

# **6th Trondheim Conference on CO<sub>2</sub> Capture, Transport and Storage 2012**

**Energy Procedia Volume 23**

**Trondheim, Norway  
16 – 18 June 2012**

**ISBN: 978-1-62748-432-9  
ISSN: 1876-6102**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by Elsevier B.V.  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact Elsevier B.V.  
at the address below.

Elsevier B.V.  
Radarweg 29  
Amsterdam 1043 NX  
The Netherlands

Phone: +31 20 485 3911  
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

<b>6th Trondheim Conference on CO<sub>2</sub> Capture, Transport and Storage</b> .....	1
<b>Comparison of Current and Advanced Post-Combustion CO<sub>2</sub> Capture Technologies for Power Plant Applications</b> .....	3
<i>Miguel A. Gonzalez-Salazar, Robert J. Perry, Ravi-Kumar Vipperla, Alvaro Hernandez-Nogales, Lars O. Nord, Vittorio Michelassi, Roger Shisler, Vitali Lissianski</i>	
<b>Positive and Negative Effects on Energy Consumption by Inter-heating of Stripper in CO<sub>2</sub> Capture Plant</b> .....	15
<i>Mehdi Karimi, Magne Hillestad, Hallvard F. Svendsen</i>	
<b>Packing Characterization: Mass Transfer Properties</b> .....	23
<i>Chao Wang, Micah Perry, Gary T. Rochelle, A. Frank Seibert</i>	
<b>NGCC and Hard-Coal Power Plant with CO<sub>2</sub> Capture Based on Absorption</b> .....	33
<i>P. A. Marchioro Ystad, O. Bolland, M. Hillestad</i>	
<b>Capacity and Kinetics of Solvents for Post-Combustion CO<sub>2</sub> Capture</b> .....	45
<i>Peter Bræder, Hallvard F. Svendsen</i>	
<b>Online Analysis of Amine Concentration and CO<sub>2</sub> Loading in MEA Solutions by ATR-FTIR Spectroscopy</b> .....	55
<i>Aslak Einbu, Arlinda F. Ciftja, Andreas Grimstvedt, Ali Zakeri, Hallvard F. Svendsen</i>	
<b>Solvents with Low Critical Solution Temperature for CO<sub>2</sub> Capture</b> .....	64
<i>Zhicheng Xu, Shujuan Wang, Jinzhao Liu, Changhe Chen</i>	
<b>Study of the Solid-liquid Solubility in the Piperazine-H<sub>2</sub>O-CO<sub>2</sub> System using FBRM and PVM</b> .....	72
<i>Inna Kim, Xiaoguang Ma, Jens-Petter Andreassen</i>	
<b>Dynamic Modeling of Post-combustion CO<sub>2</sub> Capture Using Amines—A Review</b> .....	82
<i>Actor Chikukwa, Nina Enaasen, Hanne M. Kvamsdal, Magne Hillestad</i>	
<b>Improvement of Lipophilic-Amine-based Thermomorphic Biphasic Solvent for Energy-Efficient Carbon Capture</b> .....	92
<i>Jiafei Zhang, Yu Qiao, David W. Agar</i>	
<b>A Study of Oxidative Degradation of AMP for Post-combustion CO<sub>2</sub> Capture</b> .....	102
<i>Tielin Wang, Klaus-J. Jens</i>	
<b>NMR Study on the Oxidative Degradation of MEA in Presence of Fe<sup>2+</sup></b> .....	111
<i>Arlinda F. Ciftja, Ardi Hartono, Andreas Grimstvedt, Hallvard F. Svendsen</i>	
<b>Evaluation of Parameter Fitting Procedures for Rigorous Equilibrium Model Development</b> .....	119
<i>Hamid Mehdizadeh, Tore Haug-Warberg, Hallvard F. Svendsen</i>	
<b>A General Column Model in CO<sub>2</sub>SIM for Transient Modelling of CO<sub>2</sub> Absorption Processes</b> .....	129
<i>Finn Andrew Tobiesen, Magne Hillestad, Hanne Kvamsdal, Actor Chikukwa</i>	
<b>Computational Study of Thermodynamics of Polyamines with Regard to CO<sub>2</sub> Capture</b> .....	140
<i>Mayuri Gupta, Eirik Falck Da Silva, Hallvard F. Svendsen</i>	
<b>Hydrogen Fuel Supply System and Re-heat Gas Turbine Combustion</b> .....	151
<i>Nils Erland L. Haugen, Christian Brunhuber, Marie Bysveen</i>	
<b>Development of a Dynamic Model of a Palladium Membrane Reactor for Water Gas Shift</b> .....	161
<i>A. Rossi, G. Lamonaca, P. Pinacci, F. Drago</i>	
<b>Operability Analysis and Control Design of an IRCC HMR Unit with Membrane Leakage</b> .....	171
<i>Finn Are Michelsen, Lei Zhao, Bjarne Foss</i>	
<b>Fabrication, Sealing and High Pressure Testing of Tubular La<sub>2</sub>NiO<sub>4+δ</sub> Membranes for Air Separation</b> .....	187
<i>Paul Inge Dahl, Marie-Laure Fontaine, Florian Ahouanto, Christelle Denonville, Ove Paulsen, Yngve Larring, Thijs Peters, Partow Pakdel Henriksen, Rune Bredesen</i>	
<b>Evaluation of Oxy-coal Combustion Modelling at Semi-industrial Scale</b> .....	197
<i>Michael Müller, Uwe Schnell, Simon Grathwohl, Jörg Maier, Günter Scheffknecht</i>	
<b>Corrosion of Pipeline and Compressor Materials Due to Impurities in Separated CO<sub>2</sub> from Fossil-Fuelled Power Plants</b> .....	207
<i>Benedikt Paschke, Alfons Kather</i>	
<b>Corrosion Behavior of Various Steels for Compression, Transport and Injection for Carbon Capture and Storage</b> .....	216
<i>Aki Sebastian Ruhl, Artur Goebel, Axel Kranzmann</i>	
<b>Pipeline Flow Modelling with Source Terms Due to Leakage: The Straw Method</b> .....	226
<i>Alexandre Morin, Steinar Kragset, Svend Tollak Munkejord</i>	

<b>Evaluation of SPUNG<sup>#</sup> and Other Equations of State for Use in Carbon Capture and Storage Modelling</b> .....	236
<i>Øivind Wilhelmsen, Geir Skaugen, Oddvar Jørstad, Hailong Li</i>	
<b>Two-Phase Flow of CO<sub>2</sub> with Phase Transfer</b> .....	246
<i>Halvor Lund, Peder Aursand</i>	
<b>Depressurization of a 50 km Long 24 inches CO<sub>2</sub> Pipeline</b> .....	256
<i>Sigmund Clausen, Antonie Oosterkamp, Katrine Lie Strøm</i>	
<b>Depressurization of CO<sub>2</sub> – A Numerical Benchmark Study</b> .....	266
<i>Sigmund Clausen, Svend Tollak Munkejord</i>	
<b>Analysis and Comparison of Equations-of-State with p-p-T Experimental Data for CO<sub>2</sub> and CO<sub>2</sub>-Mixture Pipeline Transport</b> .....	274
<i>Michela Mazzocoli, Barbara Bosio, Elisabetta Arato</i>	
<b>Political Rationality and CCS Discourse</b> .....	284
<i>J. Røyrvik, M. Schei Olsen, T. M. B. Aasen</i>	
<b>Innovation in a Heterogeneous CCS Research Centre, Managerial and Organizational Challenges</b> .....	296
<i>Aasen Tmb, Mølsvik Mj, Aarlién R, Bredesen R, Munkejord St, Brunsvold A, Gundersen T</i>	
<b>CO<sub>2</sub> Field Lab at Svelvik Ridge: Site Suitability</b> .....	306
<i>Audun Bakk, Jean-Francois Girard, Erik Lindeberg, Eyvind Aker, Frederic Wertz, Maike Buddensiek, Maria Barrio, David Jones</i>	
<b>BIGCO<sub>2</sub> R&amp;D Platform – Objectives and Achievements</b> .....	313
<i>Mona J. Mølsvik, David Berstad, Amy Brunsvold, Øyvind Langørgen, Paul Inge Dahl, Mario Ditaranto, Alv-Arne Grimstad, Inna Kim, Rune Aarlién</i>	
<b>ECCO Tool: Analysis of CCS Value Chains</b> .....	323
<i>Sigurd Weidemann Løvseth, Per Eilif Wahl</i>	
<b>Cost Estimation of Fossil Power Plants with Carbon Dioxide Capture and Storage</b> .....	333
<i>Diana Voll, Armin Wauschkuhn, Rupert Hartel, Massimo Genoese, Wolf Fichtner</i>	
<b>CCS Chain Capacity Selection for Flexible Load Power Plant</b> .....	343
<i>Alexey Kalinin, Jo Husebye, Amy Brunsvold, Simon Roussanally</i>	
<b>Energy Policy Scenarios of CCS Implementation in the Greek Electricity Sector</b> .....	354
<i>Christos Ioakimidis, Nikolaos Koukouzas, Anna Chatzimichali, Sergio Casimiro, Ana Macarulla</i>	
<b>Comparison of Aspen HYSYS and Aspen Plus Simulation of CO<sub>2</sub> Absorption into MEA from Atmospheric Gas</b> .....	360
<i>Lars Erikoi</i>	
<b>A Multivariable Approach for Control System Optimization of IGCC with CCS in DECAR Bit Project</b> .....	370
<i>A. Bardi, G. Pannocchia</i>	
<b>Techno Economic Evaluation of Amine based CO<sub>2</sub> Capture: Impact of CO<sub>2</sub> Concentration and Steam Supply</b> .....	381
<i>Jo Husebye, Amy L. Brunsvold, Simon Roussanally, Xiangping Zhang</i>	
<b>Aspen Plus Simulation of CO<sub>2</sub> Removal from Coal and Gas Fired Power Plants</b> .....	391
<i>Udara Sampath P. R. Arachchige, Morten Christian Melaaen</i>	
<b>A Modular Geoelectrical Monitoring System as Part of the Surveillance Concept in CO<sub>2</sub> Storage Projects</b> .....	400
<i>Cornelia Schmidt-Hattenberger, Peter Bergmann, Tim Labitzke, Stephan Schröder, Kay Krüger, Carsten Rucker, Hartmut Schütt</i>	
<b>Sensitivity of Hydrocarbon Recovery by CO<sub>2</sub> Injection to Production Constraints and Fluid Behavior</b> .....	408
<i>C. Barroux, N. Maurand, N. Kubus, D. Domitrovic</i>	
<b>Effects of CO<sub>2</sub> Storage in Coal on Coal Properties</b> .....	426
<i>Tshifhiwa Maphala, Nicola J. Wagner</i>	
<b>Feasibility of Monitoring Techniques for Substances Mobilised by CO<sub>2</sub> Storage in Geological Formations</b> .....	439
<i>Linda Stalker, Ryan Noble, Bobby Pejic, Matthew Leybourne, Allison Hortle, Karsten Michael, Tim Dixon, Ludmilla Basava-Reddi</i>	
<b>Impacts of Possible CO<sub>2</sub> Seepage from Sub-Seabed Storage on Trace Elements Mobility and Bacterial Distribution at Sediment-Water Interface</b> .....	449
<i>Murat V. Ardelan, Kathrine Sundeng, Gøril A. Slinde, Nina S. Gjøvsund, Trond Nordtug, Anders J. Olsen, Eiliv Steinnes, Tore A. Torp</i>	
<b>Well Integrity: Modeling of Thermo-Mechanical Behavior and Gas Migration along Wells-Application to Ketzin Injection Well</b> .....	462
<i>Le Guen Yvi, Asamoto Shingo, Houdu Emmanuel, Poupard Olivier</i>	
<b>Innovative Leaching Tests of an Oilwell Cement Paste for CO<sub>2</sub> Storage: Effect of the Pressure at 80°C</b> .....	472
<i>Nadine Neuville, Georges Aouad, Eric Lecolier, Denis Damidot</i>	

<b>Evaluation of the CO<sub>2</sub> Leakage Risk Along the Abandoned Wells in the French Context</b> .....	480
<i>S. Sy, A. Fabbri, Isaline Gravaud, D. Seyedi</i>	
<b>Basin-Scale Assessment for CO<sub>2</sub> Storage Prospectivity in the Province of Québec, Canada</b> .....	487
<i>Michel Malo, Karine Bédard</i>	
<b>Regional Model Development and Study of Pressure Propagation</b> .....	495
<i>Carsten M. Nielsen, Peter Frykman</i>	
<b>Small-Scale CO<sub>2</sub> Injection into a Deep Geological Formation at Heletz, Israel</b> .....	504
<i>Auli Niemi, Jacob Bensabat, Fritjof Fagerlund, Martin Sauter, Julia Ghergut, Tobias Licha, Thomas Fierz, Gabriele Wiegand, Maria Rasmusson, Kristina Rasmusson, Vladimir Shivelman, Michael Gendler, Mustang Partners</i>	
<b>Displacement and Mass Transfer of CO<sub>2</sub>/Brine in Sandstone</b> .....	512
<i>H. Ott, S. Berg, S. Oedai</i>	
<b>Pore-Scale Micro-CT Imaging: Cluster Size Distribution During Drainage and Imbibition</b> .....	521
<i>A. Georgiadis, S. Berg, G. Maitland, H. Ott</i>	
<b>Liquefied CO<sub>2</sub> Injection Modelling</b> .....	527
<i>Espen Krogh, Robert Nilsen, Roar Henningsen</i>	
<b>Author Index</b>	