## SESSION 12 COAL MINING AND BENEFICIATION - 2

*Tarunjit Butalia and Christien Strydom*

**Avdan Lignite Mine Open Pit Planning and Design Studies for Thermal Power Plant**, C. Atilla Ozturk, Murat Ozkan, Mohammad Lashgari, Selamet Ercelebi, Istanbul Technical University, TURKEY

**Modelling a Multi-Layer Coal Mine Deposit: A Case Study of Avdan Lignite Site in Denizli, Turkey**, Mohammad Lashgari, Murat Ozkan, C. Atilla Ozturk, Selamet Ercelebi, Istanbul Technical University; Mustafa Darici, Anadolu Mining Co., TURKEY

**Mineral Matter in Coals From the Soutpansberg Coalfield, South Africa**, Maseda Mphaphuli, Nicola Jane Wagner, University of Johannesburg; John Sparrow, Coal of Africa Limited, SOUTH AFRICA

**Assessing Risks Related to Stimulation of Firedamp Drainage Boreholes in Order to Recommend Prevention Measures and Monitoring Methods to Help Early Risk Management During Design of Future Drainage Projects**, Stéphane Lafortune, Régis Farret, Candice Lagny, Zbigniew Pokryszka, INERIS, FRANCE

## SESSION 13 CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS - 3

*John Bunt and Thomas Sarkus*

**Illinois Industrial Carbon Capture and Storage Project**, Scott McDonald, Archer Daniels Midland Company, USA

**Process Optimization and Solvent Reclaiming Enhanced the Operation and Production of an Existing 800 Tonnes Per Day Plant Capturing CO<sub>2</sub> From Flue Gases of a Coal-Fired Power Plant**, Ahmed Aboudheir, Lionel Kambeitz, HTC Purenergy, CANADA

**Optimization of an Existing 130 Tonnes Per Day Plant Capturing CO<sub>2</sub> From Flue Gases of a Coal-Fired Power Plant**, Ahmed Aboudheir, Lionel Kambeitz, HTC Purenergy, CANADA

**The U.S. Department of Energy’s Current Portfolio of Major Fossil Energy Demonstration Projects**, Thomas A. Sarkus, Diane Madden, Theodore J. McMahon, Anthony Zinn, Sai Gollakota, Venkat Venkataraman, Nelson Rekos, DOE/NETL, USA

## SESSION 14 COMBUSTION TECHNOLOGIES - 3

*Mohsen Alimandegari and Daniel Roberts*

**Vapor Phase Chemical Looping Combustion of Coal**, Tomasz Wiltowski, Debalina Dasgupta, Kanchan Mondal, Quan Zhang, Southern Illinois University, USA

**Copper-Based Chemical Looping with Oxygen Uncoupling: Process Development, Reactor Scale-Up, Pilot-Scale Studies and System Modeling**, Kevin J. Whitty, Matthew A. Hamilton, Kirsten M. Merritt, Kyle O’Malley, Shakar Ali, Emir Rahislic, Andrew R. Fry, JoAnn S. Lighty, The University of Utah, USA

**A Study on the Mineral Liberation and Transformations During Pulverised Bituminous Coal Combustion**, Laurence Silvester, Cheng-gong Sun, Colin Snape, Hao Liu, Ofonime Udoudo, University of Nottingham; William Livingston, Doosan Babcock Energy Limited, UNITED KINGDOM

**Combustion Properties of Bamboo When Blended with a South African Coal**, O. Makwarela, S O Bada, R Falcon, University of the Witwatersrand, SOUTH AFRICA

**An Experimental Study of Nitrogen Oxides Formation of Pulverized Coal in O<sub>2</sub>/N<sub>2</sub> and O<sub>2</sub>/CO<sub>2</sub> Atmospheres**, Jeong-Woo Kim, Hong-Min Cho, Lim Ho, Chung-Hwan Jeon, Pusan National University, KOREA

## SESSION 15 CARBON MANAGEMENT - 3

*Está van Heerden and John Duddy*

**Monolithic Amine-Grafted Sorbents for Post-Combustion CO<sub>2</sub> Capture**, Steven S. C. Chuang, Jie Yu, Long Zhang, Yuxin Zhai, Hailiang Jin, Sihan Wang, The University of Akron, USA

**Mathematical Modeling of Adsorption Behaviour of SOD-ZMOF/Chitosan Adsorbent During Post-Combustion CO<sub>2</sub> Capture**, Kelvin Odafe Yoro, Muofhe Singo, Michael O. Daramola, Jean L. Mulopo, University of the Witwatersrand, SOUTH AFRICA

**Synthesis of Chitosan-Impregnated SOD-Zeolite Metal Organic Frameworks (SOD-ZMOF) for CO<sub>2</sub> Capture: A Preliminary Investigation**, Muofhe Singo, Michael O. Daramola, University of the Witwatersrand, SOUTH AFRICA

**Nanocomposite Architecture Hydroxy Sodalite/ $\alpha$ -Alumina Membrane for CO<sub>2</sub> Capture**, O. Oloye, Michael O. Daramola, University of the Witwatersrand, SOUTH AFRICA

## SESSION 16 COAL SCIENCE - 3

*Christien Strydom and Nikki Wagner*

**Prediction of Spontaneous Combustion in Coal by Use of Thermogravimetry**, Zama A Mthabela, Nicola J Wagner, Nthabiseng Maledi, University of Witwatersrand, SOUTH AFRICA

**Mechanical and Thermal Characterization of Briquetted High Ash South African Coal Fines Using Low Density Polyethylene as the Binding Agent**, Thabo Mthombo, Christien Strydom, John Bunt, Hein Neomagus, North-West University, SOUTH AFRICA

**Evaluation of a Domestic-Use Low-Smoke Fuel Produced via the Pyrolysis of Lump Coal**, LP Sumbane, John R Bunt, Hein WJP Neomagus, Stuart SJ Picketh, Thys Kuhn, North-West University, SOUTH AFRICA

**Research of the Masking Effect of Surfactants on O-Containing Functional Groups in Low-Rank Coals**, Geng Jianchun, China University of Mining and Technology, CHINA

## SESSION 17 GASIFICATION TECHNOLOGIES: GENERAL - 1

*Shehzaad Kauchali and Francis Lau*

**Soot Gasification in Syngas Atmosphere**, G. Worringer, Linde AG - Engineering Division; R. Reimert, Karlsruhe Institute of Technology (KIT), GERMANY

**Comparison Study on Gasification of Long-Flame Briquette Coal with CO<sub>2</sub> and H<sub>2</sub>O**, Lingmei Zhou, Mo Chu, Zhibing Chang, Fang Xu, Chengliang Hao, China University of Mining and Technology, CHINA

**Experiments of Coal Partial Gasification on a Circulating Fluidized Bed**, Chao Ye, Qinhui Wang, Zhongyang Luo, Mengxiang Fang, State Key Laboratory of Clean Energy Utilization, Zhejiang University, CHINA

**Catalytic Reduction Mechanism Investigation of K<sub>2</sub>CO<sub>3</sub> Modified Iron-Based Oxygen Carrier by Carbon**, Zhongliang Yu, Shunxuan Hu, Chunyu Li, Tao Liu, Xing Zhou, Yitian Fang, Jiantao Zhao, Institute of Coal Chemistry, CHINA

## SESSION 18 COAL MINING AND BENEFICIATION - 3

*Tarunjit Butalia*

**Development of a Condition Monitoring Philosophy for a Pulverised Fuel Vertical Spindle Mill**, Andre Govender, Eskom; Walter Schmitz, Reshndren Naidoo, University of the Witwatersrand, SOUTH AFRICA

**Measurement and Prediction of Coal Flow Rates in Pulverised Fuel Pipes**, Dheshan Naran, Bonny Nyangwa, Eskom; Walter Schmitz, University of Witwatersrand, SOUTH AFRICA

**Applications of Online Coal Analysers in South Africa**, Michael Edwards, Scantech International Pty Ltd, AUSTRALIA

## ORAL SESSIONS

### Thursday, August 11, 2016

#### SESSION 19

##### CLEAN COAL AND GAS TO FUELS: CATALYTIC STUDY - 1

*Somayeh Farzad and Wenhua Li*

**Fischer-Tropsch Synthesis in the Presence of Solvent Using Novel Carbon-Oxide Composite Supported Cobalt and Iron Catalysts**, Atsushi Ishihara, Yusuke Maejima, Hiroyuki Nasu, Tadanori Hashimoto, Mie University, JAPAN

**Carbon from Pine Cones as a Support for High Temperature Fischer-Tropsch Synthesis**, Eric van Steen, Pierre Cilliers, Doreen Nabaho, Chelsea Tucker, University of Cape Town; Wanda Bout, Augustine Ofomaja, Elvera Viljoen, Vaal University of Technology, SOUTH AFRICA

**Bifunctional Hydrocracking: Is the Well-Established 'Classical' Fluid Phase Diffusion Mechanism a Delusion?**, Walter Böhringer, Peter Wynne, Roald Brosius, Stephen Roberts, Jack CQ Fletcher, University of Cape Town, SOUTH AFRICA

**Catalyst Deactivation During Hydroprocessing of Coal-Derived Liquids at Pilot Plant Scale**, Rui Wang, Zhuihua Han, Linge Ma, Jingyun Chen, Xuelei Duan, Chenjing Qian, Yinhua Long, Xiaofen Guo, National Institute of Clean-and-Low-Carbon Energy, CHINA

#### SESSION 20

##### SUSTAINABILITY AND ENVIRONMENT - 1

*Frans Waanders and Joseph Bittinger*

**Hazardous Particles from Coal Fires from Santa Catarina, South Brazil**, Diego de Medeiros, Marcos L.S. Oliveira, Fagner T.C. Sá, Silvio R. Taffarel, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**An Investigation on Incorporation of a Local Thermal Power Station Boiler Ash as a Raw Material in Clinker Manufacture**, Nonhlanhla G. Mguni, Marcia R. Nyika, Liberty L. Mguni, National University of Science and Technology, ZIMBABWE

**Environmental and Economic Evaluation of the Production of Organic Platform Chemicals from Different Feedstocks**, Florian Keller, Christian Wolfersdorf, Bernd Meyer, IEC, TU Bergakademie Freiberg; Lutz Schiffer, Saxon Academy of Sciences in Leipzig, GERMANY

**Process Simulation and Assessment of Coke Oven Gas to Methanol Integrated with CO<sub>2</sub> Recycle**, Wenying Li, Minhui Gong, Qun Yi, Yi Huang, Jie Feng, Guosheng Wu, Taiyuan University of Technology, CHINA

#### SESSION 21

##### SHALE AND COAL BED GAS

*Frans Waanders and Leslie Ruppert*

**Status of Worldwide CMM and CBM Activity Including Sub-Saharan Africa**, Jonathan Kelafant, Advanced Resources International, Inc.; Felicia Ruiz, U.S. Environmental Protection Agency, USA

**Consideration of a Possibility of Enhanced Coalbed Methane Recovery by Injecting Air Into Coal Seam**, Noritaka Shimatani, Yuichi Sugai, Kyuro Sasaki, Kyushu University, JAPAN

**The Role of the Residual Bitumen of Mature Lacustrine Shale to the Gas Storage Capacity: A Case Study of the Triassic Yanchang Shale, Ordos Basin, China**, Jianfa Chen, Feiran Chen, Zhenxue Jiang, Zhilong Huang, Guoheng Liu, Fengyang Xiong, China University of Petroleum, CHINA

**Analyses of Adsorbed and Free Gas Production Using Methane Carbon Isotope Fractionation During Canister Desorption of Shale Gas**, Yong Ma, Ningning Zhong, China University of Petroleum, CHINA; Zhejun Pan, CSIRO Energy Flagship, AUSTRALIA

**Anisotropic Permeability and its Relationship with Pore/Fracture Structure of Longmaxi Shales in the Upper Yangtze Region, China**, Ningning Zhong, Yong Ma, China University of Petroleum, CHINA

#### SESSION 22

##### COAL SCIENCE - 4

*Nikki Wagner and Joseph Bittinger*

**Desulfurization of South African Coal Using Low Power Microwave Energy**, Herman Potgieter, University of the Witwatersrand and Manchester Metropolitan University; Sanja Potgieter-Vermaak, Manchester Metropolitan University, UNITED KINGDOM; Waseela Mohammed, University of the Witwatersrand, SOUTH AFRICA

**Application of Coal Petrography in Understanding the Variation of Coal Composition in the Coalfields of Botswana**, Ndivhuho Nendouvhada, Nicola Wagner, University of Johannesburg, SOUTH AFRICA; Alan Golding, Analytika Holdings, BOTSWANA

#### SESSION 23

##### GASIFICATION TECHNOLOGIES: GENERAL - 2

*Daniel Roberts and Aleksander Sobolewski*

**Char Gasification Kinetics in Mixtures of CO<sub>2</sub> and H<sub>2</sub>O: Understanding the Roles of Active Sites and Catalysis**, Daniel Roberts, Mark Kochanek, David Harris, CSIRO, AUSTRALIA

**Green Coal Development for Application in Fixed-Bed Catalytic Gasification**, John R Bunt, Sanette Marx, Frans B Waanders, North-West University, SOUTH AFRICA

**Experimental Investigation on Char Gasification Kinetics at Elevated Pressures**, Sascha Russig, Victor Gonzalez, Mark Zink, Steffen Krzack, Stefan Guhl, Bernd Meyer, TU Bergakademie Freiberg, GERMANY

**Ash Agglomeration in the Modified Internal Circulating COORVED Coal Gasifier**, Martin Schurz, Alexander Laugwitz, Steffen Krzack, Bernd Meyer, TU Bergakademie Freiberg, GERMANY

#### SESSION 24

##### CLEAN COAL AND GAS TO FUELS: NEW TECHNOLOGIES

*Somayeh Farzad and Wenhua Li*

**Supercritical CO<sub>2</sub> Cycles for Power Production**, Mike Holmes, Joshua Stanislawski, Jason Laumb, Energy & Environmental Research Center, University of North Dakota; Xijia Lu, Brock Forrest, Mike McGroddy, 8 Rivers Capital, LL, USA

**Integration of Gasification and Fuel Cells: Interaction Between the Anode and Contaminants in the Syngas**, Marcos Millan, Esther Lorente, Paul Boldrin, Nigel Brandon, Imperial College, UNITED KINGDOM

**Liquefaction of South African Bituminous Coal Using Phenol as a Solvent**, Zach Sehume, C.A. Strydom, J.R.

Bunt, North-West University, SOUTH AFRICA; H.H. Schobert, Penn State University, USA

**Effect of Direct Addition of Alcohols to an Oligomerisation Reaction System**, Mekia Makhubu, Klaus Moller, University of Cape Town; Masikana Mdeleleni, PetroSA Synthetic Fuels Innovation Center (PSFIC), University of Western Cape, SOUTH AFRICA

#### SESSION 25

##### SUSTAINABILITY AND ENVIRONMENT - 2

*Frans Waanders and Joseph Bittinger*

**Environmental Pollution and Nano-Mineralogical Characterization of Coal, Overburden and Sediment from Assam (India) Coal Mining Acid Drainage**, Frans B. Waanders, North West University, SOUTH AFRICA; Silvio R. Taffarel, Diego de Medeiros, Cesar M. N. L. Cutruneo, Luis F.O. Silva, Centro Universitário La Salle, BRAZIL; Madhulika Dutta, CNB College and CSIR-North East Institute of Science & Technology; Binoy K Saikia, CSIR-North East Institute of Science & Technology, INDIA

**Bench-Scale Testing of Stabilized Flue Gas Desulfurization Materials to Treat Acid Mine Drainage**, Tarunjit S. Butalia, The Ohio State University, USA

**Orbitrap Analysis of Fullerene on Surface Soils and River Sediments from Santa Catarina (Brazil) Coal Area**, Diego de Medeiros, Marcos L.S. Oliveira, Silvio R. Taffarel, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL

**Fireside Corrosion Monitoring, Control and Prevention in a 600 MWe Pulverized Fuel Boiler**, Otilia Mwape, University of the Witwatersrand, SOUTH AFRICA

#### SESSION 26

##### GASIFICATION TECHNOLOGIES: UCG - 2

*Johan Brand and Thomas Sarkus*

**Can UCG Give Coal a New Lease on Life in 21<sup>st</sup> Century?**, Michael S. Blinderman, Ergo Exergy Technologies Inc., CANADA; Simon S. Maev, Laurus Energy, Inc., USA

**Life Cycle Sustainability Assessment of Integrated UCG-CCS Systems, Comparison with Clean Coal Alternatives**, Anna Korre, Sevket Durucan, Zhenggang Nie, Royal School of Mines, Imperial College London; Sebastian Franzsen, Seamwell International Ltd., UNITED KINGDOM

**Ex-Situ Simulation of High Pressure Underground Gasification of Hard Coal and Lignite**, Krzysztof Stańczyk, Krzysztof Kapusta, Marian Wiatowski, Central Mining Institute, POLAND; Sevket Durucan, Imperial College London, UNITED KINGDOM

**Experimental and Computational Studies on Underground Gasification of Turkish Lignite**, Mesut Gür, Nurdil Eskin, Hasancan Okutan, Ahmet Arisoy, Erhan Böke, Ünal Altıntaş, Oğuz Büyükkşirin, E. Deniz Canbaz, Olgu Yıldırım, Istanbul Technical University, TURKEY

#### SESSION 27

##### COAL SCIENCE - 5

*John Bunt and Leslie Ruppert*

**Trace Elements Associated with the Upper Coal Zones of the Springbok Flats Basin, South Africa**, Valerie Nxumalo, Nicola Wagner, Jan Kramers, Clarisa Vorster, Bruce Cairncross, University of Johannesburg; John Paul Hunt, Council for Geoscience and University of Johannesburg; Wojciech Przybylowicz, iThemba LABS, SOUTH AFRICA



**Organic and Inorganic Characterisation of Different Coals by Single Particle Analysis**, Sanja Potgieter-Vermaak, Manchester Metropolitan University and University of the Witwatersrand; Nthabiseng Maledi, Herman Potgieter, University of the Witwatersrand; Nicola Wagner, University of Johannesburg, SOUTH AFRICA; Robert Sparkes, Manchester Metropolitan University, UNITED KINGDOM

**Coal Cleaning Rejects and Sulphide Oxidation by Fenton's Reaction**, Diego de Medeiros, Anderson S. Pires, Marcos L.S. Oliveira, Bianca D. Lima, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**Petroleum Coke-Based Activated Carbon Modified by Binary Metal Oxides for Elemental Mercury Removal in Flue Gas**, Yang Li, Ning Zhang, Lijun Jin, Haoquan Hu, Dalian University of Technology, CHINA

**Future of Coal Utilization in the US and China**, Qingyun Sun, Richard Bajura, West Virginia University, USA; Min Zhou, Xianliang Meng, China University of Mining & Technology, CHINA

**Carbon Tax in South Africa: Sustainability Challenges**, L. Landu, Council for Mineral Technology (MINTeK); R Minnitt, R Falcon, The University of the Witwatersrand, SOUTH AFRICA

**The Application of Coal Quality Database Over Time and Space Across the Mpumalanga Coalfields**, M. P. Kekana, N. J. Wagner, University of Johannesburg, SOUTH AFRICA

**SESSION 31  
GASIFICATION TECHNOLOGIES: GENERAL - 4**  
*Johan Brand and Thomas Sarkus*

**Kinetic Studies for CO<sub>2</sub> Gasification of HOK Cokes Using Thermogravimetric Analyzers at High Pressures**, Ziad Abosteif, Stefan Guhl, TU Bergakademie Freiberg, GERMANY

**Study on the Effect of Particle Size on Gasification Characteristics of Different Ranked Chars Under High Temperature**, Xin Gong, XiaoPeng Zou, Haifeng Lu, Qinghua Guo, East China University of Science and Technology, CHINA

**Experimental Study of Particle Evolution Characteristics at Different Region in an Opposed Multi-Burner Gasifier**, Qing Zhang, Yan Gong, Qinghua Guo, Guangsu Yu, East China University of Science and Technology, CHINA

**Corrosion Testing of Steel for Production and Injection Well Applications in a UCG Process**, JC van Dyk, African Carbon Energy and North-West University; J Brand, African Carbon Energy; FB Waanders, AC van Wyk, North-West University; C Kahts, Aqua Alpha, SOUTH AFRICA

**SESSION 32  
COAL SCIENCE - 6**  
*John Bunt and Leslie Ruppert*

**Property of Extract Prepared by Hydrothermal Extraction of Brown Coal**, Masato Morimoto, Qingxin Zheng, Toshimasa Takanohashi, Research Institute of Energy Frontier, National Institute of Advanced Industrial Science and Technology, JAPAN

**Process Characteristics Investigation of Shendong Coal Co-Pyrolysis through Solid Heat Carrier**, Wenying Li, Baofu Li, Xiaohong Li, Jie Feng, Taiyuan University of Technology, CHINA

**The Prediction of Pyrolysis Products in Grading Lignite Pyrolysis Process**, Wenying Li, Lan Yi, Jie Feng, Yuhong Qin, Yuhong Qin, CHINA

**Influence of Oxygen Group and Coal Structure on the Migration of Biomass Alkalis During Coal/ Biomass Co-Pyrolysis**, Wenying Li, Rong Zhu, Yuncai Song, Laisong Wang, Jie Feng, Taiyuan University of Technology, CHINA

**Heat Release Characteristics of the Oxidation of Aliphatic Hydrocarbon Groups and its Effects on the Spontaneous Combustion of Coal**, Tao Xu, Jianghong Liu, Jinhui Wang, Yu Jiao, Yutao Kang, Xiaobei Yin, Qimiao Xie, Xianbin Li, Shanghai Maritime University; Haihui Xin, Deming Wang, China University of Mining and Technology, CHINA

**SESSION 33  
GASIFICATION TECHNOLOGIES: GENERAL - 3**  
*Christien Strydom and Aleksander Sobolewski*

**CO<sub>2</sub> and H<sub>2</sub>O Gasification Under Chemically and Diffusion Controlled Conditions**, Thobias Kreitzberg, Benjamin Gövert, Stefan Pielsticker, Reinhold Kneer, Institute of Heat & Mass Transfer (WSA), RWTH Aachen University, GERMANY

**New Approach in Gasifying Reactive Low Rank Coals Under Non/Partial Slagging Entrained-Bed Conditions: 20 TPD Pilot Test Results**, Yongseung Yun, Jin-Wook Lee, Seok Woo Chung, Institute for Advanced Engineering; Young-Tai Choi, Korea Institute of Industrial Technology, KOREA

**Influence of Quench Water Temperature and pH Value Variations on Selected Trace Components in Autothermal Gas Reforming Processes**, Ibrahim Kolawole Muritala, Technische Universität Bergakademie Freiberg, GERMANY

**Influences of the Cross Angle on the Granular Jet in Annular Gas Stream with Thick Wall of Inner Channel**, Chenchen Fang, Haifeng Liu, East China University of Science and Technology, CHINA

**ORAL SESSIONS  
Friday, August 12, 2016**

**SESSION 34  
CLEAN COAL AND GAS TO FUELS:  
PROCESSING**  
*Somayeh Farzad and Wenhua Li*

**Methane Quality, Processing and Hydrogen Production**, Klaus Rademann, Thomas Ryll, Humboldt-Universität zu Berlin, GERMANY

**The Development of Highly Anisotropic Coke from an Aliphatic Fischer-Tropsch Waxy Oil Residue**, JG Clark, Sasol Performance Chemicals, SOUTH AFRICA

**The Conversion of FT Olefins: Multiphase Reactor Simulation Study**, Klaus Möller, University of Cape Town; Bongani Mthombeni-Möller, Intens Engineering Solutions; Masikana Mdleleni, PetroSA Synthetic Fuels Innovation Centre (PSFIC), University of the Western Cape; Cyril Knottenbelt, PetroSA, SOUTH AFRICA

**Coal to Liquids by Oxidative Cracking in Near-Critical and Super-Critical Water**, Marcos Millan, Pedro Arcelus-Arriaga, Klaus Hellgardt, Imperial College, UNITED KINGDOM

**Optimization of Configurational Alternatives for a Gas to Liquids Process Based on Fischer-Tropsch Technology**, Ashcaan Khazali, Klaus Möller, Eric van Steen, University of Cape Town, SOUTH AFRICA

**SESSION 35  
GASIFICATION TECHNOLOGIES: MODELING  
- 2**  
*Johan van Dyk and Aleksander Sobolewski*

**Syngas Production from Brazilian Coal Chars in the Presence of Steam**, Humberto Jorge José, Regina de Fátima P. M. Moreira, Gabriela Carvalho Collazzo, Michele Di Domenico, Federal University of Santa Catarina, BRAZIL

**Evaluation of CO<sub>2</sub> Gasification Reactivity of Biomass and Coal Chars by Physicochemical Properties**, Zhiqing

**SESSION 28  
GASIFICATION TECHNOLOGIES: MODELING  
- 1**  
*Daniel Roberts and Aleksander Sobolewski*

**Effect of Alkali Species in Australian Coals on Slag Composition and Viscosity**, Alexander Ilyushechkin, Daniel Roberts, David Harris, CSIRO, AUSTRALIA

**Numerical Study of the Hitecom Reactor for In-Situ Measurement of Single Char Particle Conversion**, Fengbo An, Andreas Richter, Felix Küster, Stefan Guhl, Bernd Meyer, Technische Universität Bergakademie Freiberg, GERMANY

**CFD-Based Accelerated Gasification Technology Development**, Andreas Richter, Philip Rößger, Thomas Förster, Peter Seifert, Bernd Meyer, TU Bergakademie Freiberg, GERMANY

**Syngas-Based Annex Concepts and CO<sub>2</sub>-Based Power-To-X Concepts Within Pulverized Coal Combustion Power Plants**, Christian Wolfersdorf, Clemens Forman, Bernd Meyer, IEC, TU Bergakademie Freiberg, GERMANY

**SESSION 29  
CLEAN COAL AND GAS TO FUELS: CATALYTIC  
STUDY - 2**  
*Somayeh Farzad and Wenhua Li*

**Spontaneously Activatable Iron-Based Catalysts in Fischer-Tropsch Synthesis: From Lab-Scale Study to Pilot-Scale Demonstration**, Dong Hyun Chun, Geun Bae Rhim, Ji Chan Park, Ho-Tae Lee, Jung-Il Yang, Sungjun Hong, Heondo Jung, Heon Jung, Korea Institute of Energy Research, KOREA

**Single Pass Fischer-Tropsch Synthesis Over Iron-Based Catalysts**, Eric van Steen, Michael Claeys, Klaus P. Möller, Doreen Nabaho, University of Cape Town, SOUTH AFRICA

**Low-Temperature Methanation of Syngas in Slurry Reactor Over NiO@SiO<sub>2</sub> Core-Shell Catalyst**, Yizhuo Han, Junfeng Zhang, Hui Wang, Institute of Coal Chemistry, Chinese Academy of Sciences, CHINA

**SESSION 30  
SUSTAINABILITY AND ENVIRONMENT - 3**  
*Frans Waanders and Joseph Bittinger*

**American Electric Power's Experience with Mercury and Air Toxics Standards (MATS) Compliance**, Joseph E. Bittinger, Dean Bell, Jason Baker, Douglass Ritzenhaler, American Electric Power, USA

Wang, Jiejie Huang, Yitian Fang, Jiantao Zhao, Libo Dong, State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, CHINA

**The CUMT International Research Centre for Underground Coal Gasification**, Cliff Mallett, Carbon Energy Limited, AUSTRALIA

**SESSION 36  
GASIFICATION TECHNOLOGIES: GENERAL - 5**  
*Johan Brand and Francis Lau*

**Online Detection and Retention of Trace Contaminants in Reducing Gasification Atmosphere**, Philip Edinger, École Polytechnique Fédérale de Lausanne (EPFL) and Paul Scherrer Institut (PSI); Mohamed Tarik, Paul Scherrer Institut (PSI); Christian Ludwig, École Polytechnique Fédérale, SWITZERLAND

**Interaction Between Rice Straw and Jincheng Anthracite Single Particle During Ashing Process**, Wenying Li, Zibing Zhao, QingQing Han, Chengcheng Zhu, Yuhong Qin, Jie Feng, Taiyuan University of Technology, CHINA

**Catalytic Gasification with Carbon Dioxide Characteristics of Alkali and Alkaline Earth Metals Catalysts in the Fixed-bed Reactor**, Yifei Wang, Jilin Li, Guangsuo Yu, Fuchen Wang, East China University of Science and Technology, CHINA

**Oxygen Co-Gasification of Coal and Rice Straw in Drop Tube Furnace**, Xueli Chen, Jianye Tang, Qinghua Guo, Guangsuo Yu, East China University of Science and Technology, CHINA

**POSTER SESSIONS**  
**Wednesday, August 10, 2016**

**POSTER SESSION 1  
COMBUSTION**

**Influence of Combustion Temperature and Oxygen Concentration in Combustion Medium on Emissions of NO<sub>x</sub>, N<sub>2</sub>O and SO<sub>2</sub>**, Karel Svoboda, Jaroslav Moško, Tomáš Durda, Michael Pohořelý, Boleslav Zach, Michal Šyc, Aneta Krausová, Michal Jeremiáš, Institute of Chemical Process Fundamentals, Academy of Science of the Czech Republic, CZECH REPUBLIC

**POSTER SESSION 2  
CLEAN COAL AND GAS TO FUELS**

**Methanol Synthesis by Catalytic Hydrogenation and Photoelectrochemical Reduction of CO<sub>2</sub>**, Alberto Pettinau, Mauro Mureddu, Francesca Ferrara, Sotacarbo S.p.A., ITALY

**Effect of Sparger Design and Internals Configurations on the Hydrodynamics and Overall Performance of a Slurry Bubble Column Reactor for Fischer-Tropsch Synthesis**, Omar M. Basha, Badie I. Morsi, University of Pittsburgh, USA

**Isotope Analysis for Understanding the Hydrogen Transfer Mechanism in Direct Liquefaction of Bulianta Coal**, Haoquan Hu, Ben Niu, Zhiwei Shi, Lijun Jin, Yang Li, Dalian University of Technology, CHINA

**Design ZSM-22 Crystal Morphology with Urea and its Catalytic Property**, Debao Li, Pengyu Niu, Litao Jia,

Bo Hou, Institute of Coal Chemistry Chinese Academy of Science, CHINA

**POSTER SESSION 3  
SUSTAINABILITY AND ENVIRONMENT**

**Geochemical Mobility of Potential Hazardous Elements of Coal Cleaning Rejects**, Diego de Medeiros, Marcos L.S. Oliveira, Bianca D. Lima, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**Occurrence of the Hazardous Elements in Agricultural Soils Surrounding a Coal Power Plant Complex From Santa Catarina (Brazil)**, Diego de Medeiros, Marcos L.S. Oliveira, Fagner T.C. Sá, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**A Density Functional Theory Study on Acetic Acid Decomposition on Ni (111)**, Wenying Li, Yanxiong Ran, Zhenyi Du, Jie Feng, Taiyuan University of Technology, CHINA

**POSTER SESSION 4  
CARBON MANAGEMENT**

**Pretreatment of Flue Gas Using Polymeric Membrane for CO<sub>2</sub> Capture**, Soohyun Choi, Ilhyun Baek, Korea Institute of Energy Research, KOREA

**Experimental Study on CO<sub>2</sub> Capture From Simulated Flue Gas by Using Aqueous Ammonia with External Magnetic Field**, Qi Zhang, Jiayi Wu, Ping Lu, Nanjing Normal University, CHINA

**POSTER SESSION 5  
COAL SCIENCE**

**Coal Cleaning Residues and Fe-Ultrafine Particles and Fe-Minerals Consequences**, Diego de Medeiros, Felipe B. de Leão, Fagner T.C. de Sá, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA

**Zinc Occurrence in Coal Power Plant Burning Combinations of Coal and Tires**, Diego de Medeiros, Fernanda R. Silveira, Silvio R. Taffarel, Luis F. O. Silva, Centro Universitário La Salle, BRAZIL; Frans Waanders, North West University, SOUTH AFRICA; James C. Hower, University of Kentucky Center for Applied Energy Research, USA

**Hard Carbon From Coal Heavy Organics as Anode Material for Li-Ion Batteries**, Ying Zhou, Yulong Li, Ruifeng Liu, Jun Guan, Peng Wan, Lei He, Weiran Cao, Dongju Ma, Dalian University of Technology, CHINA

**The Relationship between Oxygen Transfer and Pyrolysis Conditions**, Wenying Li, Chaopeng Wang, Huijun Huang, Xiaohong Li, Jie Feng, Taiyuan University of Technology, CHINA

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