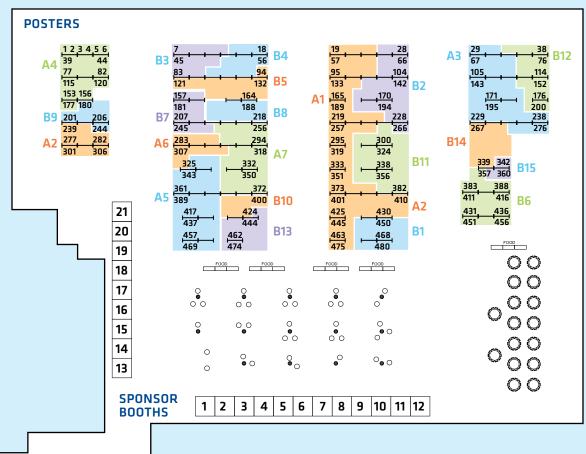


# GHGT9 Exhibit Hall Posters and Sponsor Booths

9th International Conference on Greenhouse Gas Control Technologies

Washington, D.C. 16-20 November 2008

#### **EXHIBIT HALL**



To Ballroom

Ambassador Ballroom and Bird Cage Walk

Elevator

To Diplomat Room

**THE EXHIBIT HALL** will house the posters and the sponsors' booths. It will be open as follows:

 Monday, November 17
 7:30 am - 12:30 pm | 2:30 - 6:30 pm

 Tuesday, November 18
 7:30 am - 12:15 pm | 2:15 - 6:00 pm

 Wednesday, November 19
 7:30 am - 12:15 pm | 2:15 - 5:45 pm

Thursday, November 20 7:30 am – 12:00 noon

Continental breakfast will be served each day in the Exhibit Hall from 7:30–8:30 am

The Exhibit Hall will host the poster reception beginning at 4:15 pm on Monday, November 17

All breaks will be served in the Exhibit Hall (breaks will also be available in the Bird Cage Walk)

# Sponsor Booths and Poster Sessions at a Glance

#### **Sponsor Booths**

Booth Number		Booth Number		
1	Air Products	13	Schlumberger Carbon Services	
2	Alstom	14	Shell	
3	Battelle	15	Siemens Energy	
4	ВР	16	StatoilHydro ASA	
5	Chevron	17	Total SA	
6	ExxonMobil	18 + 19	US Department of Energy	
7	GE Energy	20	Mitsubishi Heavy Industries Ltd	
8	Government of Alberta	21	CCS Norway	
9+10	IEA Greenhouse Gas R&D Programme			
11	Masdar – Abu Dhabi			
12	MIT Energy Initiative			

#### **Poster Sessions**

#### **POSTER SESSION A**

Monday 4.30pm - 5:30pm Tuesday 7:30am - 8:30 am

A1 Capture: Post Combustion

A2 Transporting CO2

A3 Integrated Systems

**A4** Geologic Storage: Capacity and Regional

Assessments

**A5** Geologic Storage: Trapping Mechanisms

and Long-Term Fate

A6 Geologic Storage: Well Bore Integrity

A7 Geologic Storage: Monitoring

#### **POSTER SESSION B**

Monday 5:30pm - 6:30pm Wednesday 7:30am - 8:30 am

**B1** CO2 Capture Project

**B2** Capture

**B3** Capture: Pre-Combustion

**B4** Capture: Oxyfuel

**B5** Membranes

**B6** Geologic Storage

**B7** Geologic Storage: Site Characterization

**B8** Geologic Storage: Storage Engineering

**B9** Geologic Storage: Development of Modeling Tools

**B10** Geologic Storage: Environmental Impact

**B11** Geologic Storage: Risk Assessment and

Management

**B12** Policy

**B13** Training, Education, Outreach

**B14** Mineral Carbonization

**B15** Ocean Storage

### **Poster Session Details**

#### **Session A**

#### **A1** CAPTURE: POST COMBUSTION

19 CO2 Absorption by Low Concentration Ammonia Liquor Je Young Kim, (RIST)

### 20 Retrofitting Coal Fired Power Plants using Low Cost Solvent Technology

Minh Ho, (University of New South Wales); Guy Allinson, Dianne Wiley

#### 57 Electrochemical CO2 Capture and Storage with Hydrogen Generation

Greg Rau, (University of California Santa Cruz)

**58** Solubility of N20 in Aqueous Monoethanolamine and **2–(2–Aminoethyl–amino) ethanol Solutions from 298K to 343K** Sholeh Ma'mun, (Norwegian University of Science and Technology); Hallvard Svendsen

### 59 Kinetics of Primary and Secondary Amine Group in Aqueous Solution of Diethylenetriamine (DETA) with Carbon Dioxide

Ardi Hartono, (NTNU); Hallvard F Svendsen

#### 60 Templated Polymeric Materials as Adsorbents for the Postcombustion Capture of CO2

Trevor Drage, (University of Nottingham); Cova Pevida, Colin Snape

#### 61 Developing Strategies for the Regeneration of Polyethylenimine based CO<sub>2</sub> Adsorbents

Trevor Drage, (University of Nottingham); Karl Smith, Ana Arenillas, Colin Snape

#### **62** Development of Solid Adsorbent Technologies for Postcombustion CO<sub>2</sub> Capture

Trevor Drage, (University of Nottingham); Colin Snape

# 95 Post Combustion Carbon Capture — Laboratory Studies of Monoethanolamine (MEA) and Alternative Solvent Systems for Cost Reduction

Raymond Davy, (RMIT University)

# 96 CO2 Capture from Flue Gas of Power Plants Running with Natural Gas (NGCC) and Pulverized Coal (PC): Assessment of a New Chemical Solvent based on Aqueous Blends of N-methyldiethanolamine and Triethylene Tetramine

Chakib Bouallou, (Centre Energétique et Procédés); Jean-Marc Amann

### 97 Use of CFD for CO2 Absorbers Optimum Design: from Local Scale to Large Industrial Scale

Ludovic Raynal, (IFP); Fares Ben Rayana, Yacine Haroun, Aude Royon-LeBeaud

#### **98 CO2 Capture by Blended Alkanolamines in a Rotating Packed Bed** Chung-Sung Tan, (National Tsing Hua University); Hsu-Hsiang Cheng

**99** Absorption of Carbon Dioxide in Aqueous Ammonia/Ethanol Shujuan Wang, (Tsinghua University); Jinzhao Liu, Bo Zhao, Huiling Tong, Changhe Chen

### 100 Vapour Liquid Equilibria Data for a Range of New Carbon Dioxide Absorbents

Graeme Puxty, (CSIRO Energy Technology); Andrew Allport, Moetaz Attalia

### 133 CO2 Capture by Aqueous Amines and Aqueous Ammonia – A Comparison

Narendra Dave, (CSIRO Energy Technology); Thong Do, Allport Andrew, Puxty Graeme, Paul Feron, Attala Moetaz

### 134 A Carbon-13 NMR Study of Carbon Dioxide Absorption and Desorption with Aqueous Amine Solutions

Qi Yang, (CSIRO Australia); Abdelselam Ali, Mark Bown, Moetaz Attalla

### 135 A Rigorous Thermodynamic Model for CO2-H2O-alkanolamine Systems

Erik Troøien Hessen, (NTNU); Hallvard F Svendsen

#### 136 Amino Acid Salts as Potential Solvents for CO2 Capture from Flue Gases

Magdalena E. Majchrowicz, (Twente University); D.W.F. (Wim) Brilman, Michiel J. Groeneveld

# 165 In situ Fourier Transform-Infrared (FT-IR) Analysis of Carbon Dioxide Absorption and Desorption in Aqueous Ammonia and Amine Solutions

Moetaz Attalla, (CSIRO Energy Technology); Graeme Puxtry, Andrew Allport

#### 166 Calculation Method for Predicting Thermal Energy Required for CO2 Recovery Plant

Yasuyuki Yagi, (Kansai Electric Power Co.); Tomio Mimura, Hiroshi Tanaka, Tsuyoshi Ohishi

#### 189 Kinetics of Carbonate based CO2 Capture Systems

Hanna Knuutila, (NTNU); Hallvard F Svendsen, Olav Juliussen

#### 190 Solvent Selection for Carbon Dioxide Capture

Ugochukwu E Aronu, (Norwegian University of Science and Technology); Hallvard F Svendsen, Karl A Hoff, Olav Juliussen

#### 219 Thermochemical Models and Analyses for the Carbon Capture with the Chilled Ammonia Process (CAP)

Gianluca Valenti, (Politecnico di Milano — Dipartimento di Energia); Davide Bonalumi. Ennio Macchi

#### 220 NanoGLOWA

Paul Raats, (KEMA Nederland BV); Theo Bosma, Arthur Stam

#### 221 Evaluation Method of Novel Absorbent for CO2 Capture

Kazuya Goto, (RITE); Hiromichi Okabe, Shinkichi Shimizu, Masami Onoda, Yuichi Fujioka

#### 222 Coal-fired Power Plants with Calcium Oxide Carbonation for Post-Combustion CO<sub>2</sub> Capture

Matteo Romano, (Politecnico di Milano)

### 223 A Comparison of Two Approaches for Preparing Effective CO2 Capture Adsorbents

Covadonga Pevida Garcia, (INCAR-CSIC)

# **224** Effect of Flue Gas Impurities on CO2 Capture Performance from Flue Gas at Coal-fired Power Stations by Vacuum Swing Adsorption Jun Zhang, (Monash University); Penny Xiao, Gang Li, Paul Webley

**225** Competition of CO2/H2O in Adsorption Based CO2 Capture Gang Li, (Monash University); Penny Xiao, Jun Zhang, Ranjeet Singh, Paul Webley

#### 258 Mass Transfer in a Small Scale Post-Combustion Flue Gas Absorber, Experiment and Modeling

Patrick JG Huttenhuis, (Procede Gas Treating); Edwin P van Elk, Geert F Versteeg

### 259 CO2 Capture by Dry Sorbents in a Pressurized Fluidized Bed System

Adina Bosoaga, (Cranfield University); Ondrej Masek, John Oakey

#### 260 Liquid Distribution of MEA in Random and Structured Packing in a Square Column

Stephen James Marcia, (University of Regina); David deMontigny, Paitoon Tontiwachwuthikul

### **261** Absorption and Desorption Rates of Carbon Dioxide with Monoethanolamine and Piperazine

Ross Dugas, (University of Texas at Austin); Gary Rochelle

#### **262** CO2 Binding Organic Liquids (CO2BOLs) for Post-Combustion Capture

David Heldebrant, (Pacific Northwest National Laboratory); Clement Yonker

#### 295 Solvent Reclaiming by Crystallization of Potassium

Sul Qing Xu, (University of Texas at Austin); Gary Rochelle

#### 296 Dissociation Constants and Thermodynamic Properties of Amines

Espen Steinseth Hamborg, (Procede Gas Treating B.V.); Geert Versteeg

# **320** Electric Swing Adsorption as Emerging CO<sub>2</sub> Capture Technique Carlos Grande, (LSRE – Laboratory of Separation and Reaction

Engineering); Rui Ribeiro, Alirio Rodrigues

# 333 Long-Term Operation of Carbon Dioxide Capture System from a Real Coal-Fired Flue Gas using Dry Regenerable Potassium-based Sorbents

Young Cheol Park, (Korea Institute of Energy Research); Sung-Ho Jo, Chong Kul Ryu, Chang-Keun Yi

#### 334 Development of Novel Tertiary Amine Absorbents for CO2 Capture

Firoz Alam Chowdhury, (Research Institute of Innovative Technology for the Earth); Hiromichi Okabe, Shinkichi Shimizu, Masami Onoda, Yuichi Fujioka

### **351 Biotechnological Approaches to Postcombustion CO2 Capture** Victoria Haritos, (CSIRO); Meihong Su, Greg Dojchinov

### 352 Solubility of CO2 in Aqueous Solution of Newly Developed Absorbents

Prachi Singh, (Twente University); D.W.F. Brilman, M J Groeneveld

### 373 Comparison of Cu-BTC and Zeolite 13X for Adsorbent Based CO2 Separation

Zhijian Liang, (CRC for Greenhouse Gas Technologies); Marc Marshall, Alan L Chaffee

#### 374 Modelling Gas Adsorption in Metal Organic Frameworks

Brad A Wells, (CRC for Greenhouse Gas Technologies); Alan L Chaffee

#### 376 Separation and Recovery of Carbon Dioxide by a Membrane Flash Process

Kazuhiro Okabe, (RITE); Satoshi Kodama, Hiroshi Mano, Yuichi Fujioka

### 377 A Simulation Study of Alternative Process Configurations for a CO2 Absorption Plant using CO2SIM

Finn Andrew Tobiesen, (SINTEF Materials and Chemistry); Carlos Dorao, Hallvard F Svendsen

### 378 Analysis of Retrofitting Coal-fired Power Plants for Carbon Dioxide Capture

Oezguer Korkmaz, (University of Duisburg-EssenLUAT); Gerd Oeljeklaus, Klaus Görner

### **401** Study on a Coal-Fired Power Plant with CO2 Flue Gas Scrubbing Elizabeth Heischkamp, (University of Duisburg-EssenLUAT); Özgür

#### **403** Environmental Impact of Amines

Ingvild Eide-Haugmo, (Norwegian University of Science and Technology); Hallvard Svendsen, Odd Gunnar Brakstad, Karl Anders Hoff, Kristin Rist Sørheim, Eirik da Silva

#### 404 CO2 Capture from Flue Gas Using Dry Regenerable Sorbents

Chong Kul Ryu, (Korea Electric Power Research Institute); Joong Beom Lee, Jeom-In Baek, Tae Hyeong Eom, Ji Hyun Lee, Won Sik Jeon

#### 405 The Dry Carbonate Process: Carbon Dioxide Recovery from Power Plant Flue Gas

Thomas Nelson, (RTI International); Luke Coleman, David Green, Raghubir Gupta, Jose Figueroa

#### 406 Development of a Commercially-Viable Regenerable Solvent Absorption Technology for Coal-Fired Power Plants

George Farthing, (Babcock & Wilcox Power Generation Group); Purusha Bonnin, Stephanie Miksche, Lisa Rimpf, Ruyu Zhang, Kevin McCauley

#### 407 Feasibility Study on the Carbonate Looping Process for Post-Combustion CO<sub>2</sub> Capture from Coal-Fired Power Plants

Jochen Ströhle, (Technische Universität Darmstadt); Alexander Galloy, Bernd Epple

### 408 Techno-Economic Evaluation of a Power Plant with CO<sub>2</sub> Capture and Storage Considering Part-Load Performance

Colin Alie, (University of Waterloo)

# 409 Amines Immobilized on a Solid Support for Postcombustion CO2 Capture — A Preliminary Analysis of the Performance in VSA or TSA Process based on the Adsorption Isotherms and Kinetic Data

Gerhard Pirngruber, (IFP-Lyon); Michele Maricar-Pichon, Jean-Pierre Courcy, Alexandra Chaumonnot, Sylvain Louret

### 410 Simplified Solvent Equilibrium Modelling using both Equilibrium and Calorimetric Measurements for Post Combustion Capture

Thor Mejdell, (SINTEF Materials and Chemistry); Karl Anders Hoff, Inna Kim, Hallvard F Svendsen

**425** Novel Adsorption Process for Post-Combustion CO<sub>2</sub> Capture Ravi Jain, (InnoSepra LLC)

### 426 Comparison of Solvents for Post-Combustion Capture of CO<sub>2</sub> by Chemical Absorption

Anusha Kothandaraman, (Massachusetts Institute of Technology); Lars Nord, Olav Bolland, Howard Herzog, Gregory McRae

### **427 Highly Efficient Absorbents for Post-combustion CO2 Capture** Jae-Goo Shim, (Korea Electric Power Research Institute)

# 428 Post-Combustion CO2-Capture in Coal-fired Power Plants: Comparison of Integrated Chemical Absorption Processes with Piperazine Promoted Potassium Carbonate and MEA

Jochen Oexmann, (Hamburg University of Technology); Alfons Kather

### **429** Enabling Post Combustion Capture Optimization – The Pilot Plant Project at Niederaussem

Peter Moser, (RWE Power AG); Sandra Schmidt, Georg Sieder, Hugo Garcia, Ilaria Ciattaglia, Harald Klein

### 430 CO2 Chemical Absorption by using Membrane Vacuum Regeneration Technology

Mengxiang Fang, (Zhejiang University); Zhongyang Luo, Shuiping Yan, Kefa Cen

#### 445 Simulation of the Carbonate Looping Power Cycle

Paula Galindo Cifre, (University of Stuttgart); Craig Hawthorne, M Troßmann, Günter Scheffknecht

### 446 Cost Effective Post-combustion CO2 Capture from Industrial Combined Heat and Power Plants in 2020

Takeshi Kuramochi, (Utrecht University); André Faaij, Andrea Ramírez, Wim Turkenburg

#### 463 CO2 Capture Pilot Test at a Pressurized Coal Fired CHP Plant

Mårten Bryngelsson, (KTH School of Chemical Science and Engineering Sweden); Mats Westermark

### 464 Capture-Ready Supercritical Coal-fired Power Plants and Flexible Post-combustion CO<sub>2</sub> Capture

Mathieu Lucquiaud, (Imperial College London); Hannah Chalmers, Jon Gibbins, Niall MacDowell

#### 475 Simulation of Absorption Processes for CO2 Capture

Jian Chen, (State Key Laboratory of Chemical Engineering); Liwei Zhao, Lihu Dong, Guanghua Gao

#### 476 Can We Improve Upon MEA as a Solvent for CO2 Capture?

Eirik F da Silva, (SINTEF Materials and Chemistry); Karl Hoff, Hallvard F Svendsen

#### **A2** TRANSPORTING CO2

**239** An Assessment of CO2 Transportation Cost from the Power Plants to Geological Formations Suitable for Storage in North Greece Nikolaos Koukouzas, (Centre for Research and Technology Hellas); loannis Typou

#### 240 Options for Transporting CO2 from Coal Fired Power Plants in Denmark

Hans Aksel Haugen, (Tel-Tek); Nils Henrik Eldrup, Christian Bernstone, Stefan Liljemark, Marius Noer, John Holland, Per Arne Nilsson, Georg Hegerland, John O Pande

### 241 Experiments and Modelling of Two-phase Transient Flow during CO<sub>2</sub> Pipeline Depressurization

Gelein De Koeijer, (StatoilHydro ASA); Jan Henrik Borch, Jana Jakobsen, Michael Drescher

# 242 CFD and Gaussian Atmospheric Dispersion Models: A Comparison within Leakages from Carbon Dioxide Transportation and Storage Facilities

Alberto Mazzoldi, (University of Nottingham); Tim Hill, Jeremy Colls

**277** Transmission of CO2 in Submarine and Onshore Pipelines Frøydis Eldevik, (Det Norske Veritas)

#### 279 The Impact of Uncertainties in the Quantitative Risk Assessment of CO2 Pipelines

Joris Maarten Koornneef, (Utrecht University); Mark Spruijt, Menzo Molag, Andre Faaij, Wim Turkenburg

#### 281 Economic Modelling of CO2 Integrated Pipeline Network for Enhanced Oil Recovery and Geologic Sequestration in the Texas Gulf Region

Joseph Essandoh-Yeddu, (Gulf Coast Carbon Center); Gürcan Gülen

#### 282 A Scalable Infrastructure Model for Carbon Capture and Storage: simCCS

Richard Middleton, (Oak Ridge National Laboratory); Jeffrey Bielicki

**301** Algorithm to Create a CCS Lowest Cost Pipeline Network Chris Hendriks, (Ecofys); Ruut Brandsma, Filip Neele

**302** Economics of Transporting CO2 for Long Term Geological Storage Francis Smart, (Montana State University); John Antle, Susan Capalbo

### 304 A Cost and Energy Efficient Concept for Combined Production and Transport of LNG and LCO2

Audun Aspelund, (NTNU); Truls Gundersen

### 305 Thermodynamic Behaviour of the CO2+SO2 Mixture: Experimental and Monte Carlo Simulation Studies

Veronique Lachet, (IFP); Theodorus De Bruin, Philippe Ungerer, Vladimir Hasanov, Frederick Lockwood, Dominique Richon, Christophe Coquelet, Alain Valtz

#### 306 Thermo- and Fluid-dynamical Modelling of Two-phase Multicomponent Carbon Dioxide Mixtures

Svend Tollak Munkejord, (SINTEF Energy Research); Jana P Jakobsen, Anders Austegard, Mona J Mølnvikn

#### **A3** INTEGRATED SYSTEMS

#### 29 Environmental Impacts of a German CCS Strategy

Petra Zapp, (Forschungszentrum Jülich, IEF-STE); Peter Markewitz, Stefan Vögele, Andrea Schreiber

### 30 Life Cycle Modelling of Fossil Fuel Power Generation with Post Combustion CO2 Capture

Anna Korre, (Imperial College London); Zhenggang Nie, Sevket Durucan

31 Comparison of Life Cycle GHG Emissions and Non Renewable Energy Consumption of Several Combined Electricity and Hydrogen Production Pathways with CO2 Capture and Storage: Selection of Technologies with Natural Gas, Coal and Lignite as Fuel for the Europea

Frédérique Bouvart, (IFP); Anne Proeur

# 67 CAPRICE Project – Engineering Study on the Integration of Post Combustion Capture Technology into the Power Plant Gas Path and Heat Cycle

Nick Booth, (E.ON Engineering Ltd); Jonas Alin, Dick Adams, David deMontigny, Teerawat Sanpasertparnich, Shujuan Wang, Richard Drew, Ole Biede, Mogens Laursen

### 68 Process Integration Analysis of a Brown Coal-fired Power Station with CO2 Capture and Storage and Lignite Drying

Trent Harkin, (CO2CRC)

#### 69 Simulation and Optimization of Coal-Fired Power Plants

Adisorn Aroonwilas, (University of Regina); Teerawat Sanpasertparnich

# 70 Towards Large-scale Co-production of Electricity and Hydrogen via Decarbonisation of Fossil Fuels Combined with CCS (Geological Storage)

Jens Hetland, (SINTEF Energy Research); Nils Anders Rokke, Petter Rokke, Yann Le Gallo, David J Evans, Charles Eickhoff, Clemens Cremer

#### 71 Driving Carbon Capture and Storage Forward in China

Hengwei Liu (Harvard University); Kelly Sims Gallagher

### 72 High Temperature Behavior of NiO-based Oxygen Carriers for Chemical Looping Combustion

Rein Kuusik, (Tallinn University of Technology); Andres Trikkel, Anders Lyngfelt, Tobias Mattisson

#### 105 ECCO - European Value Chain for CO2

Petter E Røkke (SINTEF Energy Research); Jana P Jakobsen, Grethe Tangen. Mona I Mølnvik

### 106 Carbon Mitigation in the Indian Coal-power Sector: Options and Recommendations

Ananth Chikkatur, (Harvard University); Ambuj Sagar

#### 107 BIGCO2 R&D Platform — Closing the Knowledge Gaps of the CO2 Chain

Grethe Tangen, (SINTEF Energy Research); Mona J Mølnvik, Nils A Røkke

# **108** CCS for Germany: Policy, R&D and Demonstration Activities Jürgen-Friedrich Hake, (Forschungszentrum Jülich); Hubert H. Höwener, Jochen Seier

# 109 CPER Artenay Project: Investigation of Economical and Technical Feasibility of the Capture and Storage of CO2 Issued from Bio-fuel Power Plant. Part I: Techno-economical Determination of the Optimal Location to Inject the CO2

Antonin Fabbri, (BRGM); Didier Bonijoly, Xavier Galiègue, Lionel Mercury

# 110 Pathways from Laboratory to Full Scale Carbon Capture — Technology Demonstrations in Plant Settings Barry Hooper (CO2CRC); Abdul Qader

### 143 The CO<sub>2</sub> Pilot at Lacq: An Integrated Oxycombustion CO<sub>2</sub> capture and Geological Storage Project in the South West of France

Nicolas Aimard (Total E&P); Marc Lescanne, Gérard Mouronval, Claude Prebende, Jérémie Saint-Marc, Sylvain Thibeau

### 144 Heartland Redwater Leduc Reef Saline Aquifer CO2 Capture and Geological Storage Project

William Gunter (Alberta Research Council); Stefan Bachu, Dan Palombi, Brent Lakeman, William Sawchuk, Todd Cole

### 145 CO2 Capture Retrofit Options for a Gasification-based Integrated Bitumen Extraction and Upgrading Facility

Guillermo Ordorica-Garcia (Alberta Research Council); Sam Wong, John Faltinson, Surindar Singh

### 146 CO2 Storage in Marine Geological Structure: A Review of Latest Progress and its Application in Korea

Cheol Huh (MOERI/KORDI); Seong-Gil Kang

### 147 Integrated Economic Model for CO2 Capture, Transport, ECBM and Aquifer Injection

John Faltinson (Alberta Research Council); Bill Gunter, Doug Macdonald, Stefan Bachu, Andre Lytviak, Bruce Kohse, Boyd Russell

#### 148 Reducing CO2 Emissions from the European Power Generation Sector – Scenarios to 2030

Evangelos Tzimas (European Commission, JRC, Institute for Energy); Aliki Georgakaki, Stathis Peteves

### 171 Coal Energy Conversion with Carbon Sequestration via Combustion in Supercritical Saline Aquifer Water

John Heberle (Stanford University); Chris Edwards

#### 172 Modeling Zero Emission Coal Plants

Xinxin Li (Columbia University)

### 173 Techno Economic Evaluation of Coal-based Integrated Gasification Combined Cycle with CO2 Capture and Storage Technologies

Ryo Nagumo (RITE); Shingo Kazama, Yuichi Fujioka

### 174 Evaluation of Membrane-based Post-combustion CO<sub>2</sub> Capture from an Advanced Natural Gas Combined Cycle

Matthias Finkenrath (General Electric); Tord Peter Ursin Matthew Lehar David Grainger Andrei Evulet

### 195 Comparative Study of Pre-, Post- and Oxy-combustion for CO2 Capture in the French Context

Mohamed Kanniche (EDF); René Gros-Bonnivard, Philippe Jaud, Jose Valle-Marcos

#### 196 CCS Potential under Different Policy Options

Chris Hendriks (Ecofys); Suzanne Vrijmoed, Monique Hoogwijk, Geert Verbong, Fred Lambert

#### 197 The Effect of High Oil Prices on EOR Project Economics

Sean McCoy (Carnegie Mellon University); Edward Rubin

### 198 CO2 EOR and CO2 Disposal — Economic and Capacity Potential in the North Sea for Continuous Injection and WAG

Torleif Holt (SINTEF Petroleum Research); Erik Lindeberg, Dag Wessle-Berg

#### 229 Intensity Target and CO2 Capture and Storage

Atsushi Kurosawa (The Institute of Applied Energy)

# 230 Ramp-up of CO2 Capture and Storage within Europe — Development of CO2 Transport and Storage Infrastructure in UK and Germany

Jan Kjärstad (Chalmers University of Technology); Filip Johnsson

#### 231 Role for Carbon Capture and Storage in China

Keith Burnard (AEA Energy & Environment); Wenying Chen

#### 232 Geocapacity: Economic Feasibility of CCS in Networked Systems Filip Noolo (TNO Coological Survey of the Netherlands). Chris Handriks

Filip Neele (TNO Geological Survey of the Netherlands); Chris Hendriks, Ruut Brandsma

#### 233 Low Cost Option for Co-Production of Hydrogen and Electricity in Hybrid Fossil Fuels Plant with CO2 Capture

Dimityr Popov (Technical University of Sofia)

### 234 Analysis of GHG Abatement Opportunities under America's Climate Security Act of 2007

Lisa Phares (National Energy Technology Laboratory); Joseph DiPietro, Christopher Nichols, Tyler Van Leeuwen

### 235 An improved Flowsheet Simulation Approach for Advanced CO2 Absorption Process Design and Optimization

Carlos Dorao (Norwegian University of Science and Technology); Andrew Tobiesen, Maria Fernandino

#### 236 Geologic Sequestration of Biological Sources of CO2

John Kadyszewski (Winrock International); Larry Myer, Dave Schnaars

### 238 A Multi-Period Optimization Model for Energy Planning with CO2 Emission Considerations

Tule Sirikitputtisak (University of Waterloo); Hamidreza Mirzaesmaeeli, Peter Douglas, Eric Croiset, Ali Elkamel, M Gupta

### 272 Impact Assessment of CO<sub>2</sub> Mitigation Options in Korea using Energy System Analysis Model

Seong Jegarl (KEPRI); Jeom-In Baek, Dong-Sik Jang, Chong-Kul Ryu

### 273 Co-production of Synfuels and Electricity from Coal+biomass with Zero Net Carbon Emissions: a Case Study Analysis for Illinois

Eric Larson (Princeton University)

#### 274 Fischer-Tropsch Fuels from Coal and Biomass

Eric Larson (Princeton University)

### 275 Techno-Economic Modelling of the Energy Systems: Development of Australian Reference Conditions for Technology Assessment

Lila Wanda Gurba (University of New South Wales/CRC for Greenhouse Gas Technologies); Frank van Schagen, Allen Lowe

### **276** The Impacts of CO<sub>2</sub> Capture on Transboundary Air Pollution in the Netherlands

Joris Maarten Koornneef (Utrecht University); Andrea Ramirez, Toon van Harmelen, Arjan van Horssen

#### **A4** Geologic Storage:

CAPACITY AND REGIONAL ASSESSMENTS

#### 1 Classification of CO2 Geologic Storage: Resource and Capacity

Scott Frailey, (Illinois State Geological Survey); Robert Finley

### **2** Methods for Estimating CO2 Storage in Saline Reservoirs Scott Frailey, (Illinois State Geological Survey)

#### 3 Estimation of CO<sub>2</sub> Aquifer Storage Potential in Japan

Toshihiro Takahashi, (JGI, Inc); Takashi Ohsumi, Kazuo Nakayama, Kazuo Koide, Hideaki Miida

### 4 The Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Developing Carbon Management Options for the Central Interior of North America

Edward Steadman, (Energy & Environmental Research Center)

### 5 Assessment of the All Island Potential for Geological Storage of Carbon Dioxide in Ireland

Michelle Sarah Bentham, (British Geological Survey); Karen Kirk, Andrew Chadwick, Deirdre Lewis, Nick O'Neill, David Hilditch, Karsten Michael, Guy Allinson, Tom Cleary, Richard Vernon

### 6 Assessing European Capacity for Geological Storage of Carbon Dioxide — the EU GeoCapacity Project

Thomas Vangkilde-Pedersen, (Geological Survey of Denmark and Greenland); Finn Dalhoff, Karen Lyng Anthonsen, Nikki Smith, Karen Kirk, Filip Neele, Bert van der Meer, Niels Peter Christensen

### 39 CO2 Storage Capacity of Deep Aquifers and Hydrocarbon Fields in Poland — EU GeoCapacity Project Results

Radoslaw Tarkowski, (Mineral and Energy, Economy Research Institute of Polish Academy of Sciences); Barbara Uliasz-Misiak, Adam Wojcicki

### 40 Comparative Evaluation of the CO2 Aquifer Storage Capacities across Regions: CO2 Aquifer Storage Capacity Assessment in Japan

Toyokazu Ogawa, (Taisei Corporation); Takumi Shidahara, Shigetaka Nakanishi, Takashi Yamamoto, Kazuyuki Yoneyama, Tadahiko Okumura, Tsutomu Hashimoto

# 41 Sensitivity Analysis of CO2 Migration in Deep Saline Aquifer of Ise Bay, Japan, Using Heterogeneous and Homogeneous 2D Models Based on Depositional Facies Analysis

Yuko Kawata, (Japan Oil Engineering Co, Ltd); Hiroshi Ohkuma, Satoru Yokoi, Shigetaka Nakanishi, Kazuyuki Yoneyama, Tsutomu Hashimoto

### 42 Evaluation of CO<sub>2</sub> Aquifer Storage Capacity in the Vicinity of a Large Emission Area in Japan: Case History of Osaka Bay

Tsutomu Hashimoto, (ENAA); Shin-ichi Hiramatsu, Takashi Yamamoto, Hitoshi Takano, Manabu Mizuno, Hideaki Miida

### 43 Synthesis of the Exploration of Formations with a Potential of CO2 Storage: Intermediate Depression and Madrid Basin

Isabel Suarez, (IGME); Miguel Angel Zapatero, Roberto Martínez, Alicia Arenillas

#### 44 Role of Pressure in Storage Integrity for Large Volume CO2

Timothy Meckel, (Gulf Coast Carbon Center – Texas Bureau of Economic Geology); Susan Hovorka, Ian Duncan, Jong-Wong Choi

### 77 Evaluation of Deccan Continental Flood Basalt Province, India for Environmentally Safe Sequestration of CO2

Charan Subramanian Nirmal, (National Geophysical Research Institute); Prasad Pinnelli Seetha Rama, Ravi Shekhar Singh, Archana Bhagawat Kaotekwar, Chavan Chakradhar

#### 78 The EU Geocapacity Project — Saline Aquifers Storage Capacity in Group South Countries

Roberto Martinez, (IGME); Isabel Suarez, Miguel Angel Zapatero, Bruno Saftic, Iva Kolenkovic, Marjeta Car, Sergio Persoglia, Federica Donda

#### 79 Carbon Capture and Storage in South Africa

Anthony David Surridge, (South African National Energy Research Institute); Martinus Cloete

### 80 Economic Dimensions of Geological CO2 Storage: An Assessment of Sub-Seafloor and Continental Sequestration Options

Susan Capalbo, (Oregon State University/LDEO); Dave Goldberg, Juerg Matter, Angela Slagle

### 81 Possibilities for Geological Storage and Mineral Trapping of Industrial CO2 Emissions in the Baltic Region

Alla Shogenova, (Tallinn University of Technology); Saulius Sliaupa, Kazbulat Shogenov, Rasa Sliaupiene, Raisa Pomeranceva, Rein Vaher, Rein Kuusik

### **82** 2008 Carbon Sequestration Atlas of the United States and Canada Andrea McNemar, (DOE/NETL); Dawn Deel, Sean Plasynski, John Litynski

# 115 GeoCapacity — the Coordinated Assessment of the Capacity for the Geological Storage of CO2 in Europe, NE Group of Countries Saulius Sliaupa, (Institute of Geology and Geography)

#### 116 Evaluating Storage and Leakage Scenarios for Carbon Dioxide Sequestration in Trinidad and Tobago

David Alexander, (University of Texas at Austin); Steven L Bryant

### 117 Carbon Dioxide Storage Options for the COACH Project in the Bohai Basin, China

Ceri Vincent, (British Geological Survey); Shifeng Dai, Wenying Chen, Rongshu Zeng, Guosheng Ding, Ruina Xu, Finn Dalhoff

#### 118 The Potential, Obstacles and Ways Ahead of CO2 Aquifer Storage in China

Xiaochun Li, (Chinese Academy of Sciences); Ning Wei, Zhiming Fang, Bing Bai

#### 119 CO2 Storage in Fractured Reservoirs

Koorosh Asghari, (University of Regina)

### 120 Review of CO2 Geological Storage Opportunities in the Gunnedah Basin, NSW, Australia

Lila Wanda Gurba, (CRC for Greenhouse Gas Technologies)

### 153 METSTOR: a GIS-based Method to Look for Potential Storage Zones in France

Didier Bonijoly, (BRGM); Alain Bonneville, Daniel Broseta, Aude Fradet, Vincent Lagneau, Yann Le Gallo, Aurélien Leynet, Minh Ha-Duong, Gilles Munier, Brigitte Nédélec

# 154 Wabamun Area CO2 Sequestration Project (WASP) A Comprehensive Assessment of CO2 Sequestration Suitability and Cost David Keith, (University of Calgary); Robert Lavoie

#### 155 Classification Assessment of Geologic Reservoirs in North America

John Litynski, (U.S.DOE National Energy Technology Laboratory); Sean Plasynski, Tim Carr, David Olsen

#### 156 CO2 Storage Capacity EStimates for Stacked Brine-Saturated Formations in the North Dakota Portion of the Williston Basin

James Sorensen, (Energy & Environmental Research Center); Steven Smith, Charles Gorecki, Terry Bailey, Wesley Peck, David Fischer, Edward Steadman, John Harju

# 177 A National Look at Carbon Capture and Storage – National Carbon Sequestration Database and Geographical Information System (NatCarb)

Timothy Carr, (West Virginia University); Asif Iqbal, Nick Callaghan, Dana Adkins-Heljeson, Kurt Look, Shawn Saving, Ken Nelson

#### **A5** GEOLOGIC STORAGE:

TRAPPING MECHANISMS AND LONG-TERM FATE

#### 326 Dependence of CO2-Brine Interfacial Tension on Aquifer Pressure, Temperature and Water Salinity

Stefan Bachu, (Energy Resources Conservation Board); Brant Bennion

### 328 History Matching of CO<sub>2</sub> Core Flooding CT Scan Saturation Profiles with Porosity Dependent Capillary Pressure

Ji Quan Shi, (Imperial College London); Ziqiu Xue, Durucan Sevket

### 343 The Fluid Flow Consequences of CO2 Migration from 1000 to 600 Meters with Passing of the Critical Conditions of CO2

Bert van der Meer, (TNO Built Environment and Geosciences); Cor Hofstee, Bogdan Orlic

#### 344 Long-Term Simulation of the Snøhvit CO2 Storage

Audrey Estublier, (IFP); Alf Lackner

### 345 Integrating Experiments and Modeling in the Assessment of Caprock Integrity

Olivier Bildstein, (CEA Cadarache); Michel Jullien, Anthony Crédoz

### 346 Microbially Enhanced Geologic Containment of Sequestered Supercritical CO2

Al Cunningham, (Center for Biofilm Engineering); Robin Gerlach, Lee Spangler, Andrew Mitchell

### 361 Geochemical CO2 Trapping in Open Aquifer Storage – the Tokyo Bay Model

Yasuko Okuyama, (Geological Survey of Japan, AIST); Munetake Sasaki, Shigetaka Nakanishi, Norifumi Todaka, Shuji Ajima

# 362 Reactive Transport Modeling of CO2 and SO2 Injection into Deep Saline Formations and their Effect on the Hydraulic Properties of Host Rocks

Bruce Sass, (Battelle); Diana Bacon

# 363 Predictions of Long-Term Behavior of a Large-Volume Pilot Test for CO2 Geological Storage in a Saline Formation in the Central Valley, California

Christine Doughty, (Lawrence Berkeley National Laboratory); Larry Myer, Curtis Oldenburg

### **364** Pressure Build-Up during CO2 Storage in Partially Confined Aquifers

Yagna Deepika Oruganti, (University of Texas at Austin); Steven Bryant

#### 365 CO2-Water-Silicate Mineral Reactions Enhance CO2 Storage; Evidence from Produced Fluid Measurements and Geochemical Modeling at the IEA Weyburn-Midale Project

Mark Raistrick, (Senergy Ltd); Bernhard Mayer, Ian Hutcheon, Ernie Perkins, Bill Gunter, Maurice Shevalier, Michael Nightingale, Gareth Johnson, Stephen Taylor

### 389 A Sensitivity Study of CO2 Mineralization using GEM-GHG Simulator

Ikuo Okamoto, (RITE); Saeko Mito, Takashi Ohsumi

#### 390 Key Aspects of Geochemical Trapping at the Pilot-Scale CO<sub>2</sub> Injection Site, Nagaoka, Japan

Saeko Mito-Adachi, (RITE); Ziqiu Xue, Takashi Ohsumi

#### 391 Application of Gravity Currents to the Migration of CO2 in Heterogeneous Saline Formations

Jared Hammond, (CO2CRC, CSIRO Petroleum); Jonathan Ennis-King, Herbert Huppert, Lincoln Paterson

#### 392 Saturation States Dependence of Feldspar Dissolution Rate: Sensitivity to the Timescale of Geochemical Processes on CO2 Geological Sequestration

Masao Sorai, (National Institute of Advanced Industrial Science and Technology); Munetake Sasaki

#### 393 The Seismic Tomography Image of Residual CO2 in the Porous Sandstones

Keigo Kitamura, (RITE); Zique Xue

#### 417 New Concept for Mechanism of CO2 Leakage from Aquifer

Kazuo Nakayama, (Japan Petroleum Exploration Co Ltd); Toshihiro Takahashi

#### 418 Interaction of CO2 and Caprock

Elin Skurtveit, (NGI); Magnus Soldal, Eyvind Aker, Matthieu Angeli

#### 419 Liquid-Solid Interactions Related to Subsurface Storage of CO2 - from Experiment to Prediction

Øyvind Brandvoll, (Institute of Energy Technology); I Kjersti Iden, Pål Tore Mørkved, Ingrid Anne Munz, Harald Johansen

#### 420 Modeling Reactive Transport of CO2 through Caprocks

Erwan Perfetti, (Institut Français du Pétrole); Philippe Delaplace, Laurent Trenty, Marc Fleury

#### 437 Impact of Injected CO2 on Reservoir Mineralogy during CO2-EOR

Michael Nightingale, (University of Calgary); Maurice Shevalier, Ian Hutcheon, Ernie Perkins, Bernhard Mayer

#### 438 Geochemical Modeling of Carbon Sequestration, MMV, EOR, and ECBM in the Illinois Basin

William Roy, (Illinois State Geological Survey); Peter Berger, Edward Mehnert

#### 439 Simplified Model for CO2 Leakage and its Attenuation due to **Geological Structures**

Kyung Won Chang, (University of Texas at Austin); Steven L Bryant, Susan Minkoff

#### 440 Diffusion of Dissolved CO2 in Caprock

Marc Fleury, (Institut Français du Pétrole); Philippe Berne, Pierre Bachaud

#### 457 Transport and Storage of CO2 in Natural Gas Hydrate Reservoirs Bjørn Kvamme, (University of Bergen)

#### 458 Reactive Transport of CO2 in Saline Aquifers with Implicit Geomechanical Analysis

Bjørn Kvamme, (University of Bergen)

#### 459 The Effect of CO2 Injection on the Compressional Strength of Anhydrite

Suzanne Hangx, (Utrecht University); Christopher Spiers, Colin Peach

#### 460 Role of Correlation Structure of Permeability Field on Residual Trapping Mechanism and Buoyancy-Driven CO2 Migration

Weon Shik Han, (University of Utah); Si-Yong Lee, Chuan Lu, Brian McPherson, Richard Esser

#### 469 Structural and Process Controls on the Dynamic Mass Partitioning and Spatial Distribution of CO2 Trapping Mechanisms: Impact on Isolation Performance

James W Johnson, (Lawrence Livermore National Laboratory)

#### 470 A Sensitive Analysis on Roles of Chemical Reaction and Geo-Physical Properties on CO<sub>2</sub> Dispersion in Cap-Rock

Baixin Chen, (Heriot-Watt University); Vivien Y Aissa, Masahiro Nishio, Yongchen Song, Makoto Akai

#### 471 A Mathematical Model of the Footprint of the CO2 Plume during and after Injection in Deep Saline Aquifer Systems

Ruben Juanes, (Massachusetts Institute of Technology); Christopher MacMinn

#### 472 Laboratory Examinations and Numerical Modeling of Geochemical Reactions in a Reservoir used for CO2 and Acid Gas

James Sorensen, (Energy & Environmental Research Center); Anastasia Dobroskok, Steven Hawthorne, David Miller, Yehven Holubnyak, Kurt Eylands, Edward Steadman, John Harju

#### **A6** GEOLOGIC STORAGE: WELL BORE INTEGRITY

#### 283 Improving Wellbore Seal Integrity in CO2 Injection Wells

Glen Benge, (ExxonMobil)

#### 284 Effects of Carbon Dioxide Injection on the Mechanical Stability of **Chalk and Wellbore Cement**

Emilia Liteanu, (Utrecht University); Chris Spiers, Colin Peach

#### 285 Probabilistic Study for Risk Management Associated to Long-Term Well Integrity in the Context of CO2

Sequestration - Recommendations for Well Abandonment Strategy Yvi Le Guen, (Oxand SA); Olivier Poupard, Matteo Loizzo

#### 286 Alteration of Hardened Portland Cement Paste by Impure CO2: Effect of H2S

Eric Lécolier, (IFP); Corinne Notarianni, Nathalie Ferrer, Alain Rivereau

#### 287 'Well Bore Integrity' - Say What??

Julian Cooper, (Kinkaid School)

#### 288 An Introduction to the IEA GHG International Research Network on Wellbore Integrity

Toby Aiken, (IEA Greenhouse Gas R&D Programme)

#### 307 Chemical Reactions of Wellbore Cement Under CO2 Storage **Conditions: Effects of Cement Additives**

Brian Strazisar, (US Dept of Energy/NETL); Barbara Kutchko, Gregory Lowry, David Dzombak, Niels Thaulow

#### 308 Experimental Study of Stability and Integrity of Cement in Wellbores Used for CO2 Storage

Jose Condor-Tarco, (University of Regina); Koorosh Asghari

#### 309 Quantitative Evaluation of Long-term CO2 Gas Leakage within a Well for a Risk-based Well Integrity Approach

Vincent Meyer, (Oxand SA); Emmanuel Houdu, Olivier Poupard

#### 311 Long-Term Well Bore Integrity in Otway: Integrating Ultrasonic Logs, Cement Petrophysics, and Mechanical Analysis

Matteo Loizzo, (Schlumberger Carbon Services); Brice Lecampion, Sandeep Sharma

#### 312 Assessing CO2 Interaction with Cement and Steel over a two-year Injection Period: Current State and Future Risks for the Movecbm **Project in Poland**

Matteo Loizzo, (Schlumberger Carbon Services); Peter MMC Bressers, Tjirk Benedictus, Yvi Le Guen, Olivier Poupard

#### 325 Review of Failures for Wells used for CO2 and Acid Gas Injection in Alberta, Canada

Stefan Bachu, (Energy Resources Conservation Board); Theresa Watson

#### A7 GEOLOGIC STORAGE: MONITORING

#### 250 Surface Deformation Monitoring as a Cost Effective MMV Method Glenn McColpin, (Pinnacle Technologies)

### 251 Drilling of the CO2SINK Boreholes for CO2 Geological Storage

Bernhard Prevedel, (GeoForschungsZentrum Potsdam)

#### 252 Monitoring Changes in Reservoir Geochemistry at the PennWest CO2-EOR Pilot Site, Drayton Valley, Alberta, Canada

Maurice Shevalier, (University of Calgary); Michael Nightingale, Gareth Johnson, Bernhard Mayer, Ernie Perkins, Ian Hutcheon

#### 253 Geochemical Monitoring at the CO2CRC Otway Project: Tracer Injection and Reservoir Fluid Acquisition

Linda Stalker, (CO2CRC); James Underschultz, Barry Freifeld, Chris Boreham, Ulrike Schacht, Ernie Perkins, Dirk Kirste, Sandeep Sharma

#### 254 Rapid Monitoring of Onshore CO2 Storage Sites

Jonathan Pearce, (British Geological Survey); Luke Bateson, Stan Beaubien, Giancarlo Ciotoli, David Jones, Carl Joseph, Bob Lister, Salvatore Lombardi, Richard Shaw, Michela Vellico

### 255 New and Established Techniques for Surface Gas Monitoring at Onshore CO2 Storage Sites

David Jones, (British Geological Survey); Thomas Barlow, Bob Lister, Richard Shaw, Jonathan Pearce, Stan Beaubien, Salvatore Lombardi, Ingo Möller, Frederick Gal, Gilles Brabant

### 256 A Controlled Field Pilot for Testing Near Surface CO2 Detection Techniques and Transport Models

Lee Spangler, (Montana State University); Laura Dobeck

#### 289 Surface Monitoring Technology for CCS Projects

Rod Madsen, (LI-COR Biosciences); Liukang Xu, Brent Claassen, Dayle

### 290 Geomechanical Testing and Modeling of Carbonates and Anhydrite from the Zama Oil Field, Alberta, Canada

Steven Smith, (Energy and Environmental Research Center)

### 291 Detection of Surface Deformation related with CO2 Injection by DInSAR at In Salah, Algeria

Takumi Onuma, (JGI, Inc); Shiro Ohkawa

**292 Noble Gases as Tools for Subsurface Monitoring of CO2 Leakage** Stéphane Lafortune, (Paris Geophysical Institute); Manuel Moreira, Pierre Agrinier, Alain Bonneville, Hélène Schneider, Hubert Catalette

### 293 Designing a Seismic Program for an Industrial CCS Site: Trials and Tribulations

Marcia Couëslan, (Schlumberger Carbon Services); Hannes Leetaru, Jeff Thompson, John McBride

# 294 Seismic Monitoring and Verification for the CO2CRC Otway Basin Project, Part 2: Acquisition and Analysis of Borehole Seismic Data Milovan Urosevic, (CO2CRC); Allan Campbell, Leon Dahlhaus, Aline

Milovan Urosevic, (LUZLRL); Allan Lampbell, Leon Dahlhaus, Aline Gendrin, Scott Leaney, Serguey Tcherkashnev, Michel Verliac

### 315 Real-time Assessment of CO2 Migration Direction during Geologic Storage

YagnaDeepika Oruganti, (University of Texas at Austin); Cesar Mantilla, Steven Bryant, Sanjay Srinivasan

### 316 Seismic Monitoring of the Penn West Pembina Cardium CO2 EOR Pilot, Alberta, Canada — Lessons Learned

Don Lawton, (University of Calgary); Abdullah Alshuhail, Marcia Coueslan, Louis Chabot

# **317** MW2 Concept of CO2 Monitoring for Offshore Reservoirs in Japan Daiji Tanase, (Electric Power Development Co Ltd); Shigeyuki Suda, Koji Kano. Hironori Furukawa

#### 318 Monitoring at the CO2SINK Site: A Concept Integrating Geophysics, Geochemistry and Microbiology

Rüdiger Giese, (GeoForschungsZentrum Potsdam); Jan Henninges, Stefan Lüth, Daria Morozova, Cornelia Schmidt-Hattenberger, Hilke Würdemann, Martin Zimmer, Calin Gabriel Cosma, Christopher Juhlin

### 329 A Monitoring Framework for Assessing Underground Migration and Containment of Carbon Dioxide Sequestered in an Onshore Aquifer

Kozo Sato, (University of Tokyo); Manabu Mizuno, Saeko Mito, Tadashi Horie, Hiroshi Okuma, Hideki Saito, Jiro Watanabe, Daiji Tanase, Tsukasa Yoshimura

### 330 Recent Advances in Well-based Monitoring of Geologic Carbon Sequestration

Barry Freifeld, (Lawrence Berkeley National Laboratory); Thomas Daley, Susan Hovorka, Jan Henninges, Jim Underschultz, Sandeep Sharma

### 331 Results of Investigations to Design a Monitoring Program for a CO<sub>2</sub> Storage Project in the Paris Basin, (France)

Hubert Fauriol, (BRGM); Marc Becquey, Frédéric Huguet, Marc Lescanne, Jacques Pironon, Zbigniew Pokryszka, Dat Vu Hoang

### 332 Advancing the Deployment of CO2 Monitoring Technologies through the Pembina Cardium CO2-EOR Monitoring Pilot

Brent Lakeman, (Alberta Research Council); William Gunter, Ernest Perkins, Git Lim, Rick Chalaturnyk, Don Lawton, David van Everdingen, Stefan Bachu

#### 347 The Use of Stable Isotope Measurements for Monitoring and Verification of CO<sub>2</sub> Storage

Gareth Johnson, (University of Calgary); Mark Raistrick, Bernhard Mayer, Steve Taylor, Maurice Shevalier, Michael Nightingale, Ian Hutcheon

# 348 Velocity Measurements in Reservoir Rock Samples from the SACROC Unit using Various Pore Fluids and Integration into a Seismic Survey taken before and after a CO2 Sequestration Flood

Brian Lipinski, (NETL); Christopher Purcell, William Harbert, Yee Soong, Robert McLendon, Bob Hardage, Rebecca Symth, Igor Haljasmaa, Dustin McIntyre, Jay JiKich

#### 349 Monitoring of the Kaniow Enhanced Coalbed Methane Site

Vincent Vandeweijer, (TNO); Frank van Bergen, Pascal Winthaegen, Pawel Krzystolik, Bartek Jura, Jacek Skiba

#### 350 An Introduction to the IEA GHG International Research Network on Monitoring

Brendan Beck, (IEA Greenhouse Gas R&D Programme); Toby Aiken

### **366** Geochemical Characterization of Natural CO2-rich Subsurface Systems, (Green River Seeps, Utah)

Nelly Assayag, (Cambridge University); Mike Bickle, Niko Kampman, John Becker

#### 367 Geochemical Modeling of Near-surface CO2 Interactions: The Critical Element in Risk Assessment and Cost-effective Long-term Monitoring

Elaine Darby, (Quantitative Environmental Analysis); Johnathan Bumgarner, Susan Hovorka

#### 368 A Field Laboratory for Monitoring CO<sub>2</sub> Leakage

Menno Dillen, (SINTEF): Erik Lindeberg, Per Aagaard, Eyvind Aker, Ole magne Sæter, Martha Lien, Dimitrios Hatzignatiou, Harald Johansen, Lars Golmen, Jon Oddvar Hellevang

### 369 Monitoring Pressure Transients in Zones Overlying CO2 Storage Reservoirs as a Means of Leak Detection and Diagnosis

Ethan Chabora, (Stanford University); Sally Benson

### 370 Effects of Crosswind-Topography Interaction on the Near-Surface Migration of a Potential CO2 Leak

Egemen Ogretim, (West Virginia University); Donald Gray, Grant Bromhal

#### 371 Large-scale CO2 Injection Demos for the Development of Monitoring and Verification Technology and Guidelines, (CO2REMOVE)

Ton Wildenborg, (TNO Built Environment and Geosciences); Michelle Bentham, Andy Chadwick, Petra David, Menno Dillen, Heleen Groenenberg, Yann Le Gallo

### 372 CO2 Geological Storage Field Development – Application of Measurement Monitoring and Verification

Alessandra Simone, (Shell International); Abram Grae, Elizabeth Mackie, Nigel Jenvey

#### Session B

#### **B1** CO2 CAPTURE PROJECT

#### 447 The CO2 Capture Project, (CCP): Results from Phase II, (2004-2008)

Ivano Miracca, (Snamprogetti SpA); Knut Ingvar Aasen, Jan Assink, Cal Coulter, Linda Curran, Cliff Lowe, Gustavo Torres Moure, Steven Schlasner

### 448 Case Studies of the Application of the Certification Framework to Geologic Carbon Sequestration Sites

Curtis Oldenburg, (Lawrence Berkeley National Laboratory); Steven Bryant, Jean-Philippe Nicot

#### 450 A Borehole Flow Model for Carbon Dioxide and Brine Leakage Studies

Yu-Shu Wu, (Lawrence Berkeley National Lab)

### 465 Performance of a NiO-based Oxygen Carrier for Chemical Looping Combustion and Reforming in a 120kW Pilot Unit

Johannes Bolhar-Nordenkampf, (Vienna University of Technology); Tobias Pröll, Philipp Kolbitsch, Hermann Hofbauer

### 466 Natural Minerals as Oxygen Carriers for Chemical Looping Combustion in a Dual Circulating Fluidized Bed System

Tobias Pröll, (Vienna University of Technology); Tobias Mattisson, Karl Mayer, Johannes Bolhar-Nordenkampf, Philipp Kolbitsch, Anders Lyngfelt

### 467 Fuzzy Rule-Based Probability Estimation of Fault Leakage at Geologic Carbon Sequestration Sites

Yingqi Zhang, (Lawrence Berkeley National Laboratory); Curtis Oldenburg, Preston Jordan, Stefan Finsterle, Keni Zhang

#### 468 Pressure Perturbations from Geologic Carbon Sequestration: Area-of-Review Boundaries and Borehole Leakage Driving Forces

Jean-Philippe Nicot, (University of Texas at Austin); Curtis Oldenburg, Steve Bryant, Susan Hovorka

# 477 CO2 Capture Project Phase 2, (CCP2) — Storage Program: Closing Long-Term CO2 Geological Storage Gaps Relevant to Regulatory and Policy Development

Scott Imbus, (Chevron); Dan Kieke, Walter Crow, Marcos Briceno, Calvin Cooper, Scott Rennie, Rodolfo Dino, Alessandra Simone, Calvin Coulter, Antonio Pellegrino

### 478 Synthesis Gas Generation by Chemical-looping Reforming Using a Ni-based Oxygen Carrier

Pilar Gayan, (CSIC); Luis de Diego, Juan Adanez, Francisco Garcia-Labiano, Alberto Abad, Maria Ortiz

#### 479 The CO2 Capture Project Phase 2, (CCP2) Storage Program: Progress in Geological Assurance in Unmineable Coal Beds

Dan Kieke, (Chevron); Scott Imbus, Karen Cohen, Chris Galas, Erika Gasperikova, William Pickles, Eli Silver

### 480 Effect of Gas Impurities on the Behavior of Ni-based Oxygen Carriers on Chemical-Looping Combustion

Juan Adanez, (CSIC); Francisco Garcia-Labiano, Pilar Gayan, Luis de Diego, Alberto Abad, Cristina Dueso, Carmen Forero

#### **B2** CAPTURE

#### 25 Mass-Transfer Efficiency of a Spray Column for CO<sub>2</sub> Capture by MEA

Jeffery Kuntz, (University of Regina); Adisorn Aroonwilas

### 26 CO2 Absorption into MEA-AMP Blend: Mass Transfer and Absorber Height Index

Anindo Dey, (University of Regina); Adisorn Aroonwilas

### 27 Reaction Rate of CO2 in Aqueous MEA-AMP solution: Experiment and Modeling

Roongrat Sakwattanapong, (University of Regina); Amornvadee Veawab, Adisorn Aroonwilas

#### 28 CO2 Capture in the Cement Industry

Duncan Barker, (Mott MacDonald); Simon Turner, Philip Napier-Moore, Michael Clark, John Davison

#### 63 Enhancement Factor and Kinetics of CO2 Capture by MEAmethanol Hybrid Solvents

Phairat Usubharatana, (University of Regina); Paitoon Tontiwachwuthikul

**64** CCS Opportunities in the Australian "Industrial Processes" Sector Dennis Van Puyvelde, (CO2CRC)

#### 65 The Effect of SO2 on CO2 Absorption using an Aqueous Potassium Carbonate Solvent

David Wappel, (CO2CRC); Ash Khan, Sebastian Joswig, Sandra Kentish, Geoff Stevens

#### 66 CO2 Capture Technologies for Cement Industry

Adina Bosoaga, (Cranfield University); Ondrej Masek, John Oakey

#### 101 Analysis of a Process to Capture the CO2 Resulting from the Pre-calcination of the Limestone Feed to a Cement Plant

Nuria Rodríguez, (Oviedo-Spain); Mónica Alonso, Juan Carlos Abanades, Gemma Grasa, Ramón Murillo

### **102** Recovery of Carbon Dioxide and Hydrogen from PSA Tail Gas Sunil Vyas, (Fluor Corporation); Satish Reddy

### 103 Diffusion of CCS and Energy Efficient Technologies in Power and Iron & Steel Sectors

Junichiro Oda, (RITE); Keigo Akimoto, Fuminori Sano Takashi Homma, Toshimasa Tomoda

#### 104 Scale-up of CO2 Capture Processes: The Role of Technology Qualification

Kim Johnsen, (DNV); Kaare Helle, Tore Myhrvold

#### 137 Corrosopm Inhibition Performance of Copper Carbonate in MEA-CO2 Capture Unit

 $Immanuelraj Soosai prakasam, \ (University of Regina); Amornvadee \ Veawab$ 

#### **138** Corrosion in CO2 Capture Unit Using MEA-PIPERAZINE Blends Manjula Nainar, (University of Regina); Amornvadee Veawab

# 139 The CFZ™ Process: A Cryogenic Method for Handling High CO2 and H2S Gas Reserves and Facilitating Geosequestration of CO2 and Acid Gases

P Scott Northrop, (ExxonMobil Upstream Research); Jaime Valencia

**140** Oxygen Combustion for Carbon Capture in the Cement Industry Frank Zeman, (Columbia University)

#### 141 Performance of Formulated Solvent in Handling of Enriched CO2 Flue Gas Stream

Walid ElMoudir, (HTC Purenergy); Ahmed Aboudheir

**142** Lessons Learned from the CASTOR Project on CO<sub>2</sub> Capture Earl Goetheer, (TNO); Jan Hopman

### 167 Direct Carbon Fuel Cell for Hydrogen and Electricity Fuel Filling Station with Reduced CO2 Emission and Capture

Meyer Steinberg, (HCE,LLC)

### **168** Enabling Pre-combustion Plants – the DECARBit Project Nils Anders Røkke, (SINTEF)

### 169 H2O/CO2 Condenser in Power Plant for CO2 Capturing and its Simulation with COMSOL

Kourosh Mousavi-Takami, (Malardalen University); Jafar Mahmoudi

### **170** Recent Developments in the Dutch CAPTECH Programme Daniel Jansen, (ECN); Sander van Egmond

#### 191 Designing Carbon Capture Power Plants to Assist in Meeting Peak Power Demand

Michael Haines, (IEA GHG); John Davison

#### 192 A New Flowsheeting Tool for Flue Gas Treating

Edwin van Elk, (Procede Gas Treating BV); Richard Arendsen, Geert Versteeg

### 193 Matching Medium-Scale CO2 Sources to Suitable Capture Technologies

Chris Hendriks, (Ecofys); Erika de Visser, Daan Jansen, Michiel Carbo, John Davison, Gerrit-Jan Ruijg

#### 194 Developments and Trends in CO2 Capture Systems

Chris Hendriks, (Ecofys); Eliane Blomen, Filip Neele

#### 226 New Process Concepts for CO2 Capture with Co-production of Hydrogen

Mohammad Abu-Zahra, (TNO Science and Industry); Earl Goetheer

#### 227 On the Operability of Power Plants with CO2 Capture and Storage

Colin Alie, (University of Waterloo); John Davison, Peter Douglas

#### 228 Guideline for Qualification of CO2-capture Technology

Tore Myhrvold, (Det Norske Veritas); Kaare Helle

### 265 Low-energy Packed Tower and Caustic Recovery for Direct Capture of CO2 from Air

David Keith, (University of Calgary); Frank Zeman, Maryam Mahmoudkhani

### 266 Recent Developments in Solvent Absorption Technologies at the CO<sub>2</sub>CRC in Australia

Kathryn Smith, (CO2CRC / The University of Melbourne); Ujjal Ghosh, Ash Khan, Michael Simioni, Kohei Endo, Xinglei Zhao, Sandra Kentish, Abdul Qadar, Barry Hooper, Geoff Stevens

#### **B3** Capture: Pre-Combustion

#### 7 Major Issues in the Design of Carbon Capture IGCC-based Plants

Evangelos Tzimas, (European Commission, JRC, Institute for Energy); Fred Starr, Calin-Cristian Cormos

### 8 Developing Activated Carbon Adsorbents for Pre-combustion CO2 Capture

Trevor Drage, (University of Nottingham); O Kozynchenko, Cova Pevida, Marta Plaza, Borja Arias, J Pis, Fernando Rubiera, Colin Snape, Steve Tennison

#### 10 Novel Adsorption Processes for CO2 Capture within an IGCC Process

Ranjeet Singh, (Monash University); Gongkui Xiao, Kaustubh Joshi, Simon Wilson, Paul Webley

#### 11 Performance of Water-Gas Shift Catalysts under Sorption-Enhanced Water-Gas Shift Conditions

Eric van Dijk, (ECN), Stephane Walspurger, Paul Cobden, D. Jansen, Ruud van den Brink, Frank de Vos

### 12 Staged Water-Gas Shift Configuration: Key to Efficiency Penalty Reduction during Pre-combustion Decarbonization in IGCC

Michiel Carbo, (ECN); Daniel Jansen, Jurriaan Boon, Jan Wilco Dijkstra, Ruud W van den Brink

### 13 Pre-combustion Decarbonization in IGCC: Gas Turbine Operating Window at Variable Carbon Capture Ratios

Michiel C Carbo, (ECN); Daniel Jansen, Jan Wilco Dijkstra, Jos P van Buijtenen, Adrian HM Verkooijen

#### 45 CO2 Capture by Adsorption on Activated Carbons using Pressure Modulation

Mario Pellerano, (Ecole des mines de Nantes); Pascaline Pre, Mariem Kacem, Aranud Delebarre

### 46 Pre-combustion CO2 Capture for IGCC Plants by an Adsorption Process

Johanna Schell, (ETH Zürich); Nathalie Casas, Marco Mazzotti

#### 47 Flame Stability and PM, Hg and NOx Emissions with Oxy-Coal Combustion

Scott Skeen, (Washington University in St. Louis); Achariya Suriyawong, Melissa Holtmeyer, Xiaofeng Zhang, Ari Roisman, Pratim Biswas, Richard Axelbaum

#### 48 Calcium Enhanced Hydrogen Production with CO2 Capture

Douglas Harrison, (Louisiana State University)

### 49 Sorption-enhanced Methane Steam Reforming in a Circulating Fluidized Bed Reactor System.

Bjørnar Arstad, (SINTEF); Richard Blom, Egil Bakken, Jana Jakobsen, Petter Røkke

#### 50 Development of Carbon Dioxide Removal System from the Flue Gas of Coal Fired Power Plant

Takashi Ogawa, (Toshiba); Yukio Oohashi, Susumu Yamanaka, Katsuya Yamashita, Kiyoshi Miyaike

#### 83 Sorption Enhanced Steam-Methane Reforming – Reactor Modelling

Jana Jakobsen, (SINTEF Energy Research); Elise Halmøy

### 84 Sorption-Enhanced Steam-Methane Reforming: CaO-CaCO<sub>3</sub> Capture Technology

Paul Cobden, (ECN); Ruud van den Brink, Daniel Jansen, Jan Wilco Dijkstra, Saskia Booneveld, Gerard Elzinga

# 85 A Modeling Software Linking Approach for the Analysis of an Integrated Reforming Combined Cycle with Hot-Potassium CO2 Capture

Lars Olof Nord, (NTNU); Anusha Kothandaraman, Olav Bolland, Greg McRae, Howard Herzog

#### 86 Feasibility Study of Hydrogen Production from Methane with In Situ Carbon Capture over an Integrated Catalytic CO2 Sorbent

Anuta Belova, (Columbia University); Tuncel Yegulalp, Christopher Yee

#### **B4** Capture: Oxyfuel

### 14 Opportunities for CO<sub>2</sub> Capture through Oxygen Conducting Membranes at Medium-scale Oxyfuel Coal Boilers

Michiel C Carbo, (ECN); Daniel Jansen, Chris Hendriks, Erika de Visser, Gerrit Jan Ruijg John Davison

#### 15 Results of Initial Operation of the Jupiter Oxygen Corporation Oxy-Fuel 15 MWth Burner Test Facility

Thomas G Weber, (Jupiter Oxygen Corporation); Brian Patrick, Dietrich M Gross, Mark Schoenfield, Thomas Ochs, Danylo Oryshchyn, Cathy Summers

#### 16 Investigation of NiO/NiAl2O4 Oxygen Carriers for Chemical-looping Combustion Produced by Spray-drying

Erik Jerndal, (Chalmers University of Technology)

#### 17 The Fate of Sulphur during Oxy-fuel Combustion of Lignite

Daniel Fleig, (Chalmers University of Technology); Fredrik Normann, Klas Andersson, Filip Johnsson, Bo Leckner

### 18 Combustion of Lusatian Dry Lignite under Oxyfuel Process Conditions

Helge Kass, (Technical University of Brandenburg Cottbus); Hans Joachim Krautz

#### 51 Natural Gas Oxy-Fuel Cycles — Part 1: Conceptual Aerodynamic Design of Turbo-Machinery Components

Flavio Franco, (ALSTOM Power UK); Gordon Woollatt, Olav Bolland, Jens Keyser, Sina Rezvani, Frank Sander, Roland Span

#### 52 Natural Gas Oxi-Fuel Cycles — Part 2: Heat Transfer Analysis of a Gas Turbine

Flavio Franco, (ALSTOM Power UK): Thomas Hammer, Jens Jeyser, Olav Bolland, Jian Xin Chen, Sina Rezvani, Frank Sander

### 53 Using Chemical-looping with Oxygen Uncoupling (CLOU) for Combustion of Solid Fuels

Henrik Leion, (Chalmers University of Technology); Tobias Mattisson, Anders Lyngfelt

### 54 Modelling of a Supercharged Semi-Closed Oxyfuel Combined Cycle with CO<sub>2</sub> Capture and Analysis of the Part-Load Behaviour

Roland Span, (Ruhr-University Bochum)

#### 55 Dynamic Simulation of a Mixed-Conducting Membrane based Gas Turbine Power Cycle for CO2 Capture

Konrad Eichhorn Colombo, (NTNU); Olav Bolland

#### 56 Simulation of Entrained Flow Coal Gasification

Eddy Chui, (CANMET Energy Technology Centre); Adrian Majeski, Dennis Lu, Robin Hughes, Haining Gao, Ben Anthony

### **87** Alstom Oxyfuel CFB boilers, a Promising Option for CO<sub>2</sub> Capture Silvestre Suraniti, (Alstom Power Boilers); Nsakala Nsakala

#### 88 Modeling of a 10 kWth Chemical Looping Combustor using CuO/ Al2O3 Oxygen Carrier – Methane Combustion Efficiency in the Fuel Reactor

Alberto Abad, (ISIC); Juan Adanez, Francisco Garcia-Labiano, Luis Francisco de Diego, Pilar Gayan

### 89 Chemical-Looping Combustion with Solid Fuel — Testing in a 10 kWth Unit Using Mexican Petcoke

Nicolas Berguerand, (Chalmers University of Technology); Anders Lyngfelt

### 90 Synthesis and Characterisation of Bimetallic Fe/Mn Oxides for Chemical Looping Combustion

Arnold Lambert, (IFP); Isabelle Clemençon, Elodie Comte, Céline Delquié, Bernard Durand

#### 91 OxyFuel Combustion in a 100 kW Circulating Fluidized Bed

Werner Höltl, (Vienna University of Technology); Tobias Pröll, Joachim Rohovec, Bernhard Kronberger, Hermann Hofbauer

#### 92 Improved Oxygen Production Technologies

Rodney Allam, (Imperial College London)

### 93 Viability of Mixed Conducting Membranes for Oxygen Production and Oxyfuel Processes in Power Production

Wim Haije, (ECN)

#### **B5** MEMBRANES

### 123 CO2 Separation by Hollow Fibre Carbon Membranes: Experiment and Process Simulation

Xuezhong He, (NTNU); May-Britt Hägg, Jon Arvid Lie, Edel Sheridan

#### 124 Process Integration of Membrane Reactor for Steam Methane Reforming for Hydrogen Separation with CO<sub>2</sub> Capture in Power Production by Natural Gas Combined Cycle

 ${\bf Mohammad\ Soltanieh,\ (Sharif\ University\ of\ Technology);\ Bita\ Najmi}$ 

### 126 High Temperature Polymer-Based Membranes for Hydrogen Purification and Carbon Capture

Kathryn A Berchtold, (Los Alamos National Laboratory); Stephan Blum, Kevin W Dudeck, Cynthia Welch, Kevin C O'Brien, Gopala Krishnan

#### 127 Scale-up of Polybenzimidazole Membrane for Pre-Combustion Separations

Kevin O'Brien, (SRI International); Gopala Krishnan, Kathyrn Berchtold, Stephan Blum, Richard Callahan, Will Johnson, David Byard, Tony Wu, Jose Figueroa

### **128 High Temperature Gas Separation Membranes in Coal Gasification** Joao C Diniz da Costa, (The University of Queensland); Graham Reed,

Joao C Diniz da Costa, (The University of Queensiand); Granam Reed, Kelly Thambimuthu

### 129 MEM-BRAIN Gas Separation Membranes for Zero-emission Fossil Power Plants

Michael Czyperek, (Forschungszentrum Jülich GmbH); Wilhelm A. Meulenberg, Lorenz Singheiser, Detlev Stöver

### 130 Performance of Hydrogen-selective Amorphous Alloy Membranes in Coal-derived Syngas

Michael Dolan, (CSIRO Energy Technology); Narendra Dave, Leigh Morpeth, Richard Donelson, Michael Kellam, Daniel Liang

#### 131 The Effect of Condensable Minor Components on the Gas Separation Performance of Polymeric Membranes for Carbon Dioxide Capture

Colin Scholes, (CO2CRC); Sandra Kentish, Geoff Stevens

### 132 Co-Production of Hydrogen and Electricity from Autothermal Reforming of Natural Gas by Means of Pd-Ag Membranes

Giampaolo Manzolini, (Politecnico di Milano); Federico Viganò

### 161 Ionomeric High Voltage Membranes (IHVM's) — Synthesis and Application in CO<sub>2</sub> Capture

Martijn Huibers, (KEMA Netherlands); Theo Bosma, Paul Raats

### 162 Using Baffles to Improve the Performance of Membrane Contactors for CO<sub>2</sub> Absorption

Prachya Junnasaksri, (University of Regina); David deMontigny

#### 163 CO2 Desorption Using a Membrane Contacting Process

Sakarin Khaisri, (King Mongkut's University of Technology); David deMontigny, Paitoon Tontiwachwuthikul, Ratana Jiraratananon

# 164 Oxygen Permeation and Stability of Bao.5Sro.5Coo.8Feo.2O3 — A Membrane According to Trace Elements and Oxygen Partial Pressure in Synthetic Air

Jung Hoon Park, (Korea Institute of Energy Research); Sou Hwan Son, II Hyun Baek

#### **B6** GEOLOGIC STORAGE

### 383 Economic Assessment of Enhanced Coalbed Methane Recovery for Low Rank Coal Seam

Sohei Shimada, (The University of Tokyo); Kounosuke Yamaguchi

#### 384 Pure and Competitive Adsorption of CO2, CH4 and N2 on Coal for FCRM

Ronny Pini, (ETH Zurich); Stefan Ottiger, Giuseppe Storti, Marco Mazzotti

### 385 IEA GHG Weyburn-Midale CO2 Monitoring & Storage Project – Moving Forward with the Final Phase

Ray Knudsen, (Petroleum Technology Research Centre); Carolyn Preston

### 386 CO2 Storage in Aquifers II – Experience from Existing Storage Operations

Karsten Michael, (CO2CRC & CSIRO); Guy Allinson, Alexandra Golab, Thomas Berly

### 387 The First Project on CO2 Geo-sequestration in Coal Seams in lapan

Shigeo Yamamoto, (The General Environmantal Technos Co Ltd); Masao Nako, Hironobu Komaki, Fumio Takahashi

#### 388 Formation-water Database on Saline Aquifers in Japan: Assessment of Solubility Potential in Open Aquifer Storage of CO2

Yasuko Okuyama, (Geological Survey of Japan, AIST); Masao Sorai, Munetake Sasaki, Hirofumi Muraoka, Norio Yanagisawa, Nobuyuki Kaneko

#### 411 Storing CO2 with Enhanced Oil Recovery

Vello Kuuskraa, (Advanced Resources International); Robert Ferguson, Lisa Phares, Tyler Van Leeuwen

### 412 Field test of CO2 Injection and Storage in Lignite Coal Seam in North Dakota

Lisa Botnen, (University of North Dakota); David Fisher, Anastasia Dobroskok, Tom Bratton, Keith Greaves, Robert McLendon, Greg Steiner, James Sorensen, Edward Steadman, John Harju

### 413 CO2GeoNet, the Unique Role of the European Scientific Body on CO2 Geological Storage

Isabelle Czernichowski-Lauriol, (BRGM); Rob Arts, Dominique Durand, Sevket Durucan, Peter Johannessen, Franz May, Marie-Laure Olivier, Sergio Persoglia, Nick Riley, Mehran Sohrabi

**414** CO2 storage in coal: report on the MOVECBM field test in Poland Niels van Wageningen, (Shell Exploration & Production); Rick Wentinck, Claus Otto

#### 415 Validating Geologic Storage Potential in the Midwestern USA through Multiple Field Demonstrations

Neeraj Gupta, (Battelle); David Ball, Phil Jagucki, Judith Bradbury

### 416 Cross-Country Comparison of Policy Developments for the Deployment of Carbon Capture and Storage

Andrea Ramirez Ramirez, (Utrecht University); Andre Faaij

### 431 Permanent Carbon Dioxide Storage into Basalt: The Carb-Fix Pilot Project, Iceland

Juerg Matter, (Columbia University); Martin Stute, Wallace Broecker, Sigurdur Gislason, Einar Gunnlaugsson, Gudni Axelsson, Eric Oelkers, Grimur Björnsson, Andri Stefánsson

### 432 Gravitational Trapping of CO2 in Deep Ocean Sediments: Permeability Upgrading and Mechanical Stability

Jonathan Levine, (Columbia University); Juerg Matter, Dave Goldberg, Klaus Lackner

# 433 Feasibility Study of Carbon Dioxide Capture from Power Plants and other Major Stationary Sources and Storage in Iranian Oil Fields for Enhanced Oil Recovery (EOR)

Mohammad Soltanieh, (Sharif University of Technology); Adnan Moradian

#### 434 Laboratory and Field Tests of CO2-water Injection into the Ogachi Hot Dry Rock Site, Japan

Akira Ueda, (Kyoto University); Yoshihiro Nakatsuka, Makoto Kunieda, Yosuhiro Kuroda, Hisao Satoh, Akiko Ozawa, Hiroshi Wakahama, Saeko Mito, Hideshi Kaji, Hideshi Kaieda

### 435 The Concept of CO2 Georeactor Sequestration at the Ogachi HDR Site, NE Japan

Hiroshi Wakahama, (RITE)

### 436 Storage of CO2 in Natural Gas Hydrate Reservoirs and Rate Limiting Processes

Bjørn Kvamme, (University of Bergen)

### 451 Assessing Capacity for Geological Storage of Carbon Dioxide in Central — East Group of Countries (EU GeoCapacity Project)

George Hatziyannis, (IGME-GR); Gyorgy Falus, Georgu Georgiev, Constantin Sava

#### 453 Investigation on CO2 Behavior in Shallower Geologic Strata: Natural Analogue of Leaked Natural Gas in the Mobara Gas Field, Japan

Shiro Tanaka, (CRIEPI); Hiroshi Suenaga, Eiji Nakata, Kameichiro Nakagawa, Takumi Shidahara

#### 454 Measurements of CO2 Sorption on Rocks using a Volumetric Technique for CO2 Geological Storage

Takashi Fujii, (Tohoku University); Yuichi Sugai, Kyuro Sasaki, Toshiyuki Hashida

# 455 CO2 Streams Containing Additional Components — A Review of Thermodynamic and Geochemical Properties and Assessment of Reactive Transport Codes

Nicolas Jacquemet, (BRGM); Yann Le Gallo, Audrey Estublier, Véronique Lachet, Ilka von Dalwigk, Jinying Yan, Mohamed Azaroual, Pascal Audigane

### 456 Carbon Dioxide Enhanced Oil Recovery Injection Operations Technologies

Michael Parker, (ExxonMobil Production Company); Stephanie Meadows

#### **B7** Geologic Storage: Site Characterization

## 157 A Framework for the Characterization of CO2 Storage Aquifer Properties using Core Analysis Techniques and Experimental Data Michael Krause (Stanford University) Joan Christophe Porrie, Sally

Michael Krause, (Stanford University); Jean-Christophe Perrin, Sally Benson

### 158 A Site Selection Methodology for CO2 Underground Storage in Deep Saline Aquifers: Case of the Paris Basin

Sandrine Grataloup, (BRGM); Didier Bonijoly, Etienne Brosse, Rémi Dreux, Daniel Garcia, Vladimir Hasanov, Marc Lescanne, Patrick Renoux, Alain Thoraval

# 159 Building a Geocellular Model of the Sedimentary Column at Rousse CO2 Geological Storage Site (Aquitaine, France) as a Tool to Evaluate a Theoretical Maximum CO2 Injection Pressure

Claude Gapillou, (TOTAL E&P); Sylvain Thibeau, Gérard Mouronval, Marc Lescanne

# 160 Evaluating the Impacts and Capabilities of Long Term Subsurface Storage in the Context of Carbon Sequestration in the San Juan Basin, NM and CO

Drew Haerer, (New Mexico Institue of Mining and Technology); Brian McPherson

#### 181 Exploring Geological Storage Sites for CO2 from Norwegian Gas Power Plants: Utsira South

Per Eirik Strand Bergmo, (SINTEF)

### 182 Geological Characterisation of the Otway Project Pilot Site: What a Difference a Well Makes

Tess Dance, (CO2CRC); Lynton Spencer, Josh-Qiang Xu

# 183 Geological Modelling and Dynamic Flow Analysis as Initial Site Investigation for Large-Scale CO2 Injection at the Vedsted Structure, NW Denmark

Peter Frykman, (GEUS); Niels Bech, Ann Sørensen, Lars-Henrik Nielsen, Carsten Nielsen, Lars Kristensen, Torben Bidstrup

# 184 Igneous Intrusions in the Sedimentary Basins of Eastern Australia: Implications for Hydrocarbon Maturation and CO2 Storage Potential

Lila Wanda Gurba, (CO2CRC); Zhongsheng Li, Colin Ward, Alexandra Golab, Kaylie Hyland

### 207 Mathematical Numerical Investigations on CO2 Storage Capacity in Saline Geologic Formations

Andreas Kopp, (University Stuttgart); Holger Class, Rainer Helmig

### 208 Modelling of CO2 Storage and Long Term Behaviour in the Casablanca Field

Alexandre Fornel, (I F P); Tomas Vallaure

### **209** RWE's 450 MW IGCC-CCS Project: Status and Perspective Part 2: Storage Site

Thies Dose, (Storage Assessment Team at RWE Dea AG); Michael Seeling, Felix Leicht, Kees Castelijns, Thomas Bartels, Christian Marchel

### 210 Reservoir Simulation Study of CO2 Storage and CO2-EGR in Atzbach-Schwanenstadt Gas Field in Austria

Szczepan Polak, (SINTEF)

#### 246 Sonic Data Inversion for in situ Stress Characterization and Geomechanical Study at the CO2 Otway Basin Pilot Project, Australia

Thomas Berard, (Schlumberger Carbon Services); Bikash Sinha, Tan Phuat Chee, Pallikathekathil Zachariah John

#### 247 The Geology of CO2SINK Site: From Regional Scale to Laboratory

Andrea Förster, (GeoForschungsZentrum Potsdam); Rüdiger Giese, Chris Juhlin, Ben Norden, Niels Springer, CO2SINK Group

#### 248 Carbon Sequestration Geological Formation

Anurodh Dayal, (National Geophysical Research Institute)

#### **B8** Geologic Storage: Storage Engineering

### 186 CO2 Storage in Saline Aquifers: Injectivity Profiles for the Esmond Complex (UK) and a North German Aquifer (GE)

Vincent Vandeweijer, (TNO); Bert van der Meer, Leslie Kramers, Filip Neele, David Evans, Karen Kirk, Frauke Schaefer, Yann Le Gallo, Dan Bossie-Codréanu, Nicolas Maurand

### **187** Carbon Storage in Depleted Gas Fields: Key Challenges David Hughes, (Senergy Ltd)

### 188 Designing a Pilot-Scale Experiment for the Production of Natural Gas Hydrates and Sequestration of CO2 in Geologic Reservoirs

Mark White, (Pacific Northwest National Laboratory); Pete McGrail

# 211 Effects of Saline Aquifer Water on the Corrosion Behaviour of Injection Pipe Steels 1.4034 and 1.7225 during Exposure to CO2 Environment

Anja Pfennig, (FHTW University of Applied Sciences and BAM Federal Institute of Materials); Axel Kranzmann

### 212 Electrical Resistivity and Viscosity of Aqueous NaCl Solutions with Dissolved CO2

Marc Fleury, (Institut Français du Pétrole); Hervé Deschamps

# 213 Linking Pressure Dissipation within Geologic Formations & the Energy Penalty for Large-Scale Subsurface Carbon Dioxide Capture and Storage

Kurt House, (Harvard University); Charles Harvey, Michael Aziz, Daniel Schrag

#### 214 Methane and Carbon Dioxide Sorption and Transport Rates in Coal at In-situ Conditions

Denis Pone, (Penn State University); Phillip Halleck, Jonathan Mathews

### 215 Prediction Model of BHP Temperature and Pressure at Deep Injector for CO<sub>2</sub> Sequestration to Recover Injection Rate

Kyuro Sasaki, (Kyushu University); Tetsu Yasunami, Yuichi Sugai

### 216 Risk Mitigation Through the Optimization of Solubility and Residual Gas Trapping for CO2 Storage in Saline Aquifers

Long Nghiem, (Computer Modelling Group Ltd); Chaodong Yang, Vijay Shrivastava, Bruce Kohse, Mohamed Hassam, Colin Card

# **217** Super-atomization of Liquid CO2 for Stable Geological Storage Suguru Uemura, (Tokyo Institute of Technology); Shohji Tsushima, Shuichiro Hirari

#### 218 WESTCARB Small Volume Pilot CO2 Injection Tests

Larry Myer, (Lawrence Berkeley National Lab)

#### **B9** GEOLOGIC STORAGE:

**DEVELOPMENT OF MODELING TOOLS** 

### 180 Integrated Modeling, Monitoring, and Site Characterization to Assess the Isolation Performance of Geologic CO2 Storage

James W Johnson, (Lawrence Livermore National Laboratory)

### 201 Understanding CO2 Plume Behavior during Sequestration Projects through the Use of Reservoir Fluid Modeling

Hannes Leetaru, (Illinois State Geological Survey); Scott Frailey, James Damico, Edward Mehnert, Jens Birkholzer, Quanlin Zhou, Preston Jordan

### 202 Modeling the Phase Equilibria of CO2 and H2S in Aqueous Electrolyte Systems at Elevated Pressure

Xiaohua Tang, (Delft University of Technology); Ruben Spoek, Andr Bardow, Joachim Gross, Peter Jansens

#### 203 Validation of CO<sub>2</sub> Injection Simulations with Monitoring Well

Diana Bacon, (Battelle Pacific Northwest Division); Joel Sminchak, Jacqueline Gerst, Neeraj Gupta

#### 204 Coupling Models of Different Complexity for the Simulation of CO2 Storage in Saline Aquifers

Holger Class, (University Stuttgart); Melanie Darcis, Bernd Flemisch, Andreas Kopp, Anozie Ebigbo, Rainer Helmig

#### 205 Optimization-Based Dynamic Process Control of CO2 Sequestration Process under Uncertainty

Xiaodong Zhang, (University of Regina); Gordon Huang

### 206 The Large-Scale Effects of Multiple CO2 Injection Sites on Caprock and Formation Stability

Joseph Morris, (Lawrence Livermore National Laboratory); Russell Detwiler, Julio Friedmann

#### 243 The Effect of Faults on Dynamics of CO2 Plumes

Kyung Won Chang, (University of Texas at Austin); Steven L Bryant

#### 244 Analytical Solution to Evaluate Salt Precipitation during CO<sub>2</sub> Injection in Saline Aquifers

Mehdi Zeidouni, (University of Calgary); Mehran Pooladi-Darvish, David Keith

#### **B10** GEOLOGIC STORAGE: ENVIRONMENTAL IMPACT

#### 394 A Numerical Study of Transport and Spreading of Gases from Natural Analogues of Gas-Seepage through the Seafloor

Lars Inge Enstad, (University of Bergen); Guttorm Alendal, Peter M Haugan

**395** Assessing Environmental Impacts from Geological CO2 Storage Michael Stenhouse, (Monitor Scientific LLC); Wei Zhou, Randy Arthur

### **396** Assessing Risk to Fresh Water Resources from Long term CO<sub>2</sub> Injection — Laboratory and Field Studies

Rebecca C Smyth, (University of Texas at Austin); Susan D Hovorka, Katherine D Romanak, Judson W Partin, Corinne Wong, Timothy A Meckel, Jean-Philippe Nicot, Robert M Holt

#### 397 Ecosystem Effects of Elevated CO2 Concentrations on Microbial Populations at a Terrestrial CO2 Vent at Laacher See, Germany

Martin Krüger, (BGR); Julie West, Birte Oppermann, Marie-Christine Dictor, C Joulian, Dave Jones, Pat Coombs, Kay Green, Jonathan Pearce, Ingo Möller

# 398 Large-scale Numerical Simulation of CO2 Geologic Storage and its Impact on Regional Groundwater Flow: A Hypothetical Case Study at Tokyo Bay, Japan

Hajime Yamamoto, (Taisei Corporation); Keni Zhang, Kenzi Karasaki, Atsunao Marui, Hitoshi Uehara, Noriaki Nishikawa

#### 399 Modelling the Fate of Carbon Dioxide in the Near-Surface Environment at the Latera Natural Analogue Site

Philip Maul, (Quintessa Ltd); Stan Beaubien, Alex Bond, Laura Limer, Salvatore Lombardi, Jonathan Pearce, Mike Thorne, Julia West

### 400 Natural Gas Behavior in Shallow Geologic Layers as Natural Analogues of Discharge of CO2

Kameichiro Nakagawa, (CRIEPI); Shiro Tanaka, Hiroshi Suenaga, Eiji Nakata, Yuki Ito

# 421 Identification of Thermodynamic Controls defining the Concentration of Hazardous Elements in Potable Ground Waters and the Potential Impact of Increasing Carbon Dioxide Partial Pressure

John A Apps, (Lawrence Berkeley National Laboratory); Yingqi Zhang, Liange Zheng, Tianfu Xu, Jens T Birkholzer

### 422 Numerical Study on the Rise of pCO2 in Seawater by the Leakage of CO2 Purposefully Stored under the Seabed

Toru Sato, (University of Tokyo); Yuki Kano

#### 423 Sub-sea Geological Storage of CO2; The Marine Component

Guttorm Alendal, (University of Bergen); Lars Golmen, Sønke Maus, Jon Oddvar Hellevang, Arild Sundfjord, Dominique Durand, Peter M Haugan, Inge Morten Skaar

#### **B11** GEOLOGIC STORAGE:

RISK ASSESSMENT AND MANAGEMENT

#### 263 Hydrogeochemical Modeling for Natural Analogue Study of CO2 Leakage due to Matsushiro Earthquake Swarm

Norifumi Todaka, (Electric Power Development Co Ltd); Shigetaka Nakanishi, Tianfu Xu, Karsten Pruess

### **264** Quantifying the Potential Exposure Hazard Due To Energetic Releases of CO<sub>2</sub> from a Failed Sequestration Well

Roger Aines, (Lawrence Livermore National Laboratory); Martin Leach, Todd Weisgraber, Matthew Simpson, S Julio Friedmann, Carol Bruton

#### 297 The ADM/Illinois Project: Initial Results from Risk Assessment and Framework for Performance Assessment

Ken Hnottavange-Telleen, (Schlumberger Carbon Services)

#### 298 Determining Safety Criteria for CO2 Geological Storage

Olivier Bouc, (BRGM); Pascal Audigane, Gaël Bellenfant, Hubert Fabriol, Jérémy Rohmer, M. Dariush Seyedi

### 299 Use of Hybrid Uncertainty Theories to Analyse the Variability of CO<sub>2</sub> Plume Extension in Geological Storage

Gaël Bellenfant, (BRGM); Dominique Guyonnet

#### 300 Building CO2 Storage Risk Profiles with the Help of Quantitative Simulations

Claudia Vivalda, (Schlumberger Carbon Services); Matteo Loizzo

### 321 A Unified Approach to Performance Assessment (PA) of Geological CO2 Storage

Richard Metcalfe, (Quintessa Limited); Philip Maul, Steven Benbow, Claire Watson, David Hodgkinson, Alan Paulley, Laura Limer, Russell Walke, David Savage

### 322 Probabilistic Approach to the Quantification of the Features, Events, and Processes (FE) for CO2 Storage Risk Assessment

Anastasia Dobroskok, (University of North Dakota); Scott Ayash, James Sorensen, Stephanie Wolfe, Edward Steadman, John Harju

### 323 Modularised Risk Assessment for Carbon Capture and Storage Projects

Matt Gerstenberger, (GNS Science); Andy Nicol, Kelvin Berryman, Wendy Saunders, Warwick Smith, Mike Stenhouse Mark Stirling, Terry Webb

### 324 CO2 Geological Storage Field Development: Containment Risk Assessment & Management

Nigel Jenvey, (Shell International Exploration & Production); Martin Jagger, Andrew Garnet, Richard Metcalf

### 335 Second Generation CO2 FEP Analysis: CASSIF-Carbon Sequestration Scenario Identification Framework

Ferhat Yavuz, (TNO Built Environment and Geoscience); Petra David, Tom van Tilburg, Mark Spruijt, Ton Wildenborg

#### 336 FEP Analysis and Markov Chains

Manuel Nepveu, (TNO – Built Environment and Geosciences); Ferhat Yavuz

### 337 Modelling the Uncertainty and Risks Associated with the Design and Life Cycle of CO<sub>2</sub> Storage in Coalbed Reservoirs

Anna Korre, (Imperial College London); Ji Quan SHI, Claire Imrie, Sevket Durucan

### 338 A Simplified, Semi-Analytical Method to Handle Uncertainty in Long-Term Containment in Geologic CO2 Storage Sites

Semere Solomon, (Det Norske Veritas); Todd Flach, Michael Carpenter, Ståle Selmer-Olsen

# 353 Coupled Hydromechanical Modelling for the Study of Integrity and Safety of Geological Storage of CO2 Coupled Hydromechanical Modeling for the Study of Integrity and Safety of Geological Storage of CO2

Mohammad-Dariush Seyedi, (BRGM); Nicolas Guy, Jeremy Rohmer, Ariane Ducellier, Francois Hild

### 354 Simplified CO<sub>2</sub> Plume Dynamics for a Certification Framework for Geologic Sequestration Projects

Navanit Kumar, (University of Texas at Austin); Steven Bryant, Jean-Philippe Nicot

### 355 Feasibility of Reproduction of Stored CO2 from the Utsira Formation at the Sleipner Gas Field

Idar Akervoll, (SINTEF Petroleum Research); Erik Lindeberg, Alf Lackner

#### 356 An Introduction to the IEA GHG International Research Network on Risk Assessment

Brendan Beck, (IEA Greenhouse Gas R&D Programme); Toby Aiken

#### 379 A Novel Theoretical Methodology for Monitoring the Risks of CO2 Leakage from Wellbores

Jose A Condor-Tarco, (University of Regina); Koorosh Asghari

### 380 Long-term Safety of CO2 Storage has to be based on Monitoring and Remediation Plans

Erik LIndeberg, (SINTEF Petroleum Research)

### 381 Characterizing Fault-plume Intersection Probability for Geologic Carbon Sequestration Leakage Risk Assessment

Preston Jordan, (Lawrence Berkeley National Laboratory); Curt Oldenburg, Jean-Phillippe Nicot

**382** Mitigation Planning for Large-Scale Storage Projects:Multiple Injection Zones and Reservoir Pressure Reduction Engineering Design Brian McPherson, (University of Utah); Weon Shik Han, Si-Yong Lee, Chuan Lu, Richard Esser

#### **B12** Policy

# 34 Comparing the Development and Deployment of Carbon Capture and Sequestration Technology in Norway, the Netherlands, Australia, Canada and the US — An Innovation System Perspective

Klaas van Alphen, (Utrecht University); Marko Hekkert, Wim Turkenburg

#### 35 A Framework to Add Incentives for Managements after CO2 Injection

Kohko Tokushige, (RITE)

#### 36 Results of the ACCSEPT project

Jason Anderson, (IEEP); Joana Chiavari

### **37** Progress with the UK Carbon Capture and Storage Consortium Jon Gibbins, (Imperial College London)

#### 38 The Brazilian Carbon Sequestration Technological Development

Paulo Cunha, (CENPES-Petrobas Research Center)

### 73 Prospects for UCG in a Carbon Constrained, Energy Secure World Julio Friedmann, (Lawrence Livermore National Laboratory)

### 74 Practice, Protocols, and Performance-based Standards for Carbon Sequestration Projects

Julio Friedmann, (Lawrence Livermore National Laboratory)

#### 75 Trust as Predictor of Public Acceptance of CCS

Bart Terwel, (Leiden University); Fieke Harinck, Naomi Ellemers, Dancker Daamen, Marjolein de-Best Waldhober

### **76** Assessing a Liability Regime for Carbon Capture and Storage Elizabeth Wilson, (University of Minnesota); Alexandra Klass

### 111 Financing Carbon Capture and Storage Projects: The Results of Two Expert Meetings

Brendan Beck, (IEA GHG); John Kessels

#### 112 Carbon Capture and Storage Business Models

Haroon Kheshgi, (ExxonMobil Research and Engineering Company)

# 113 Should Life Cycle Assessment be part of the Environmental Impact Assessment? Case study: LCA of CO2 capture and storage in Canada

Anastassia Manuilova, (University of Regina); Jitsopa Suebsiri, Malcolm Wilson

### 114 The CCSReg Project: A Regulatory Framework for the Capture and Geologic Sequestration of Carbon Dioxide in the United States

Granger Morgan, (Carnegie Mellon University); Sean McCoy, Jay Apt, Michael Dworkin, Paul Fischbeck, Lee Gresham, Robert Nordhaus, Edward Rubin, Elizabeth Wilson

#### 149 UIC Permit Challenges within a Developing Regulatory Framework

Scott Frailey, (Illinois State Geological Survey); Sallie Greenberg

#### 150 Sites, Regulations and Policies for CO2 Capture and Geological Storage in India

Rudra Kapila, (University of Edinburgh); Stuart Haszeldine

#### 151 Geography of CCS Regulatory Development in the U.S.

Melisa Pollak, (University of Minnesota); Jennifer Johnson, Elizabeth Wilson

### 152 Harmonizing the Quantification of CCS GHG Emission Reductions through Oil and Natural Gas Industry Project Guidelines

Theresa Shires, (URS Corporation); Karin Ritter, Robert Siveter, Haroon Kheshgi, Miriam Lev-On

#### 175 How to Combat Global Warming - The Bellona Scenario

Aage Stangeland, (The Bellona Foundation); Bjorn Utgard, Guro Hauge, Christine Karlsen, Ane Brunvoll, Konrad Pütz, Birgitte Laird, Laetitia Birkeland, Elisabeth Sæther, Marius Holm

### 176 Energy Policy on Shaky Ground? – A Study of CCS-scenarios, their Policy Implications, and the Authors behind Them

Mårten Bryngelsson, (KTH); Anders Hansson

### 199 Afraid to Start Because the Outcome is Uncertain?: Public Acceptance Issues in CCS and Scaling Up Projects

Sarah Wade, (AJW, Inc); Sallie Greenberg

#### 200 Understanding Potential CCS Risk: A Multi-Disciplinary Framework to Foster Responsible Stewardship

Sarah Wade, (AJW, Inc); Chiara Trabucchi

#### **B13** Training, Education, Outreach

#### 424 A Study on Public Acceptance of CO2 Ocean Sequestration — Questionnaire Investigation and Trial of Risk Communication

Toru Sato, (University of Tokyo); Norihiro Kamishiro

#### 441 A Survey on the Public Perception of CCS in France

Minh Ha-Duong, (CIRED, CNRS); Alain Nadai, Ana Sofia Campos

#### 442 Keeping Stakeholder Involvement in Perspective

Elizabeth Malone, (Joint Global Change Research Institute)

#### $443\ \textsc{Opportunities}$ and Hurdles in Applying CCS Technologies in China

David Reiner, (University of Cambridge); Xi Liang, Simon Shackley

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Emma ter Morsl, (Leiden University); Mieneke Weenig, Naomi Ellemers, Danker Daamen

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Peta Ashworth, (CSIRO); Melissa Mayhew, Frances Millar, Naomi Boughen

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Chai McConnell, (Zerogen Pty Ltd); Peta Ashworth, Howard Morrison

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Sallie Greenberg, (Illinois State Geological Survey); Hannes Leetaru, Ivan Krapac, Kenneth Hnottavange-Telleen, Robert Finley

#### **B14** MINERAL CARBONIZATION

### 267 Utilization of Oil Shale Ash to Prepare PCC: Leachibility Dynamics and Equilibrium in the Ash-Water System

Rein Kuusik, (Tallinn University of Technology); Olga Velts, Mai Uibu, Irina Rudjak, Juha Kallas

### 268 Influence of Particle Size on the Carbonation of Stainless Steel Slags for CO2 Storage

Renato Baciocchi, (University of Rome 'Tor Vergata'); Giulia Costa, Alessandra Polettini, Raffaella Pomi

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Sam Krevor, (Columbia University); Christopher Graves, Klaus Lackner, Anne McCafferty, Brad Van Gosen

### 270 Comparison of Pretreatment Method for the Enhancement of CO2 Sequestration by Serpentine

Hyung-Taek Kim, (Ajou University); Na-Hyung Jang, Joon-Soo Lee, Li-Hua XII

### 271 Estimation of CO2 Sequestration Potential via Mineral Carbonation in Fly Ash from Lignite Combustion in Poland

Alicja Uliasz-Bocheńczyk, (Mineral and Energy Economy Research Institute of The Polish Academy of Sciences); Eugeniusz Mokrzycki, Zbigniew Piotrowski, Radosaw Pomykaa

### 339 Analysis of the Effect of CO<sub>2</sub> Pressure and Salinity on the Olivine Dissolution Kinetics

Valentina Prigiobbe, (ETH Zurich); Markus Hänchen, Giulia Costa, Renato Baciocchi, Marco Mazzotti

#### 340 Mineral Carbonation Process Design for CO2 Sequestration

Valentina Prigiobbe, (ETH Zurich); Markus Hänchen, Giulia Costa, Renato Baciocchi, Marco Mazzotti

### 341 Carbonation of Magnesium Silicate Mineral using a Pressurised Gas-solid Process

Ron Zevenhoven, (Åbo Akademi University); Johan Sipilä, Sebastian Teir

#### **B15** Ocean Storage

#### 342 Topographic Effects on CO<sub>2</sub> Diffusion and Dissolution from the Seafloor

Kristin Rygg, (Bergen Center for Computational Science, Unifob); Lars Inge Enstad, Guttorm Alendal, Peter Mosby Haugan

### 358 The Role of CO2 Hydrate on the CO2 Leakage Rates from Deep Ocean CO2 Storage

Bjørn Kvamme, (University of Bergen)

#### 359 Experiment on the Hydrate Nucleation of Liquid CO2 Droplet

Yuki Matsumoto, (University of Tsukuba); Akiko Fujiwara, Yutaka Abe, Kenji Yamane

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