



Thirty - Fourth Annual INTERNATIONAL PITTSBURGH COAL CONFERENCE

University of Pittsburgh · Swanson School of Engineering

FINAL PROGRAM

COAL - ENERGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT



September 5 - 8, 2017

Pittsburgh, PA. USA

Sheraton Pittsburgh Hotel at Station Square



Hosted by:



University of Pittsburgh

WELCOME!

On behalf of the Conference Advisory Board, Conference Committees, and the University of Pittsburgh we welcome you to the Thirty-Fourth Annual International Pittsburgh Coal Conference, which will be held September 5 - 8, 2017 at Sheraton Pittsburgh Hotel at Station Square in Pittsburgh, PA, USA. The Conference is hosted by the University of Pittsburgh.

The theme of this year's conference "Coal - Energy, Environment and Sustainable Development" covers wide spectrum of important topics on energy and environmental issues and technologies, directly related to coal extraction and utilization and its byproducts. Over 220 technical papers and posters will be presented throughout the conference. The Poster Sessions will be held on Wednesday, September 7, 2017 from 17:30 to 19:30. For detailed information about the technical sessions and speakers, please turn to page 6 in the Technical Program.

The invited Plenary Speakers include: Dr. Grace Bochenek, Director, National Energy Technology Laboratory (NETL), Department of Energy (DOE), USA; Dr. John Duddy, Director, Heavy Oil and Coal Technology, Axens North America, Inc., USA; Mr. Joseph D'Amico, CEO, D'Amico Technologies Corp., USA; Dr. Chang Wei, President & CEO at National Institute of Clean-and-Low-Carbon Energy (NICE), China; Dr. Daniel Roberts, Principal Research Scientist at CSIRO, Australia; Dr. Cliff Mallett, Carbon Energy Limited, Australia; Dr. Evan Granite, Research Chemical Engineer, NETL, DOE, USA; Mr. Thomas Adams, Executive Director, American Coal Ash Association, USA; and Dr. Raghubir Gupta, Senior Vice President, Energy Technology Division, RTI International, USA.

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 2017 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-Fifth Annual International Pittsburgh Coal Conference, which will be held in the beautiful city of Xuzhou, Jiangsu Province, P. R. China, October 15-18, 2018.

Sincerely,

Massood Ramezan, Chair



Senior Technical Advisor at KeyLogic Systems, USA

CONFERENCE REGISTRATION

On-Site Registration will begin Tuesday, September 5, from 15:00 - 19:00 and continues Wednesday, Thursday, from 7:00 - 17:00, and Friday from 7:00 until 10:30.

Please check in even if you have Pre-Registered!

THE INTERNATIONAL PITTSBURGH COAL CONFERENCE

EXECUTIVE DIRECTOR:

Dr. Badie I. Morsi

CONFERENCE OFFICE:

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GENERAL INFORMATION

TECHNICAL TOUR

NETL'S RESEARCH FACILITIES AT PITTSBURGH SITE

Tuesday, September 5, 2017

Time: 9:30 a.m. - 11:30 a.m.

The National Energy Technology Laboratory (NETL), part of the U.S. Department of Energy (DOE) national laboratory system, is owned and operated by the DOE. NETL implements a broad spectrum of energy and environmental research and development (R&D) programs that will return benefits for generations to come. These include: Enabling domestic coal, natural gas, and oil to economically power our Nation's homes, industries, businesses, and transportation, and protecting our environment and enhancing our energy independence.

NETL has expertise in coal, natural gas, and oil technologies; contract and project management; analysis of energy systems; and international energy issues. In addition to research conducted onsite, NETL's project portfolio includes R&D conducted through partnerships, cooperative research and development agreements, financial assistance, and contractual arrangements with universities and the private sector. Together, these efforts focus a wealth of scientific and engineering talent on creating commercially viable solutions to national energy and environmental problems.

To register for the NETL tour on Tuesday, September 5, please contact the conference office at:

ipcc@pitt.edu

Tour cost: \$30 (to be paid online in the conference website or in cash the day of the tour).

ACCOMODATIONS

SHERATON PITTSBURGH HOTEL AT STATION SQUARE

**300 W Station Square Dr.
Pittsburgh, PA 15219**

The Sheraton Pittsburgh is located on the waterfront, in the heart of a 52-acre riverfront complex that includes Station Square restaurants, entertainment and many things to do in Pittsburgh just steps away.

To qualify for the special PCC rates, please book before August 14, 2017

For reservations:

Phone: +1 (412) 261-2000

<http://www.sheratonpittsburghstationssquare.com/>

GATEWAY CLIPPER DINNER CRUISE

Wednesday, September 6, 2017

17:45 - Meet in the Hotel Lobby for a short walk to the boarding dock

18:00 - 18:30 - Boarding at the dock by the Station Square

18:30 - 21:00 - Dinner and cruising

21:00 - Return to dock for a short walk to the hotel

Please join us for a dinner cruise on Pittsburgh's three rivers! Back by popular demand, this cruise is complimentary for conference attendees, but there is a charge of \$45 to bring a spouse or friend. However, you **MUST** RSVP to the PCC secretary to be included on the cruise. For more information and to RSVP, please visit our website.

GENERAL INFORMATION

CONFERENCE OVERVIEW

TUESDAY, SEPTEMBER 5, 2017

Technical Tour	08:00 - 15:00
Registration	15:00 - 19:00
Reception	18:30 - 20:30

WEDNESDAY, SEPTEMBER 6, 2017

Registration	07:00 - 17:00
Opening Ceremony	08:30 - 08:45
Plenary Session - 1	08:45 - 10:30
Concurrent Tech. Sessions	10:50 - 12:30
Conference Luncheon	12:30 - 13:30
Concurrent Tech. Sessions	13:30 - 17:10
Gateway Clipper Dinner Cruise	18:00 - 21:00

THURSDAY, SEPTEMBER 7, 2017

Registration	07:00 - 17:00
Plenary Session - 2	08:45 - 10:30
Concurrent Tech. Sessions	10:50 - 12:30
Conference Luncheon	12:30 - 13:30
Concurrent Tech. Sessions	13:30 - 17:10
Poster Session	18:00 - 21:00

FRIDAY, SEPTEMBER 8, 2017

Registration	07:00 - 10:30
Plenary Session - 3	08:45 - 10:30
Concurrent Tech. Sessions	10:50 - 12:30
Awards Luncheon	12:30 - 13:30

PLENARY SPEAKERS

WEDNESDAY, SEPTEMBER 6, 2017

ENERGY PRODUCTION AND POLICIES

Dr. Grace Bochenek

DOE-NETL, USA

“Creating the 21st Century Energy Ecosystem ”

Dr. John Duddy

Axens North America, Inc., USA

“Direct Coal Liquefaction Synergy with Natural Gas”

Mr. Joseph D’Amico

D’Amico Technologies Corp , USA

“Coal Bed Methane Recovery & Utilization for the 21st Century ”

THURSDAY, SEPTEMBER 7, 2017

INTERNATIONAL ISSUES

Dr. Chang Wei

NICE, CHINA

“Cleaner Coal Applications: Nice Perspectives ”

Dr. Daniel Roberts

CSIRO, AUSTRALIA

“Coal in Australia: the Journey from the Bedrock of our Economy to... ”

Dr. Cliff Mallett

Carbon Energy Limited, AUSTRALIA.

“The Evolution of Underground Coal Gasification”

FRIDAY, SEPTEMBER 8, 2017

ENVIRONMENTAL ISSUES

Dr. Evan Granite

DOE-NETL, USA

“Trace Elements in Coal - a Magical Journey Across The Periodic Table ”

Mr. Thomas Adams

ACAA, USA

“Recent Developments In Coal Ash Beneficial Use ”

Dr. Raghubir Gupta

RTI, USA

“Coal Utilization for Power and Chemicals in a Carbon-Constrained World”

PROGRAM SCHEDULE

Tuesday, September 5, 2017						
8:00 - 15:00	Technical Tour - NETL research facilities (Pittsburgh Site)					
15:00 - 19:00	Registration					
18:30 - 20:30	Reception					
Wednesday, September 6, 2017						
8:00 - 17:00	Registration					
8:30 - 8:45	Opening Ceremony					
8:45 - 10:30	Plenary Session 1					
10:30 - 10:50	Morning Break					
ROOM	1	2	3	4	5	6
	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 - Environments	Coal Ash Management - 1	Coal Science - 1	Gasification Technologies - General 1	Rare Earth Elements - 1
12:30 - 13:30	Lunch					
	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 - Advanced Technologies	Coal Ash Management - 2	Coal Science - 2	Gasification Technologies - General 2	Rare Earth Elements - 2
15:10 - 15:30	Afternoon Break					
	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 - General 1	Coal Ash Management - 3	Coal Science - 3	Gasification Technologies - UCG	Rare Earth Elements - 3
18:00 - 21:00	Gateway Clipper Dinner Cruise					
Thursday, September 7, 2017						
8:00 - 17:00	Registration					
8:45 - 10:30	Plenary Session 2					
10:30 - 10:50	Morning Break					
ROOM	1	2	3	4	5	6
	Session 19	Session 20	Session 21	Session 22	Session 23	Session 24
10:50 - 12:30	Carbon Management - Technology Development Status	Combustion Technologies - General 2	Coal Ash Management - 4	Coal Science - 4	Gasification Technologies - Gas Cleanup	Clean Coal and Gas to Fuels - 1
12:30 - 13:30	Lunch					
	Session 25	Session 26	Session 27	Session 28	Session 29	Session 30
13:30 - 15:10	Carbon Management - Modeling and Optimization	Power Plants - Advanced Technologies	Coal Ash Management - 5	Coal Science - 5	Gasification Technologies - General 3	Clean Coal and Gas to Fuels - 2
15:10 - 15:30	Afternoon Break					
	Session 31	Session 32	Session 33	Session 34	Session 35	Session 36
15:30 - 17:10	Carbon Management - Chemical Analysis and Characterization Studies	Power Plants - General	Coal Ash Management - 6	Value-Added Products from Coal - 1	Gasification Technologies - Modeling 1	Coal Bed and Shale Gas - 1
18:00 - 21:00	Poster Session					
Friday, September 8, 2017						
8:00 - 10:30	Registration					
8:45 - 10:30	Plenary Session 3					
10:30 - 10:50	Morning Break					
ROOM	1	2	3	4	5	6
	Session 37	Session 38	Session 39	Session 40	Session 41	Session 42
10:50 - 12:30	Sustainability and Environment	Gasification Technologies - Modeling 2	Coal Mining and Beneficiation	Value-Added Products from Coal - 2	Gasification Technologies - Co-gasification	Coal Bed and Shale Gas - 2
12:30 - 13:30	Awards Luncheon					

TECHNICAL PROGRAM

ORAL SESSIONS

Wednesday, September 6

10:50 - 17:10

SESSION 1

CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS—1

Diane Madden and Ted McMahon

The Petra Nova Carbon Capture Project, Greg Kennedy, Petra Nova/NRG Energy, USA.

Update on the Kemper County IGCC Project, J. Matt Nelson, Tim Pinkston, Southern Company; Diane Madden, NETL / DOE, USA.

Low Cost 4500 TPD CO₂ Capture Plant from Coal-Fired Flue Gases, Ahmed Abou-dheir, Pinnacle Industrial Services, CANADA. Zechuan Huang, Daoyong Yang, AEET Purenergy, CHINA.

Optimizing Power Plant Performance through Coal Beneficiation, Mark Ness, Great River Energy; Nenad Sarunac, University of North Carolina, USA.

SESSION 2

COMBUSTION TECHNOLOGIES - ENVIRONMENT

Andreas Richter and Henry Pennline

Ni@SiO₂ Core@Shell Nanocatalysts for Selective Combustion Reactions, Yahui Yang, Götz Vesper, University of Pittsburgh, USA.

NO formation in flames with high oxygen feed gas concentrations, Klas Andersson, Thomas Ekvall, Chalmers University of Technology, SWEDEN.

Fate of Sulfur in Coal Direct Chemical Looping Systems, Yaswanth Pottimurthy, Cheng Chung, Mingyuan Xu, Tien-Lin Hsieh, Dikai Xu, Yitao Zhang, Yu-Yen Chen, Pengfei He, Marshall Pickarts, Andrew Tong, Liang-Shih Fan, The Ohio State University, USA.

SESSION 3

COAL ASH MANAGEMENT - 1

Tarunjit Butalia and Bill Petruzzi

Harvesting of Coal Combustion Products Stored in a Dry Storage Area for Beneficial Use, Marty Leedy, Rafic Minkara, Headwaters Construction Materials, LLC, USA.

CCP Harvesting Protocol – Embracing ASTM E50.003 for Beneficial Use of CCP from Active and Inactive Storage Areas,

William G. Petruzzi, Hull and Associates, Inc., USA.

Engineering Cost-Effective Project Outcomes: Construction Quality Programs for CCR Projects, Dale W. Evans, Kathleen Whysner, Remedial Construction Services, L.P., USA.

What's Really in the Water? New Treatment Options for Coal Combustion Residuals (CCRs) and Mining-Influenced Water, Pamela Dugan, Carus Corporation, USA.

The Decommissioning Process and Consideration of Environmental Factors That Can Impact Cost, Schedule and Reuse Options, William Ahlert, HDR Engineering, Inc., USA.

SESSION 4

COAL SCIENCE - 1

Wenhua Li and Ishihara Atsushi

Involvement of Radicals as Intermediates in Coal Autocatalytic Heating During Storage, Haim Cohen, Ariel University and Ben-Gurion University of the Negev; Sharon Ruthstein, The Bar Ilan University; Zeela Taub, Ariel University, ISRAEL.

Coal Ash Fusion Temperature and Viscosity at High Temperature by Molecular Dynamics Simulation and Experiments: The Role of Cao/Fe₂O₃ Ratio, Xin Dai, Jin Bai, Du Shiyu, Xiaodong Wen, Lingxue Kong, Zongqing Bai, Wen Li, Chinese Academy of Sciences, CHINA.

SESSION 5

GASIFICATION TECHNOLOGIES - GENERAL 1

Massood Ramezan and Daniel Roberts

An Overview of DOE's Gasification Systems Program, K. David Lyons, NETL; Christopher Munson, Massood Ramezan, KeyLogic Systems, USA.

Experimental Study on Tar Formation during Pressurized Brown Coal Pyrolysis as Part of the British Gas/Lurgi (BGL) Gasification Process, David Scheithauer, Marco Küttner, Steffen Krzack, Denise Reichel, Bernd Meyer, TU Bergakademie Freiberg, GERMAN.

Gasification of PRB Coal Solvent Extraction Residue, William C. Schaffers, David Bell, University of Wyoming, USA.

Steam Gasification of Weihua Sub-bituminous Coal with Ca(OH)₂ as a Catalyst, Dianmiao Cui, Longpeng Cui, Research Institute of Petroleum Processing, China Petrochemical Corporation, CHINA.

Kinetic Benefits of Small Particle Size for

Fluid Bed for Transport Coal Gasification, Girish Srinivas, Staci Van Norman, Steven C. Gebhard, Steven Schwab, Drew Galloway, Nathan Weinstein, Jeff Martin, TDA Research Inc., USA.

SESSION 6

RARE EARTH ELEMENTS - 1

Evan Granite and Elliot Roth

Feasibility of Recovering Rare Earth Elements from Coal and Coal By-Products, Mary Anne Alvin, NETL, USA.

Recovery of Rare Earth Elements from North Dakota Lignite-Related Feedstocks, Daniel A. Laudal, Steven A. Benson, University of North Dakota, USA.

Recovery of Rare Earth Elements from Coal Ash with a Recycling Acid Leach Process, Rick Peterson, Mike Heinrichs, Rachid Taha, Slawek Winecki, Darwin Argumedo, Battelle Memorial Institute, USA.

An Environmentally Friendly Approach to Recovery of Rare Earth Elements from Coal Production and Utilization Byproducts, Maohong Fan, Zaixing Huang, Kai Li, Hanjing Tian, University of Wyoming; Yan Luo, West Virginia University; Eric Williams, Gabrielle Gaustad, Rochester Institute of Technology; Hertanto Adidharma, Maciej Radosz, University of Wyoming, USA.

Bioleaching of Rare Earth Elements from Coal-based Products, Yanna Liang, Ji Zhang, Southern Illinois University Carbon-dale, USA.

SESSION 7

CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS - 2

Venkat Venkataraman and Greg O'Neil

Keeping Coal Competitive in Future Markets with Flameless Pressurized Oxy-Combustion, Peter Reineck, Peter Reineck Associates, UNITED KINGDOM; Massimo Malavasi, Itea S.p.A; ITALY; Joshua Schmitt, SwRI, USA.

Development of a Cycle for Large Pilot and Commercial Power Plant Using Flameless Pressurized Oxy-Combustion, Joshua Schmitt, Southwest Research Institute, USA. Massimo Malavasi, Itea S.p.A; ITALY; Brandon Ridens, Adrian Alvarado, SwRI, USA.

Replacing Liquified Natural Gas with Synthetic Natural Gas in the Energy Mix of Pakistan, Farid Malik, Forman Christian College, PAKISTAN.

TECHNICAL PROGRAM

SESSION 8

COMBUSTION TECHNOLOGIES - ADVANCED TECHNOLOGIES

Aleksander Sobolewski and Andreas Richter

Experimentally Observed Influences of KCl and SO₂ on CO Oxidation in an 80 kW Oxy-Propane Flame, Thomas Ekvall, Klas Andersson, Chalmers University of Technology, SWEDEN.

Attrition and Reactivity Analysis of Oxygen Carrier Materials under High Temperature Conditions, J.G. van der Watt, Daniel Laudal, Harry Feilen, Michael Mann, University of North Dakota; Srivats Srinivasachar, Teagan Nelson, Envergenx LLC, USA.

Design of a Methane-Oxygen Pilot Burner for High Pressure Oxy-Coal Combustor Application, Arifur Chowdhury, Ahsan Choudhuri, Norman Love, The University of Texas at El Paso, USA.

Chemical-Looping Technologies for Solid Fuels, Tobias Mattisson, Carl Johan Linderholm, Anders Lyngfelt, Chalmers University of Technology, SWEDEN.

Experimental and Numerical Study On Ash Deposition Model in A 35kw Horizontal Coal Reactor: Application to Coal-Fired Boiler, Seok-Gi Ahn, Pusan National University; Young-Gap Jeong, Korea South-East Power Co.; Chung-Hwan Jeon, Pusan National University, SOUTH KOREA.

SESSION 9

COAL ASH MANAGEMENT - 2

Tarunjit Butalia and Mark Rokoff

CCR Industry Overview: A View from the Websites, Mark Rokoff, AECOM, USA.

Geophysical Tools and Techniques for Improvement of Coal Ash Management, Nathaniel P. Shields, Thomas B. Brackman, Near Surface Geophysics Innovations LLC; Michael T. May, Western Kentucky University; John Kerr, ATC Group Services LLC, USA.

Reclaiming and Recycling Coal Combustion Residuals for Encapsulated Beneficial Reuse, Bill Fedorka, ATAP, SEFA; Jimmy Knowles, John Castleman, SEFA, USA.

Application of Best Practices in the Seismic Stability Assessment of CCR Landfills and Surface Impoundments, Nicolas Betancur, Anand Govindasamy, W. Allen Marr, Geocomp Corporation; Steven L. Kramer, University of Washington; Nicholas A. McClung, Tennessee Valley Authority, USA.

Synthesis of Zeolite Type X from Coal Fly Ashes and Bottom, Thiago Fernandes de Aquino, Sabrina Teixeira Estevam, Gabriela Roveda Corrêa, Carolina Resmini Melo

Marques, Aline Resmini Melo, Reginaldo Rosso Marcello, Beneficent Association of the Santa Catarina Coal Industry – SATC; Marçal Pires, Marta Eliza Hammerschmitt, Pontifical Catholic University of Rio Grande do Sul; Humberto Gracher Riella, Federal University of the Santa Catarina, BRAZIL.

SESSION 10

COAL SCIENCE - 2

Ishihara Atsushi and Wenhua Li

Attractiveness of Wyoming Powder River Basin (PRB) Coal as a Valuable Resource From Which to Manufacture Non-Energy and Fuel Products, Richard A. Horner, John E. Myers, William “Sandy” A. Duncan, University of Wyoming; Carl Bauer, C. O. Bauer Consulting, Inc, USA.

Dry Sensor-Based Sorting of Coal at Demonstration Plant Level, David M. Powell, Isabel King, Neo Makhalemele, Carl Bergmann, Mintek, SOUTH AFRICA.

Investigation of Washability of Akcelik Lignite, Tekirdag/Turkey, Ali Ucar, Sevgi Karaca, Ozer Oren, Dumlupinar University; Murat Ozturun, Akcelik Mining; Cem Sensogut, Dumlupinar University, TURKEY.

Study on the Properties of Coal-sludge Slurry Prepared by Lean Coal and Sludge from Coal-to-Oil Process, Yuxing Zhang, Ping Feng, Yanan Tu, Zhiqiang Xu, China University of Mining & Technology, CHINA.

The Spontaneous Combustion Liability of Akcelik Lignite, Tekirdag/Turkey, Cem Sensogut, Ozer Oren, Sevgi Karaca, Dumlupinar University; Halim Demirkan, Akcelik Mining; Ali Ucar, Dumlupinar University, TURKEY.

SESSION 11

GASIFICATION TECHNOLOGIES - GENERAL 2

Dave Lyons and Joseph Bittinger

Advances in Coal Gasification R&D, Jaiwoh Kim, DOE, K. David Lyons, NETL, Regis Conrad, DOE, USA.

Characterization of Mineral Matter Transformation in Brown Coal Ashes Processed under Gasification Conditions, Daniel Roberts, Alexander Ilyushechkin, San Shwe Hla, David Harris, CSIRO Energy, AUSTRALIA.

Measurement, Characterization and Market Potential of Tars from British Gas/Lurgi (BGL) Gasification and their Representation in Aspen Plus® Modeling, Michaela Nguyen, Fred Compart, Kristin Boblenz, Bernd Meyer, TU Bergakademie Freiberg, GERMANY.

Effect of Graphitization Degree of Residual

Carbon on Ash Fusibility, Ling-xue Kong, Ji Wang, Jin Bai, Zong-qing Bai, Wen Li, State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, CHINA.

SESSION 12

RARE EARTH ELEMENTS - 2

Evan Granite and Elliot Roth

Brief Overview of Rare Earth Research at NETL R&IC, Evan Granite, Elliot Roth, Tracy Bank, Ronghong Lin, Bret Howard, Yee Soong, Mac Gray, Chris Wilfong, Ranjani Sriwardane, James Bennett, Jin Nakano, Mary Anne Alvin, Kurt Rothenberger, NETL, USA.

Effect of Pre-Reaction Ball Milling of LaPO₄*H₂O + Na₂CO₃ on Kinetic Parameters of the LaPO₄ Roasting Reaction, Ward Burgess, Murphy Keller, Elliot Roth, Jonathan Lekse, Bret Howard, Evan Granite, DOE / NETL, USA.

Elucidating Distribution and Speciation of Rare Earth Elements in Coal Utilization By-Products Utilizing Synchrotron Microscopy and Spectroscopy, Mengling Stuckman, AECOM; Christina Lopano, Evan Granite, DOE/NETL, USA.

Grain Scale Rare Earth Element Distribution in Coal Fly Ash, Allan Kolker, Clint Scott, U.S. Geological Survey; James Hower, University of Kentucky; Christina Lopano, DOE/NETL, USA.

Determination of Rare Earths in Coal Combustion By-Products, Evan Granite, DOE/NETL; Elliot Roth, Tracy Bank, DOE/AECOM; Mary Anne Alvin, DOE; Ken Ladwig, EPRI, USA.

SESSION 13

CLEAN COAL DEMONSTRATION AND COMMERCIAL PROJECTS - 3

Anthony Zinn and Tom Sarkus

Techno-Economic Analysis of Battelle’s Direct Coal-to-Liquids Process for Jet Fuel & Diesel Using Biomass Derived Solvents, Satya Chauhan, Dan Garbark, Rachid Taha, Rick Peterson, Battelle; Jason T. Lewis, DOE/NETL, USA.

Lignite-plus-Biomass to Synthetic Jet Fuel with CO₂ Capture & Storage: Design, Cost & GHG Emissions Analysis for a Near-Term FOAK Demonstration Project in Mississippi and Prospective Future Plants, Eric Larson, Princeton University, USA; Chris Greig, The University of Queensland, AUSTRALIA; Thomas G. Kreutz, Johannes C. Meerman, Robert H. Williams, Princeton University, USA.

TECHNICAL PROGRAM

Economic Improvements in U.S. Coal Producing Regions, Bhima Sastri, Angelos Kokinos, U.S. DOE/FE; John Rockey, Advanced Combustion Systems, USA.

SESSION 14

COMBUSTION TECHNOLOGIES - GENERAL 1

Henry Pennline and Daniel Roberts

Liquid Components As Enabling Technologies for Advanced, High-Temperature Power Cycles, Michael Jaworski, Princeton Plasma Physics Laboratory; Brandon Field, University of Southern Indiana, USA.

Modeling of Mineral Redistribution and Transformation for a Sub-Bituminous Coal, Noman Sadi, Kwangkook Jeong, Jaedal Lee, Arkansas State University, USA.

Method for Separation of Coal Conversion Products from Oxygen Carriers, Junior Nasah, University of North Dakota; Srivats Srinivasachar, Envergen LLC, USA.

An Investigation of Combustion Kinetics of Coal-Microalgae Biomass Fuel, Ejesieme Vitus, Ben Zeelice, Gary Dugmore, Nicole Vorster, Nelson Mandela University, SOUTH AFRICA.

Experimental Study On Nitrogen Oxides Formation of Pulverized Coal During Unstaged and Staged Oxyfuel Combustion, Hong-Min Cho, Jeong-Woo Kim, Ho Lim, Chung-Hwan Jeon, Pusan National University, SOUTH KOREA.

SESSION 15

COAL ASH MANAGEMENT - 3

Tarunjit Butalia and Sean Rome

Rapid Solidification of Coal Combustion Residuals (CCR) Leachate & Wet Ash Wastes, Richard P. Traver, Pace Engineering, LLC, Milind Khire, Quint Barefoot, University of North Carolina; Chris Hardin, Zappa-Tec, LLC; James E. Meagher, Mineral Processing Services, LLC, USA.

Ash Pond Closure and Repurposing at Net Zero Discharge Facilities, Sean Rome, RECON Services, L.P., USA.

Design, Installation and Operation of Coal Ash Basin Dewatering Treatment Systems, Charles McCloskey, Evoqua Water Technologies, USA.

The Unique Role of Slurry Wall Systems for CCR Impoundment Closure Programs, Dale W. Evans, Kathleen Whysner, Remedial Construction Services, L.P., USA.

Beneficial Use of CCR Using Geotextile Tubes for Ash Pond Closure, Tom Stephens, TenCate, Water and Environment; Meena

Viswanath, Ming Zhu, Geosyntec Consultants; Kirk Foley, Infrastructure Alternatives Inc, USA.

SESSION 16

COAL SCIENCE - 3

Wenhua Li and Ishihara Atsushi

Fractionation of Wyoming Coals to Produce Intermediates for Non-Fuel Products, David A. Bell, University of Wyoming, USA.

Substantial Upgrading of a High-Ash Lignite By Hydrothermal Treatment with Calcium Hydroxide, Jie Wang, Xueping Liu, Xuantaowu, East China University of Science and Technology, CHINA.

SESSION 17

GASIFICATION TECHNOLOGIES - UCG

Aleksander Sobolewski and Johan Van Dyk

In-Situ CO₂ Capture During A UCG Process by Simulating Possible CO₂ Absorption On Roof, Floor and Coal Mineral Structures, J.C. van Dyk, J Brand, FB Waanders, African Carbon Energy, SOUTH AFRICA.

Evolution of the key Seam UCG Process, Burl E. Davis, Carbon Energy Limited; Cliff Mallet, CUMT International UCG Research Centre and Carbon Energy Limited, AUSTRALIA.

The Gas -Coal Interface in Underground Coal Gasification, Cliff Mallet, Jianmin Zhang, CUMT International UCG Research Centre and Carbon Energy Limited, AUSTRALIA.

The Effect of the Roof and Floor Geological Structures on the Mineralogical Composition of Ash Produced from Coal at UCG Operating Temperatures, J.C. van Dyk, African Carbon Energy; R.C. Uwaoma, C.A. Strydom, R.H. Matjie, J.R. Bunt, North-West University, SOUTH AFRICA.

Fundamentals in Environmental Management for Underground Coal Gasification, Cliff Mallet, CUMT International UCG Research Centre and Carbon Energy Limited; Burl E. Davis, Carbon Energy Limited, AUSTRALIA.

SESSION 18

RARE EARTH ELEMENTS - 3

Evan Granite and Elliot Roth

Organic and Inorganic Association of Rare Earth Elements in Coal, Ronghong Lin, Tracy L. Bank, Evan J. Granite, Yee Soong, DOE / NETL; Elliot A. Roth, AECOM, USA.

Application of a Hand-held XRF Unit to Establish the Lineal Extent of Rare Earth

Element Concentration in Investigative Cores, Robert Uhrin, David C. Uhrin, Eugene Uhrin, XLight Corporation, USA.

Influence of Temperature on the Recovery of Metal Elements from Coal Ash - FACTSAGE™ Simulations, J.C. Van Dyk, North-West University. African Carbon Energy; A.C. Collins, C.A. Strydom, J.R. Bunt, North-West University, SOUTH AFRICA.

Characterization of Rare Earth Element Minerals in Coal Utilization Byproducts and Associated Clay Deposits from Appalachian Basin Coal Resources, Scott N. Montross, Circe A. Verba, Amy Falcon, James Poston, Mark McKoy, NETL, USA.

ORAL SESSIONS

Thursday, September 7

10:50 - 17:10

SESSION 19

CARBON MANAGEMENT - TECHNOLOGY DEVELOPMENT STATUS

Nicholas Siefert and Omar Basha

Regional Impacts of Carbon Capture and Sequestration (CCS), Joshua Stanislawski, Steve Schlasner, Bruce Folkedahl, Mike Swanson, Melanie Jensen, University of North Dakota, USA

CO₂-SCREEN: Application to the Oriskany Sandstone, Sean Sanguinito, AECOM; Angela Goodman, NETL; James Sams III, AECOM, USA.

Status of Technology Development at the National Carbon Capture Center, Doug McCarty, Southern Company Services, USA.

Greenhouse Gas Emissions in the U.S. Coal Industry and the Market for Emission Offsets, Clark Talkington, Advanced Resources International, Inc; Felicia Ruiz, EPA, USA.

SESSION 20

COMBUSTION TECHNOLOGIES - GENERAL 2

Daniel Roberts and Evan Granite

Hydrothermal Co-carbonization (HTCC) of Coal-Biomass Blend, Toufiq Reza, Akbar Saba, Ohio University, USA.

Raman Spectroscopy for the On-Line Analysis of Oxidation States of Oxygen Carrier Particles in Chemical Looping Combustion, Hergen Eilers, John Kirtley, Victoria Leichner, Washington State University, USA.

TECHNICAL PROGRAM

Co-Firing of Biochar and Lignite under the Oxy-Fuel Combustion Mode, Miriam Issac, Anthony De Girolamo, Lian Zhang, Monash University, AUSTRALIA.

Instrument Model for Narrow Angle Radiometers, Kaitlyn Scheib, Jennifer Spinti, Andrew Fry, Stan Harding, Ignacio Preciado, Zsolt Dobo, University of Utah, USA.

Combustion Characteristics of Coal in A Pilot-Scale Oxy-Circulating Fluidized Bed Combustor System, Tae-Young Mun, Ji Hong Moon, Sung-Ho Jo, Myung-Won Seo, Uendo Lee, Chang Won Yang, Nguyen Hoang Khoi, Ho Won Ra, Sang Jun Yoon, Jae-Goo Lee, Korea Institute of Energy Research, SOUTH KOREA.

SESSION 21

COAL ASH MANAGEMENT - 4

Tarunjit Butalia

Emerging Issues in Coal Ash Management : A Panel Discussion, Tarunjit Butalia, The Ohio State University, USA.

SESSION 22

COAL SCIENCE - 4

Wenhua Li and Andreas Richter

Pyrolysis Characteristics of a Sub-Bituminous Coal with Char Solid Heat Carrier at Different Initial Temperature, Wenyang Li, Baofu Li, Xiaohong Li, Taiyuan University of Technology, CHINA

SESSION 23

GASIFICATION TECHNOLOGIES—GAS CLEANUP

Vann Bush and Robert Kornosky

Pilot-Scale Capture of Mercury, Arsenic, and Selenium from Warm Syngas at Elevated Pressures by Palladium Sorbents, Evan Granite, DOE / NETL; Hugh G. C. Hamilton, Stephen Poulston, Liz Rowsell, Wilson Chu, Andrew W. J. Smith, Johnson Matthey Technology Centre; John Socha, Tony Wu, Subhash Datta, Robert C. Lambrecht, John M. Wheelodon, National Carbon Capture Center; Karen J. Uffalussy, Henry W. Pennline, Elliot Roth, Bret Howard, DOE / NETL, USA.

Coal Gasification on a Pilot Scale System for the Application of Liquid Fuel Production, Fehmi Akgün., Serhat Gül, Emir Aydar, TÜBİTAK Marmara Research Center Energy Institute, TURKEY.

Catalytic Reduction of Ammonia in Syngas, Alper Sarioglan, Yeliz Durak-Çetin, TÜBİTAK Marmara Research Center Energy Institute; Hasancan Okutan, İstanbul Technical University,

Fehmi Akgün, TÜBİTAK Marmara Research Center Energy Institute, TURKEY.

SESSION 24

CLEAN COAL AND GAS TO FUELS - 1

John Duddy and Johan Van Dyk

Spontaneously Activatable Iron-Based Catalysts in Fischer-Tropsch Synthesis: Application to High Temperature Processes, Dong Hyun Chun, Geun Bae Rhim, Ji Chan Park, Ho-Tae Lee, Jung-Il Yang, Heondo Jung, Heon Jun, Korea Institute of Energy Research, SOUTH KOREA.

Highly Selective FT Synthesis for Production of JP-8 Jet Fuel from Coal and Coal/Biomass Mixtures, Andrew Lucero, Brittany Basu, Brandon Cline, Patrick Woolcock, Curtis Thompson, Kevin McCabe, Santosh K. Gangwal, Southern Research, USA.

Simulation of a Fischer-Tropsch Fluids Refinery using Aspen Plus, Md Imranul Haque, David A Bell, Sara Harkins, University of Wyoming, USA.

SESSION 25

CARBON MANAGEMENT - MODELING AND OPTIMIZATION

Nicholas Siefert and Henry Pennline

Integration of Heat Recovery Unit to Reduce CO₂ Capture Costs, Ravinder K Garlapalli, Michael Spencer, Khairul Alam, Jason P. Trembly, Ohio University, USA.

Cost-Effective Post-Combustion Carbon Capture from Coal-Fired Power Plants, Seyfetting C. (John) Gulen, S. C. Gulen, W. R. Elliott, Bechtel Infrastructure & Power, Inc., USA.

Technical and Economic Feasibility Analysis of Integrating Activated Carbon Plant with Heating Plant, Kirtipal A. Barse, Dan Laudal, Michael Mann, Steve Benson, University of North Dakota; Srivats Srinivasachar, EnvergeX LLC, USA.

Combined CO₂ Capture /Water-Gas Shift with Integrated Heat Management for IGCC Applications, Andrew Lucero, Shen Zhao, Santosh K. Gangwal, Southern Research, USA.

Computational Fluid Dynamics Modeling and Optimization of Absorber Design for Pre-combustion CO₂ Capture, Omar M. Basha, ORISE/U.S. DOE/NETL; Isaac Gamwo, Nicholas Siefert, NETL, USA, Badie Morsi, University of Pittsburgh, USA.

SESSION 26

POWER PLANTS - ADVANCED TECHNOLOGIES

Ting Wang and Thomas Sarkus

Discussion of Using Aspen Plus Vs. Thermoflex to Model NGCC and IGCC Power Plants, Henry A. Long, Ting Wang, University of New Orleans, USA.

Progress of Coal Direct Chemical Looping Development at The Ohio State University (OSU), Yitao Zhang, Dikai Xu, Tien-Lin Hsieh, Cheng L. Chung, Yaswanth Pottimurthy, Cody Park, Mingyuan Xu, Andrew Tong, Liang-Shih Fan, The Ohio State University, USA.

High Performance Computing Design Exploration for a 500 MW Oxy-coal Fired Boiler Design, Michal Hradisky, Derek Harris, N. Stan Harding, Philip J. Smith, University of Utah, USA.

Integrated Process to Lower Emissions and Increase Efficiency, Donald W. Collins, Western Research Institute; Alan Bland, Ash Management Engineering, Inc., USA.

Dynamic Corrosion Testing of Alloys for Supercritical CO₂ Cycles, Joshua Stanislowski, John Kay, Jason Laumb, Michael Swanson, University of North Dakota; Xijia Lu, Brock Forrest, Mike McGroddy, 8 Rivers Capital, USA.

SESSION 27

COAL ASH MANAGEMENT - 5

Tarunjit Butalia and Luis G. Arboleda

Evaluation of Compressibility Characteristics of Fly Ash under Constant Rate of Strain, Jaime A. Mercado, Luis G. Arboleda-Monsalve, University of Central Florida; Tarunjit S. Butalia, The Ohio State University, USA.

Control of Leaching Characteristics of Heavy Metals for Utilization of Landfilled Coal Ash to Geomaterial, Hirokazu Murata, Motoyuki Asada, Masato Kawaguchi, Hiroyuki Tochiyama, Shimizu Corporation, JAPAN.

Beneficial Re-Use of CCRs for Coal Mine Reclamation, Kathleen Whysner, Dale W. Evans, Remedial Construction Services L.P., USA.

Beneficial Use of Fresh and Legacy CCBs in Maryland, Paul Petzrick, Maryland Department of Natural Resources Power Plant Research Program, Tawes State Office; Robin Lee, Environmental Resources Management, Inc; Jason Litten, Western Maryland Regional GIS Center, USA.

The Role of Work Area Quantification for CCR Construction Efforts, Dale W. Evans, Kathleen Whysner, Remedial Construction

TECHNICAL PROGRAM

Services, L.P.; Joseph Scalia, Christopher Bareither, Colorado State University, USA.

SESSION 28

COAL SCIENCE - 5

Andreas Richter and Joseph Bittinger

Cold Strength of Coal Briquettes For Finex®, Wool Park, Hyeonsu Kim, POSCO, SOUTH KOREA.

SESSION 29

GASIFICATION TECHNOLOGIES - GENERAL 3

Daniel Robert and Robert Kornosky

R-GAS Technology Development and Testing of High Ash, High Ash Fusion Temperature Chinese Coals, Don Stevenson, Andrew Kramer, Derek Wissmiller, Gas Technology Institute, USA.

Chemical Looping Coal Gasification Using CO₂ as a Co-Feedstock for Chemicals Production (with 100% carbon efficiency) and its Modularization Scaling Strategy: Thermodynamic Analysis, Techno-economic Assessment and Experimental Proof of Concept, Peter Sandvik, Mandar Kathe, Gabrielle Grignonis, Charles Fryer, Fanhe Kong, Yitao Zhang, Liang-Shih Fan, The Ohio State University, USA.

Catalytic Gasification of a Powder River Basin Coal with CO₂ and H₂O Mixtures, Maohong Fan, University of Wyoming, USA; Fan Zhang, National Institute of Clean and-low-Carbon Energy; Xin Huang, China University of Mining and Technology, CHINA; Morris D. Argyle, Brigham Young University, USA; Bo Zhang, China University of Mining and Technology; Yulong Zhang, National Institute of Clean and-low-Carbon Energy, CHINA.

Effects of B-site Substitutions on BaFeO_{3-δ} Perovskites for Oxygen Separation from Air, Elliot Roth, NETL/AECOM; Jonathan Lekse, Evan Granite, NETL, USA.

Chemical Looping Coal Gasification Sub-Pilot Unit Demonstration and Economic Assessment for IGCC Applications, Fanhe Kong, The Ohio State University; James Simpson, WorleyParsons; Mandar Kathe, Dikai Xu, Tien-Lin Hsieh, Yitao Zhang, Chunyi Li, Robert Statnick, Andrew Tong, Liang-Shih Fan, The Ohio State University, USA.

SESSION 30

CLEAN COAL AND GAS TO FUELS - 2

Johan Van Dyk and John Duddy

Near-Completion CO-Conversion and Total H₂-Recovery by One-Step Water Gas Shift

Reaction in Zeolite Membrane Reactor, Junhang Dong, Antonios Arvanitis, Xinhui Sun, Peter Smirniotis, University of Cincinnati, USA.

The Impact of Copper Oxidation States on H₂ Production from Partial Oxidation of Methanol, Hao Chi, Christopher Andolin, University of Pittsburgh; Jonathan Li, State University of New York; Matthew Curnan, University of Pittsburgh; Guangwen Zhou, State University of New York; Judith Yang, Götz Vesper, University of Pittsburgh, USA.

New Mechanistic Insights into Oxidative Coupling of Methane, Gizem Ozbuyukkaya, Götz Vesper, University of Pittsburgh, USA.

Efficient Syngas Upgrading with High Flux Zeolite Membranes, Mattias Grahn, Luleå University of Technology, SWEDEN; Chris Higman, Higman Consulting GmbH, GERMAN; Jonas Hedlund, Luleå University of Technology, SWEDEN.

Comparison of Integrated vs. Non-integrated Processes for Coal to Synthetic Natural Gas (SNG) Application to Produce Power, Ting Wang, University of New Orleans, USA; Hsiu-Mei Chiu, Po-Chuang Chen, Yau-Pin Chyou, Institute of Nuclear Energy Research, TAIWAN.

SESSION 31

CARBON MANAGEMENT - CHEMICAL ANALYSIS AND CHARACTERIZATION STUDIES

Felicia Ruiz and Vann Bush

Characterizing The Geochemistry of the CO₂-Fluid-Shale Interface using In-Situ Infrared Spectroscopy and Feature Relocation Scanning Electron Microscopy, Sean Sanguinito, AECOM; Angela Goodman, NETL; Mary Tkach, ORISE; Barbara Kutchko, NETL, USA.

The Effect of Topology of Lewis Pair Functionalized Metal Organic Framework on CO₂ adsorption and Hydrogenation, Lin Li, Jingyun Ye, Karl Johnson, University of Pittsburgh, USA.

CO₂ Capture on Li₂CuO₂ Under Different Physicochemical Conditions, Hugo Lara-García, Heriberto Pfeiffer, Universidad Nacional Autónoma de México, MEXICO.

Sorption of Flue Gas Mixture on South African Bituminous and Anthracite Coals under Feeds of Supercritical Conditions: CO₂ Sequestration Study, Major Mabuza, Kasturie Premllal, Maurice Onyango, Tshwane University of Technology; Michael O. Daramola, University of the Witwatersrand, SOUTH AFRICA.

SESSION 32

POWER PLANTS - GENERAL

Thomas Sarkus and Ting Wang

Performance of Ion Selective Electrodes (ISE) on Wastewaters from Power Plants, Jay Wilhelm, Kyle McGaughy, Toufiq Reza, Ohio University, USA.

Theoretical Modeling For Thermophoretic Ash Deposition Ash In Gas-To-Gas Heater, Sandeep Aryal, Kwangkook Jeong, Arkansas State University, USA; Jedal Lee, Doosan Heavy Industries & Construction Co., LTD, SOUTH KOREA.

Opportunities for Existing Coal Infrastructure, Angelos Kokkinos, DOE; Peter Rozelle, Churnside Technology Management, LLC; John Rockey, Advanced Combustion Systems; John Wimer, DOE / NETL, USA.

MRC DICE: Flexible, Efficient, Low Emissions Power from Coal, Daniel Roberts, Louis Wibberley, CSIRO Energy, AUSTRALIA.

SESSION 33

COAL ASH MANAGEMENT - 6

Tarunjit Butalia and Pamela Dugan

Project Delivery Method Selection: A Prescription for Success in CCR Construction, Dale W. Evans, Kathleen Whysner, Remedial Construction Services, L.P., USA.

Theoretical Modeling for Thermophoretic Ash Deposition, Sandeep Aryal, Kwangkook Jeong, Arkansas State University, USA.

Using a Tufted Geosynthetic Final Closure System to Effectively Close Ash Impoundments & Landfills, Chris Eichelberger, Agru America; Paul O'Malley, Jose Urrutia, Watershed Geosynthetics; Don DiGuilio, Agru America, USA.

Coal Ashes As a Valuable Commodity For Fixation of Toxic Wastes, Haim Cohen, Ariel University and Ben-Gurion University of the Negev, ISRAEL; Roy Nir Lieberman, Institute of Environmental Assessment and Waster Research ((ID/EA) Consejo Superior de Investigaciones Cientificas (CSIC), SPAIN; Yaniv Knop, Ariel University, ISRAEL.

SESSION 34

VALUE-ADDED PRODUCTS FROM COAL - 1

John Duddy and Joseph Bittinger

Anode Coke from Low Ash Coal, Matthew Weisenberger, Rodney Andrews, John

TECHNICAL PROGRAM

Craddock, Terry Rantell, David Whitlow, John Wiseman, James C. Hower, University of Kentucky, USA.

Carbon Fiber from Coal Tar Pitch, Matthew Weisenberger, Rodney Andrews, David Eaton, Nik Hochstrasser, Aaron Owen, Ashley Morris, University of Kentucky, USA.

Production of High-Quality Precursor Feedstocks from Coal, Donald W. Collins, Western Research Institute; Alan Bland, Ash Management Engineering, Inc.; Charles A. Atkins, Ramaco Carbon LLC; Garrett W. Lindemann, USA.

Understanding The Chemical Composition of Coal Oils, Tars and Pitches, Donald W. Collins, Jeramie J. Adams, Jean-Pascal Planche, Western Research Institute; Charles A. Atkins, Ramaco Carbon LLC, USA.

SESSION 35

GASIFICATION TECHNOLOGIES - MODELING I

Robert Kornosky and Massood Ramezan

CFD-Simulation of a Fluidized Bed Coal Gasifier Under Reactive Conditions using a Two-Fluid-Model, Andreas Richter, Philip.Roessger, TU Bergakademie Freiberg, GERMANY; Petr Nikrityuk, University of Alberta, CANADA.

Towards a Validated CFD Setup for a Range of Fluidized Beds, Lukas Porter, Alexander Laugwitz, Andreas Richter, Bernd Meyer, Technische Universität Bergakademie Freiberg, GERMANY.

DOE/NETL Multiphase Flow Science Impact and Benefits Analysis for Gasification Applications and Beyond, Madhava Syamlal, Chris Gunther, William Rogers, DOE / NETL; Christopher Munson, Massood Ramezan KeyLogic Systems, USA.

SESSION 36

COAL BED AND SHALE GAS - 1

Evan Granite and Henry Pennline

Coal mine and Coalbed Methane Development in India, Joseph Beninati, Jonathan Kelafant, Advanced Resources International, Inc; Felicia Ruiz, EPA, USA.

Opportunities for Methane Recovery and Use from Abandoned Underground Coal Mines, Michael Cote, Ruby Canyon Engineering; Felicia Ruiz, EPA, USA.

ORAL SESSIONS

Friday, September 8

10:50 - 12:30

SESSION 37

SUSTAINABILITY AND ENVIRONMENT

Evan Granite and Felicia Ruiz

Potential Remedial Options For a Site With Groundwater Adversely Affected by Coal Combustion Residuals, Bob Kleinmann, HDR, USA.

Sustainable Reuse of Lime Sludge from Water Utilities as an Environmental Sorbent in Power Utilities, Hafiz Salih, Jiaying Li, Craig Patterson, Seyed A. Dastgheib, Illinois State Geological Survey, USA.

Hydrothermal Gasification Reaction of Phenol Water With Fe and Co Catalyst Supported on Carbon-Oxide Composite Carrier, Atsushi Ishihara, Yusuke Hirai, Tadanori Hashimoto, Hiroyuki Nasu, Mie University, JAPAN.

Vortex-Induced Vibration and Energy Harvesting of Two Staggered Circular Cylinders with Passive Turbulence Control, Lin Ding, Qianyun Ye, Li Zhang, Zhongqing Yang, Chongqing University, CHINA.

How to Overcome the Limitations Inherent in Sustainable Development, Dai-Yeun Jeong, Asia Climate Change Education Center, SOUTH KOREA.

SESSION 38

GASIFICATION TECHNOLOGIES - MODELING -2

Aleksander Sobolewski and Van Bush

Comparison of Different Modeling Approaches of Coal Pyrolysis for Improved Configurations in a CFD Framework for Entrained Flow Gasification, Thomas Förster, Kevin Günther, Mathias Hartwich, Michele Vascellari, Andreas Richter, Bernd Meyer, TU Bergakademie Freiberg, GERMANY.

Some Critical Improvements in Modeling The Kinetics Of K₂co₃-Catalyzed and Steam-Pressurized Gasification of Ash-Free Coal Char, Xuanta Wu, Jie Wang, Key Laboratory of Coal Gasification and Energy Chemical Engineering of Ministry of Education, East China University of Science and Technology, CHINA.

Modeling of Cavity Growth in Underground Coal Gasification, Sreeja Narayanan, Preeti

Aghalayam, Indian Institute of Technology, INDIA.

SESSION 39

COAL MINING AND BENEFICIATION

Joseph Bittinger and Ishinara Atsushi

Blast Design in Accordance With The Safe Vibration Limits in The Coal Production Close to Settlements - A Case Study, Tugce Ongen, Gurcan Konak, Dogan Karakus, Ahmet Hakan Onur, Gokhan Turan, Dokuz Eylul University, TURKEY.

Influence of Gas Compressibility on an Accidental Methane/Air/Coal Dust Fire Scenario in a Coalmine Passage, Elizabeth Ridgeway, Sinan Demir, V'yacheslav Akkerman, West Virginia University, USA.

SESSION 40

VALUE-ADDED PRODUCTS FROM COAL - 2

Johan Van Dyk and John Duddy

Thin Films of Solution Processed Coal Nanoparticles for Electronic Devices, Nicola Ferralis, Jeffrey C. Grossman, Massachusetts Institute of Technology, USA.

Spectroscopic Diagnostics and Material Characterization for Wave Liquefaction™ Processing of Carbon Materials for the Production of Value-Added Chemicals and Feedstocks, Randy Vander Wal, Arupnananda Sengupta, Penn State University; George Skoptsov, James Strohm, H Quest Vanguard, Inc, USA.

Mechanical Properties of Coal-Plastic Composites with Varying Filler and Coupling Agent Content, Ravinder K Garlapalli, Lakin Phillips, Keerti Kappagantula, Jason P. Trembly, Ohio University, USA.

Downhole Flexible-Fuel Gasification, Craig Pichach, CleanCarbon Energy Corporation; Donald W. Collins, Western Research Institute, USA.

SESSION 41

GASIFICATION TECHNOLOGIES - CO-GASIFICATION

Francis Lau and Massood Ramezan

Kinetic Study On Co-Gasification of Coal-Biomass Blended Char in an Atmosphere Containing H₂O, CO₂, H₂, and CO: Inhibition and Competition, Massoud Massoudi Farid, TU Bergakademie Freiberg, GERMANY; Jungho Hwang, Yonsei University, SOUTH KOREA.

Gasification Reactivity of Coal Char in gasification Syngas at High Temperature, Yifei Wang, Longchu Zhu, Jilin Li, Fuchen Wang,

TECHNICAL PROGRAM

Fuchen Wang, East China University of Science and Technology, CHINA.

SESSION 42

COAL BED AND SHALE GAS - 2

Ting Wang and Andreas Ritscher

Catalytic Combustion of Low Concentration Methane over Supported Bimetallic Cu-Ni Catalysts, Zhongqing Yang, Yu Chen, Li Zhang, Lin Ding, Chongqing University, CHINA.

POSTER SESSIONS

Thursday, September 7

18:00 - 21:00

GASIFICATION TECHNOLOGIES

Characterization of Solid Products of Co-gasification of Coal and Bio-oil, Ping Feng, Hongxiang Xu, Zhiqiang Xu, China University of Mining & Technology, CHINA.

Characterization of the Flowability of Biomass-Coal Blended Powders, Guiling Xu, Menghui Li, Ping Lu, Nanjing Normal University, CHINA

Study On Co-Pyrolysis Impact On Co-Gasification Reactivity of Biomass and Coal Blended Char and Synergy Behavior During Co-Gasification, Xia Liu, Juntao Wei, Yifei Wang, Guangsuo Yu, East China University of Science and Technology, CHINA.

COMBUSTION TECHNOLOGIES

Formation Characteristics of Aerosol Particle in Wet Ammonia Desulfurization Process, Jingjing Bao, Licheng Sun, Guo Xie, Jiguo Tang, Sichuan University, CHINA.

CLEAN COAL AND GAS TO FUELS

Mesoporous ZSM-5 Supported Ni-Mo Catalysts for Hydrodenitrogenation of N-heterocyclic Compounds, Juan Liu, Wenying Li, Xiang Gao, Zhongyang Luo, Taiyuan University of Technology, CHINA

Modular Reactors and Process Intensification for Gas-To-Liquid Applications, Fabiana Arias Pinto, Omar M. Basha, Badie Morsi, University of Pittsburgh, USA.

Stable Supported and Non-Supported Catalysts for Methanol Synthesis from Carbon Dioxide, Mauro Mureddu, Francesca Ferrara, Sotacarbo S.p.A; Elisabetta Rombi, Università di Cagliari; Alberto Pettinau, Sotacarbo S.p.A, ITALY.

CARBON MANAGEMENT

Continuously Looping Physical Solvent CO₂ Capture Test Facility at NETL, Omar Basha, ORISE/U.S. DOE/NETL; Isaac Gamwo, David Hopkinson, Nicholas Siefert, NETL, USA, Badie Morsi, University of Pittsburgh, USA.

Oxygen Enrichment in Ultra-Supercritical Coal-Fired Plants for CO₂-Free Power Generation: A Techno-Economic Assessment, Alessandro Orsini, Alberto Pettinau, Francesca Ferrara, Andrea Porcu, Sotacarbo S.p.A; Vittorio Tola, Giorgio Cau, University of Cagliari, ITALY.

COAL SCIENCE

Effect of Apparent Viscosity On the Fluidization and Separation Characteristics in an Air Dense Medium Fluidized Bed, Xueshuai Zhu, Lubin Wei, China University of Mining & Technology, CHINA.

Metallurgical Coal of the United States: GIS Files of Modern and Historical Mining Locations and Geochemical, Rheological, and Petrological Data from Modern Samples, Michael Trippi, Leslie Ruppert, U.S. Geological Survey; Cortland F. Eble, Kentucky Geological Survey; James C. Hower, University of Kentucky, USA.

COAL MINING AND BENEFICIATION

Influence of Gas Compressibility on an Accidental Methane/Air/Coal Dust Fire Scenario in a Coalmine Passage, Elizabeth Ridgeway, Sinan Demir, V'yacheslav Akkerman, West Virginia University, USA.

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