



DECHEMA

Gesellschaft für Chemische Technik
und Biotechnologie e.V.

ICCDU XVII

23-27 June 2019

Aachen, Germany

From Science to Application

PROGRAMME

23 – 27 June 2019 · Aachen · Germany

ICCDU 2019 17th International Conference on Carbon Dioxide Utilization

www.dechema.de/ICCDU2019





YOU CAN'T TURN CO₂ INTO A MATTRESS. WHY NOT?

#CO2Dreams #PushingBoundaries

At Covestro, we succeeded in transforming carbon dioxide from a problem into a value – by developing a technology for foam production that replaces part of the crude oil with CO₂. Find out more about our technologies and high-tech polymers that push the boundaries of possibility. For a more sustainable and brighter world. covestro.com



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As of 6 June 2019, subject to alterations.

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GREETINGS / SPONSORS

GREETINGS

For a long time, the chemical transformation of carbon dioxide has been considered the realm of nature only. The chemical industry has utilized it as raw material merely in a very limited set of chemical syntheses, most prominent perhaps in the production of urea or Aspirin. With the discussions on peak oil and in particular on climate change, the perception of CO₂ turned more and more into that of an environmentally malicious greenhouse gas without economic value. Already more than 25 years ago, however, a number of scientists grasped the yet hidden, unexplored potential of CO₂ as versatile chemical building block:

- a) CO₂ can serve as alternative to fossil-based resources,
- b) CO₂ can contribute to circular economy by bringing carbon back into the value chain, and
- c) CO₂ together with renewable energy can sustainably replace high-energy components of the energetic and chemical value chains.

These scientists started to take a long ride on CO₂, a molecule, which initially seemed to be a “dead horse” regarding its reactivity and thermodynamic characteristics. Starting from curiosity driven and very fundamental investigations, carbon capture and utilization became the overarching goal of the studies of this growing scientific community, a goal, which finally covered the complete life cycle of CO₂ from cradle to cradle. The International Conference on Carbon Dioxide Utilization (ICCDU) soon became the central platform for researchers from all over the world to exchange their latest results and to discuss technological concepts.

Today, scientific progress has significantly broadened the scope of what had initially been view as ‘dream reactions’ and ‘dream processes’ based on carbon dioxide utilization. It covers CO₂ capture and separation, and the conversion of CO₂ to fuels, chemicals, and polymers, applying a rich set of technologies such as diverse catalytic approaches, electrochemical or plasma-chemical methods. With the increasing availability of cost effective green energy, “Power-to-X” technologies are gaining increasing importance, for example through the utilization of carbon monoxide or other components, which can be reformed from CO₂. Finally, nature’s example of using CO₂ as essential building block for biomass, which has been successful for aeons, has been taken up and widely extended to biotechnological, biocatalytic and other bio-borne conversions of CO₂.

Several of these approaches have gone through all stages of an innovation process and have reached a high level of maturity. Creative inventions to utilize CO₂ have become innovative processes and products, which are now being commercialized by major industrial players as well as by agile start-up companies. A broad scientific fundament, a vivid scientific community, and an emerging commercialization of CO₂-borne products form the basis of this exciting development to establish CO₂ capture and utilization as future sustainable element for chemical production.

We are looking forward to welcome the delegates of ICCDU XVII in Aachen to discuss the latest scientific results and to review the dynamic development “From Science to Application” in the field!

Prof. Dr. Walter Leitner (Chairman)
Max Planck Institute for Chemical Energy Conversion
and RWTH Aachen University

Dr. Christoph Gürtler (Co-Chairman)
Covestro Deutschland AG
Head of Catalysis and Technology Incubation

GOLD SPONSORS

We would like to thank our Sponsors



COMMITTEES

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Christoph Gürtler	Covestro Deutschland AG, Leverkusen/D

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NATIONAL SCIENTIFIC COMMITTEE

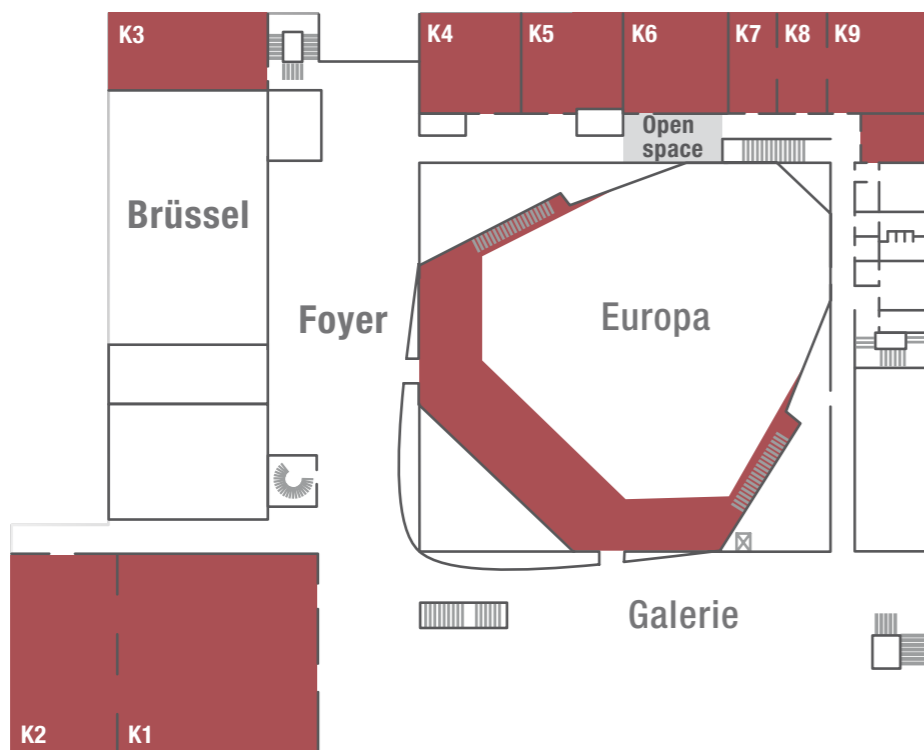
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Stefanie Roth	Forschungszentrum Jülich GmbH/D
Thomas Schaub	BASF SE, Ludwigshafen/D
Jennifer Strunk	Leibniz-Institut für Katalyse e.V., Rostock/D
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INTERNATIONAL SCIENTIFIC COMMITTEE

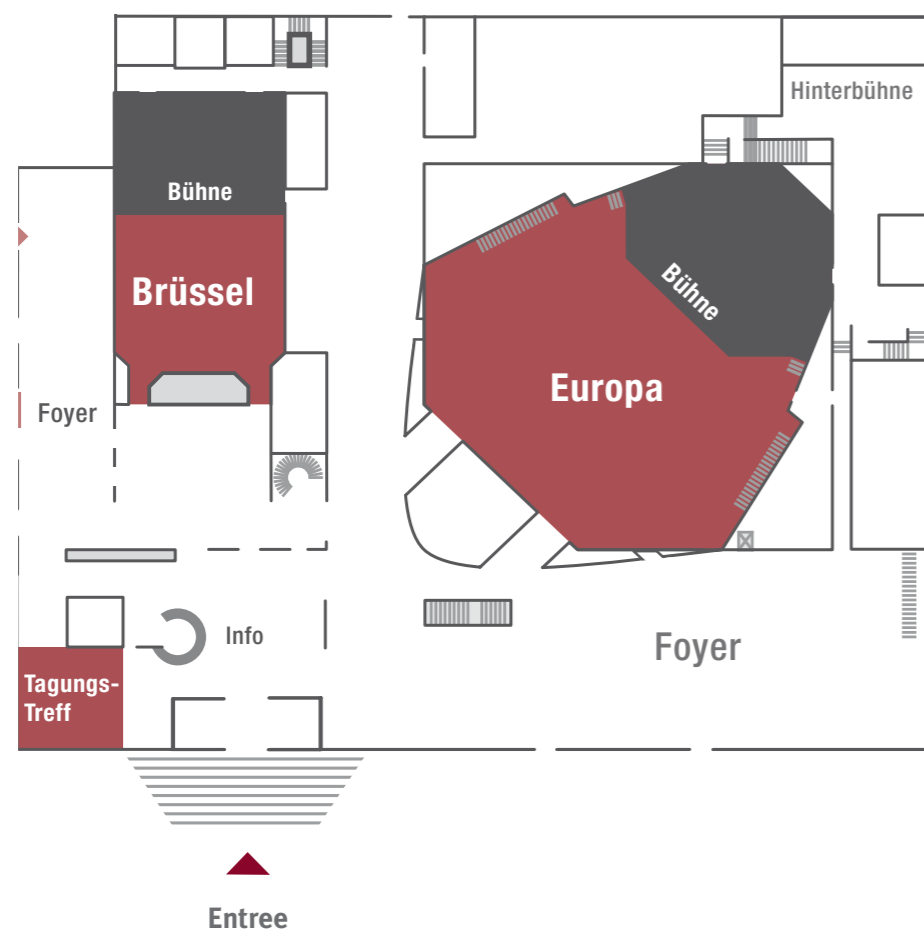
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Robert Tabita	USA
Ron Zevenhoven	Finland
Andrew B. Bocarsly	USA

VENUE

1st Floor



Ground Floor



PROGRAMM AT A GLANCE

Sunday, 23 June 2019

Brüssel	
16:00	Registration
17:30	WELCOME C. Gürtler, Covestro AG, Leverkusen/D
17:40	WELCOME LECTURE A. Quadrelli, CPE Lyon/F
18:10	GET TOGETHER (18:10 – 19:30)

Monday, 24 June 2019

Brüssel																								
OPENING CEROMONY																								
09:30	OPENING W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D																							
	WELCOME M. Wessling, RWTH Aachen/D																							
10:00	Honorary Chairman E. Dinjus																							
10:15	PLENARY LECTURE R. Schlögl, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin/D																							
11:00	Coffee break																							
	<table border="1"> <thead> <tr> <th>Brüssel</th> <th>K2</th> <th>K3</th> <th>K4</th> </tr> </thead> <tbody> <tr> <td>Kopernikus P2X Day P2X as a key technology for integrated energy</td> <td>CO₂-capture and separation Materials for Capture Processes</td> <td>CO₂ to carbonate Industry-perspective on carbonation</td> <td>CO₂ to chemicals CO₂ to Hydrocarbons</td> </tr> <tr> <td><i>Chair:</i> G. Schmid</td> <td>H. Yamada</td> <td>P. Knops</td> <td>T. Schaub</td> </tr> <tr> <td>11:30 R.-A. Eichel</td> <td>Q. Wang</td> <td rowspan="2">J. Theulen</td> <td>Y. Sun</td> </tr> <tr> <td>11:50 J. Baumgartner</td> <td>H. Li</td> <td>S.-M. Hwang</td> </tr> <tr> <td>12:10 L. Schulz</td> <td>S. Chen</td> <td>P. Carey</td> <td>X. Guo</td> </tr> </tbody> </table>	Brüssel	K2	K3	K4	Kopernikus P2X Day P2X as a key technology for integrated energy	CO₂-capture and separation Materials for Capture Processes	CO₂ to carbonate Industry-perspective on carbonation	CO₂ to chemicals CO ₂ to Hydrocarbons	<i>Chair:</i> G. Schmid	H. Yamada	P. Knops	T. Schaub	11:30 R.-A. Eichel	Q. Wang	J. Theulen	Y. Sun	11:50 J. Baumgartner	H. Li	S.-M. Hwang	12:10 L. Schulz	S. Chen	P. Carey	X. Guo
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16:30	POSTERPARTY																							
18:00	End of Conference Day																							

PROGRAMME AT A GLANCE

Tuesday, 25 June 2019

Brüssel				
08:30	PLENARY LECTURE P. Dröll, European Commission, Research and Innovation, Brussels/BE			
	Brüssel	K2	K3	K4
	Policy Session CO ₂ Forum	CO ₂ to carbonates Carbonation of industrial (by)products and wastes	CO ₂ to chemicals CO ₂ to Oxygenates	
Chair:	A. Quadrelli	P. Carey	M. North	
09:20	Introduction A. Quadrelli			
09:30	S. Wilmet	L. Esquivias	E. Gyenge	
09:50	F. Ramos	K. Han	K.Parkhomenko	
10:10	A. Bazzanella/F. Ausfelder	P. Knops	P. Vidinha	
10:30	Panel discussion: Policy perspectives		J. D. Rozendo	
10:50		A. V.M. Nunes	J. Boon	
11:10	Coffee break			
	Power to X	CO ₂ to carbonates Role of catalysts in carbonation/ mineralization	CO ₂ to chemicals CO ₂ to Oxygenates	Policy Session
Chair:	G. Schmid	K. Lamb	A. Kleij	A. Bazzanella
11:30	B. Stefansson	N. Zhang	K. Liu	S. Roth
11:50		B. Olaniyan	S. Bontemps	L. Popin
12:10	A. de Lhoneux	C. Mota	M. Siebert	J. Kemper
12:30	P. Styring		T. Kaiser	B. Olfe-Kräutlein
12:50	T. E. Müller	A. Brège	W. Huang	A. Chavez
13:10	Lunch break			
	Power to X Methanation	CO ₂ to carbonates Natural materials mineralization	Photocatalysis	Acceptance-Workshop Public perceptions, acceptance, and communication design for CCU Products
Chair:	A. Ausfelder	S. -E. Park	A. Bocarsly	K. Arning
14:10	S. Santhanam	G. Brent	J. Tan	Introduction K. Arning/A. Linzenich
14:30	S. Garcia	J. Wang	K. Teramura	
14:50	Z. Veselovskaya	A. M. Bremen	H. S. Jung	
15:10	R. Chauvy	A. Elhoweris	Y. Amao	
15:30	Coffee break			
	Power to X Syngas & Chemicals	CO ₂ to carbonates	Electrocatalysis	Roadmap and Guidelines
Chair:	P. Styring	J. Theulen	K. Teramura	S. Roth
15:50	L. Dittrich	A. Kaleva	K. Torbensen	S. Bringezu
16:10	S. Pitter	K. Lamb	M. König	
16:30	J. Kärki	A. Park	E. Yu	A. Sternberg
16:50	S. Gupta		A. Bocarsly	N. Thonemann
17:10	End of Conference Day			

PROGRAMME AT A GLANCE

Wednesday, 26 June 2019

Brüssel				
08:30	PLENARY LECTURE H. Bach, Covestro AG, Leverkusen/D			
	Brüssel	K2	K3	K4
	CO ₂ to chemicals CO ₂ to Hydrocarbons		Electrocatalysis	LCA /TEA
Chair:	E. Dinjus		E. Gyenge	K. Armstrong
09:20	C. Song		U.-P. Apfel	T. Wich
09:40	N. Heikkinen		S. Stojkovič	J. Kleinekorte
10:00	C. Henriques		K. junge Puring	Q. Shen
10:20	Coffee break			
	CO ₂ to Polymers	CO ₂ to chemicals CO ₂ for organic synthesis	Catalysis	LCA /TEA
Chair:	C. Gürtler	A. Park	R. Heyn	A. Bardow
11:00	M. Machat	A. Kleij	L. Gonsalvi	A. Zimmermann
11:20	J. Norwig		Y. Himeda	B. Kolosz
11:40	K. Melin	M. North	G. Zhang	S. Turnau
12:00	B. Grignard	D.-G. Yu	S. Rogg	K. Armstrong
12:20	Y. Gu	C. Johnson	S. -E. Park	C. Zhang
12:40	X. Feng	B. Buckley	H. Kawanami	S. McCord
13:00	Lunch break			
	CO ₂ to chemicals CO ₂ for organic synthesis	CO ₂ reforming	Biotechnological CO ₂ -conversion	LCA
Chair:	S. Müller	P. Sanderson	H. de Wever	B. Olfe-Kräutlein
14:00	N. Sun	M. R. Damacherla	L. Maia	A. Bardow
14:20	M. Tamura	M. Lee	I. K. Stoll	
14:40	T. Schaub	H. Pfeiffer	T. Jung	S. Troy
15:00	C. Maquilón		E. Yu	A. Lozanovski
15:20	Coffee break			
	Start-up Workshop and discussion	Plasma technologies for CO ₂ conversion	CO ₂ to chemicals CO ₂ to methanol	
Chair:	V. Sick	R. Rothman	T. E. Müller	
15:50	V. Sick G.W. Quance M. Kember	A. Call	J. Wang	
16:10		F. Ahmad	B. Xie	
16:30		Y. Mu	N. Podrojková	
16:50	Discussion Participants: C. Gürtler, M. Kember, G.W. Quance, E. Barsch	P. Kaliyappan	X. Tu	
17:10		D. Ray	C. -J. Liu	
17:30	End of Conference Day			
19:30	Europa	CONFERENCE DINNER (19:30 – 23:00)		

PROGRAMME AT A GLANCE

Thursday, 27 June 2019

	Brüssel	K2	K3	K4
	Power to X Process-Engineering & Techno- Economic Assesments	Biotechnological CO ₂ -conversion	Capture and separation	LCA/TEA
Chair:	A. Varone	E. Yu	C. Song	A. Zimmermann
09:30	H. Schramm	J. Mampel	S. Chen	H. Ostovari
09:50	F. Ortloff	H. de Wever	W. Pragot	S. Kaiser
10:10	J. Burre	P. Skoczinski	C. Pinheiro	K. Armstrong
10:30	Coffee break			
	Power to X	Biotechnological CO ₂ conversion and LCA	Capture and separation	CO ₂ to chemicals CO ₂ to methanol
Chair:	F. Ortloff	D. Krämer	O. Hurtig	J. Boon
11:00	K. Hortmann	L. Rachbauer	R. Edwards	T. Schuhmann
11:20	G. Herz	H. de Wever	B. Alcántar Vázquez	J. Stewart
11:40	A. Varone	M. Bachmann	A. Lockley	M. Gothe
12:00	CLOSING REMARKS (12:00 – 12:30)			

PROGRAMME

Sunday, 23 June 2019

16:00	Registration
	<i>Room: Brüssel</i>
17:30	WELCOME C. Gürtler, Covestro AG, Leverkusen/D
17:40	WELCOME LECTURE CO ₂ – a molecule for all seasons A. Quadrelli, CPE Lyon/F
18:10	GET TOGETHER (welcome reception) (18:10 – 19:30)



MONDAY, 24 JUNE 2019

LECTURE PROGRAMME

Room: Brüssel		
Chair: W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D		
09:30	OPENING CEREMONY	09:30
09:45	WELCOME M. Wessling ¹ ; ¹ RWTH Aachen/D	09:45
10:00	Catalytic Conversion of CO ₂ – Ups and Downs in Science and Innovation E. Dinjus ¹ ; ¹ Karlsruhe Institute of Technology (KIT), Eggenstein-Leopoldshafen/D	10:00
10:15	PLENARY LECTURE CO ₂ as feedstock for synthetic fuels – status and perspectives R. Schlögl ¹ ; ¹ Max Planck Institut für chemische Energiekonversion, Mülheim a.d. Ruhr/D	10:15
11:00	Coffee break	11:00

Room: Brüssel		Room: K 2	
KOPERNIKUS P2X Session P2X as a key technology for integrated energy		CO ₂ -CAPTURE AND SEPARATION Materials for Capture Processes	
Chair: G. Schmid, Siemens AG/D		Chair: H. Yamada, Research Institute of Innovative Technology for the Earth (RITE), Kizugawa, Kyoto/J	
11:30	Power-to-X: Storage, Utilization and Valorization of CO ₂ R.-A. Eichel, Forschungszentrum Jülich GmbH/D	11:30	Recent advances in intermediate- and high-temperature CO ₂ capture materials Q. Wang ¹ ; ¹ Beijing Forestry University, Beijing/CN
11:50	Renewable hydrocarbons from water, CO ₂ and renewable energy J. Baumgartner, K. Hauptmeier, sunfire GmbH/D	11:50	Activation of Starbon® materials with KOH or CO ₂ to enhance CO ₂ capture H. Li ¹ ; ¹ University of York, York/UK
12:10	Integration of Modular Technologies into P2X Value Chains L. Schulz, INERATEC GmbH, Karlsruhe/D	12:10	CO ₂ Capture in Nonaqueous Solution Enhanced by Nanoparticles of TiO ₂ S. Chen ¹ ; ¹ Qingdao University/CN

Room: Brüssel		Room: K 2	
KOPERNIKUS P2X Session Power-to-Chemicals		CO ₂ -CAPTURE AND SEPARATION CO ₂ -adsorption	
Chair: R. Dittmeyer, Karlsruhe Institut für Technologie/D		Chair: S. Chen, Dalian University of Technology, Dalian/CN	
14:00	Renewable Synthesis of chemical Feedstock and Specialties employing low temperature electrochemical reduction of CO ₂ G. Schmid, Siemens AG, /D	14:00	Modelling CO ₂ Adsorption in Fixed-bed Columns using Long Short Term Memory (LSTM) Neural Network C. Bajamundi ¹ ; ¹ VTT Technical Research Centre of Finland, Jyväskylä/FIN
14:20		14:20	Providing CO ₂ by pressure-swing chemical absorption: Ionic liquid-based CO ₂ separation technology T. Stegmaier ¹ ; J. Schäffer ¹ ; F. Ortloff ¹ ; F. Graf ¹ ; T. Kolb ¹ ; ¹ Engler-Bunte-Institut, KIT, Karlsruhe/D
14:40	On the development of Gas Diffusion Electrodes for electrochemical CO ₂ reduction A. Lüken, Covestro AG, Leverkusen/D	14:40	Gas adsorption properties of electrospun carbon nanofibres for CO ₂ valorization and storage A. Kretzschmar ¹ ; H. Tempel ¹ ; H. Kungl ¹ ; R. Eichel ¹ ; ¹ Forschungszentrum Jülich GmbH, Jülich/D

Room: Brüssel		Room: K 2	
KOPERNIKUS P2X Session Power-to-Fuels		CO ₂ -CAPTURE AND SEPARATION Amine based CO ₂ capture	
Chair: R.-A. Eichel, Forschungsinstitut Jülich GmbH/D		Chair: P. Behr, University Duisburg-Essen/D	
15:30	Kopernikus P2X: Potential of OME-based Synthetic Fuel blends to reduce Engine Emissions S. Pischinger, B. Lehrheuer, A. Omari, RWTH Aachen/D	15:30	Simulation of amine-based CO ₂ capture using transition state theory H. Yamada ¹ ; ¹ Research Institute of Innovative Technology for the Earth (RITE), Kizugawa, Kyoto/J
15:50	Power-to-Fuels – Overview and recent progress towards integrated processes based on modular units R. Dittmeyer, Karlsruher Institut für Technologie/D	15:50	Enhanced kinetics for CO ₂ sorption in amine-functionalized mesoporous silica nanosphere with inverted cone-shaped pore structure F. Lou ¹ ; A. Zhang ¹ ; G. Zhang ¹ ; L. Ren ¹ ; X. Guo ¹ ; C. Song ¹ ; ¹ Dalian University of Technology, Dalian/CN
16:10	Catalyst development for hydrogen release and transfer from LOHC systems P. Wasserscheid ¹ ; ¹ University of Erlangen-Nuremberg (FAU)/D	16:10	Amine solvent development for CO ₂ capture and its application in China industry S. Chen ¹ ; ¹ Dalian University of Technology, Dalian/CN
16:30	POSTERPARTY (16:30 – 18:00)	16:30	POSTERPARTY (16:30 – 18:00)

LECTURE PROGRAMME

MONDAY, 24 JUNE 2019

Room: Brüssel		
Chair: W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D		
09:30	OPENING CEREMONY	09:30
09:45	WELCOME M. Wessling ¹ ; ¹ RWTH Aachen/D	09:45
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11:00	Coffee break	11:00

Room: K 3		Room: K 4	
CO ₂ TO CARBONATE Industry-perspective on carbonation		CO ₂ TO CHEMICALS CO ₂ to Hydrocarbons	
Chair: P. Knops, Green Minerals/NL		Chair: T. Schaub, BASF SE, Ludwigshafen am Rhein/D	
11:30	How concrete and feed can use CO ₂ to contribute to Paris-agreement: from R&D to commercialization J. Theulen ¹ ; ¹ HeidelbergCement AG, Eindhoven/NL	11:30	Direct CO ₂ hydrogenation into value-added hydrocarbons with high selectivity P. Gao ¹ ; C. Yang ¹ ; Y. Sun ¹ ; ¹ Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai/CN
11:50		11:50	Single-atom cobalt and nitrogen coordinated carbon catalyst for CO ₂ hydrogenation to liquid hydrocarbons S. Hwang ¹ ; ¹ Korea Research Institute of Chemical Technology (KRICT), Daejeon/ROK
12:10	The development of carbonation in a box – commercial direct flue gas capture and utilisation. P. Carey ¹ ; ¹ Carbon8 Systems Limited, Chatham Maritime/UK	12:10	Highly Active and Stable Catalysts Derived from ZIFs for Selective CO ₂ Hydrogenation to Hydrocarbons X. Guo ¹ ; J. Liu ¹ ; G. Zhang ¹ ; A. Zhang ¹ ; C. Song ² ; ¹ Dalian University of Technology, Dalian/CN; ² Pennsylvania State University, University Park/CN

Room: K 3		Room: K 4	
CO ₂ TO CARBONATE Carbonation of concrete/ recycled aggregates		CO ₂ TO CHEMICALS CO ₂ to Hydrocarbons	
Chair: C. Mota, Federal University of Rio de Janeiro, Rio de Janeiro/BR		Chair: C. Song, Pennsylvania State University, University Park, Pennsylvania/USA	
14:00	Carbon Dioxide Sequestration in Concrete Materials and Products C. Shi ¹ ; ¹ Hunan University, Changsha/CN	14:00	Particle Size Effect of Unpromoted Iron-based catalyst in CO ₂ Hydrogenation to Hydrocarbons Reaction J. Zhu ¹ ; ¹ Dalian University of Technology, Dalian/CN
14:20	Simultaneous CO ₂ and Steam Curing of Precast Concrete I. Amr ¹ ; B. Fadhel ¹ ; S. Park ¹ ; A. Hunaidy ¹ ; R. Bamagain ¹ ; ¹ Saudi Aramco, Dhahran/SAR; ² Korea Advanced Institute of Science and Technology, Daejeon/ROK	14:20	Carbon Dioxide Reduction: The Problem with Hydrogen P. Styring ¹ ; ¹ The University of Sheffield, Sheffield/UK
14:40	Carbon Dioxide Utilization for transformation of demolishing waste into cementitious materials J. Skocek ¹ ; M. Zajac ¹ ; M. Ben Haha ¹ ; ¹ HeidelbergCement AG, Leimen/D	14:40	Direct synthesis of methane from bicarbonates and hydrogen to form carbonates as CO ₂ absorbent P. Behr ¹ ; ¹ Universität Duisburg-Essen, Essen/D

Room: K 3		Room: K 4	
ELECTRO- AND PHOTOCATALYSIS		CO ₂ TO CHEMICALS CO ₂ to Hydrocarbons	
Chair: A. Krüger, Universität Würzburg, Würzburg/D		Chair: D. Krämer, DECEMA e.V., Frankfurt am Main/D	
15:30	Multiphysics-Modeling-Based Design of Solar Fuel Devices for CO ₂ Reduction H. Zhang ¹ ; H. Wang ² ; J. Xuan ¹ ; ¹ Loughborough University, Loughborough/UK; ² Imperial College London, London/UK	15:30	The development and validation of a microchannel reactor for carbon dioxide methanation N. Engelbrecht ¹ ; D. Bessarabov ¹ ; ¹ North-West University, Potchefstroom/ZA
15:50	CO ₂ reduction using Pt ₀ Fe ₈₀ /poly(triphenylamine) electrodes in a gas-diffusion electrolyzer G. Gobaille-Shaw ¹ ; V. Del Angel Hernandez ¹ ; ¹ University of Bristol/UK	15:50	Catalytic carbonylation of olefins with carbon dioxide X. Zhan ¹ ; C. Shen, L. Hen ¹ ; ¹ Chinese Academy of Sciences, Lanzhou/CN
16:10	Photocatalytic fixation of CO ₂ with epoxides to form cyclic carbonates using Ru-TiO ₂ Hyper-branched nanorods S. Gavrielides ¹ ; j. tan ¹ ; E. Sanchez Fernandez ¹ ; M. Maroto-Valer ¹ ; ¹ Heriot Watt University, Edinburgh/UK	16:10	Carbon Flows in the Swiss Energy Transition Z. Stadler ¹ ; ¹ Hochschule für Technik Rapperswil, Rapperswil/CH
16:30	POSTERPARTY (16:30 – 18:00)	16:30	POSTERPARTY (16:30 – 18:00)

TUESDAY, 25 JUNE 2019

LECTURE PROGRAMME

Room: Brüssel		Room: K 2	
Chair: C. Gürtler, Covestro Deutschland AG, Leverkusen/D		Chair: P. Carey, Carbon 8 Systems Limited/UK	
08:30	PLENARY LECTURE R&I Policy and support for CO ₂ utilisation – what is on the Horizon P. Dröll ¹ , ¹ European Commission, Research and Innovation, Brussels/B	08:30	
CO₂ BUSINESS MODELS Climate relevance and policies		CO₂ TO CARBONATES Carbonation of industrial (by) products and wastes	
Chair: A. Quadrelli, CPE Lyon, Lyon/F		Chair: P. Carey, Carbon 8 Systems Limited/UK	
09:20	Introduction A. Quadrelli, CPE Lyon, Lyon/F	09:20	
09:30	Prospects and challenges for the chemical industry S. Wilmet, Cefic, Brussels/B	09:30	CO₂ mineral sequestration by industrial wastes in Andalusie L. Esquivias ¹ , ¹ University of Seville, Sevilla/E
09:50	A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy F. Ramos ¹ , ¹ DG Climate Action, European Commission, Brussels/B	09:50	Technical and Economical Evaluations of A Co-production Process of CaCO₃ and NaHCO₃ Utilizing CO₂ and Steel Slag S.-H. Kim ¹ ; M. W. Lee ² ; G. Kim ³ ; K. Han ³ ; ¹ Keimyung University, Gwangyang/ROK; ² RIST, Pohang/ROK; K. Han, ³ RIST, Gwangyang/ROK
10:10	Low carbon chemical industry – fact or (science) fiction A. Bazzanella ¹ ; F. Ausfelder ¹ ; ¹ DECHEMA e.V., Frankfurt am Main/D	10:10	Mineralization from lab to business. From academic interest towards realization P. Knops ¹ ; ¹ Green Minerals, Twello/NL
10:30	Panel discussion: Policy perspectives (10:30 – 11:00) D. Dröll, S. Wilmet, F. Ramos, A. Bazzanella	10:50	Advantages of using ionic liquids high pressure biphasic systems in the homogeneous catalytic production of carbonates from CO₂ A. Nunes ¹ ; ¹ LAQV-REQUIMTE/ FCT - NOVA University of Lisbon, Caparica/P
11:10	Coffee break	11:10	
POWER TO X		CO₂ TO CARBONATES Role of catalysts in carbonation/mineralization	
Chair: G. Schmid, Siemens AG, Erlangen/D		Chair: K. Lamb, Green Chemistry Centre of Excellence, University of York, York/UK	
11:30	Industrial scale Power-to-X: the success story of Vulcanol B. Stefansson ¹ ; ¹ Carbon Recycling International, Kopavogur/IS	11:30	CO₂ sequestration by precipitating carbonates from aqueous alkaline solution with nickel nanoparticles in tubular reactor N. Zhang ¹ ; R. Santos ² ; L. Siller ¹ ; ¹ Newcastle University, Newcastle upon Tyne/UK; ² University of Guelph/CDN
11:50		11:50	Direct synthesis of chloromethyl ethylene carbonate via CO₂ utilisation using a novel Zr/ZIF-8 catalyst B. Olaniyan ¹ ; ¹ London South Bank University, London/UK
12:10	Power To X - from electrons to molecules A. de Lhoneux ¹ ; D. Thomas ¹ ; ¹ Hydrogenics GmbH, Oevel/B	12:10	Production of Organic Carbonates over Heterogeneous Catalysts: Experimental and Theoretical Insights C. Mota ¹ ; ¹ Federal University of Rio de Janeiro, Rio de Janeiro/BR
12:30	Planes, Trains and Automobiles: The Case for Synthetic e-Fuels in a Circular Economy P. Styring ¹ ; ¹ The University of Sheffield, Sheffield/UK	12:30	
12:50	Converting the Fluctuating Supply of Renewable Energy to Storable and Transportable Energy Carriers T. Müller ¹ ; ¹ Ruhr-Universität Bochum, Bochum/D	12:50	Mechanistic and kinetic insights into the CO₂ addition over diols promoted by DBU/alkylating agent dual systems A. Brège ¹ ; ¹ Bordeaux/F
13:10	Lunch break	13:10	
POWER TO X Methanation		CO₂ TO CARBONATES Natural materials mineralization	
Chair: A. Ausfelder, DECHEMA e.V., Frankfurt am Main/D		Chair: S.-E. Park, Inha University, Incheon/ROK	
14:10	Reduction of carbon dioxide and steam using high temperature electrolysis in power to methane systems S. Santhanam ¹ ; M. Heddrich ¹ ; ¹ DLR/Institute of engineering thermodynamics, Stuttgart/D	14:10	Mineral Carbonation for CO₂ Utilisation: Developments in the MCI Project G. Brent ¹ ; ¹ Orica, Kurri Kurri/AUS
14:30	CO₂ conversion via methanation reaction using Li₄SiO₄-NiO composites as dual functional materials E. Vera ¹ ; M. Maroto-Valer ¹ ; S. Garcia ¹ ; ¹ Heriot-Watt University, Edinburgh/UK	14:30	NaHCO₃-promoted H₂ Production during Water-Olivine Reactions under High-temperature conditions J. WANG ¹ ; N. Watanabe ² ; A. Okamoto ² ; K. Nakamura ² ; T. Komai ² ; ¹ Tohoku University, Aoba-Ku, Sendai-Shi, Miyagi-Ken/J; ² Tohoku University, Sendai/J
14:50	Direct Air Capture/Methanation process for transforming atmospheric CO₂ to CH₄ J. Veselovskaya ¹ ; O. Netskina ¹ ; A. Okunev ¹ ; ¹ Novosibirsk State University, Novosibirsk/RUS; ² Borekov Institute of Catalysis SB RAS, Novosibirsk/RUS	14:50	Towards Model-based Design and Optimization of Mineral Carbonation Processes A. Bremen ¹ ; T. Ploch ¹ ; A. Mhamdi ¹ ; A. Mitsos ¹ ; ¹ RWTH Aachen University, AVT - Aachener Verfahrenstechnik, Process Systems Engineering, Aachen/D
15:10	Production of Synthetic Natural Gas from Industrial Carbon dioxide R. Chauvy ¹ ; L. Dubois ¹ ; D. Thomas ¹ ; G. De Weireld ¹ ; ¹ UMONS, Mons/B	15:10	A conceptual design for a carbon capture and utilisation process for the production of alternative building materials A. Elhoweris ¹ ; ¹ Gulf Organisation for Research and Development, Doha/Q
15:30	Coffee break	15:30	
POWER TO X Syngas & Chemicals		CO₂ TO CARBONATES	
Chair: P. Styring, The University of Sheffield, Sheffield/UK		Chair: J. Theulen, HeidelbergCement AG/D	
15:50	CO₂-valorization by co-electrolysis – A method to produce tailored syngas L. Ditttrich ¹ ; S. Foit ¹ ; I. Vinke ¹ ; L. de Haart ¹ ; R. Eichel ¹ ; ¹ RWTH Aachen University, Aachen/D; ² Forschungszentrum Jülich GmbH, Jülich/D	15:50	Formation of carbonate structures on Zn surfaces by scCO₂ A. Kaleva ¹ ; V. Saarimaa ¹ ; J. Nikkanen ¹ ; T. Tassaing ¹ ; G. Le Bourdon ¹ ; A. Markkula ¹ ; P. Väisänen ¹ ; E. Levänen ¹ ; ¹ Tampere University, Tampere, Finland/FIN; ² Top Analytica Ab, Turku/FIN; ³ University of Bordeaux/F; ⁴ SSAB Europe Oy, Hämeenlinna/FIN
16:10	CO₂-rich syngas, an option for energy-related chemical processes? S. Pitter ¹ ; ¹ KIT, Eggenstein-Leopoldshafen/D	16:10	Influence of mesoporous silica properties on cyclic carbonate synthesis catalysed by supported aluminium(salen) complexes P. Carvalho ¹ ; J. Comerford ¹ ; K. Lamb ¹ ; M. North ¹ ; ¹ SINTEF Materials and Chemistry, Oslo/N; ² Green Chemistry Centre of Excellence, University of York, York/UK
16:30	Climate-friendly hydrocarbons from biogenic carbon dioxide and renewable electricity J. Kärki ¹ ; E. Tsupari ¹ ; M. Hurskainen ¹ ; P. Simell ¹ ; J. Lehtonen ¹ ; ¹ VTT Technical Research Centre of Finland Ltd, Jyväskylä/FIN	16:30	CO₂ Utilization via Carbon Mineralization for Enhanced Extraction of Alkaline Metals and Rare Earth Elements from Unconventional Resources A. Park ¹ ; ¹ Columbia University, New York/USA
16:50	Reversible solid oxide cell based energy storage and methanol production system S. Gupta ¹ ; S. Santhanam ¹ ; M. Heddrich ¹ ; K. Friedrich ¹ ; ¹ German Aerospace Center (DLR), Stuttgart/D	16:50	

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LECTURE PROGRAMME

TUESDAY, 25 JUNE 2019

Room: Brüssel		Room: K 4	
Chair: C. Gürtler, Covestro Deutschland AG, Leverkusen/D		Chair: M. North, University of York, Green Chemistry Center of Excellence, York/UK	
08:30	PLENARY LECTURE R&I Policy and support for CO ₂ utilisation – what is on the Horizon P. Dröll ¹ , ¹ European Commission, Research and Innovation, Brussels/B	08:30	
CO₂ TO CHEMICALS CO ₂ to Oxygenates		POLICY SESSION	
Chair: M. North, University of York, Green Chemistry Center of Excellence, York/UK		Chair: A. Bazzanella, DECHEMA e.V., Frankfurt am Main/D	
09:20		09:20	
09:30	Bimetallic Electrocatalysts for CO₂ Electroreduction to Formate E. Gyenge ¹ ; C. Moore ¹ ; F. Mayer ¹ ; ¹ University of British Columbia, Vancouver/CDN	09:30	PHOENIX – A European Integrated approach to CO₂ valorisation S. Roth ¹ ; ¹ Forschungszentrum Jülich GmbH, Berlin/D
09:50	Carbon dioxide hydrogenation into dimethyl ether with CuO-ZnO-ZrO₂ catalyst and ZSM5 zeolite K. Parkhomenko ¹ ; B. Louis ¹ ; A. Roger ¹ ; ¹ CNRS, University of Strasbourg/F	09:50	Role of Carbon Capture and Utilization and Synthetic Fuels for Climate Mitigation from a Systems Perspective L. Popin ¹ ; ¹ Potsdam Institute for Climate Impact Research (PIK), Potsdam/D
10:10	Development of different hybrid catalytic strategies for the valorisation CO₂ P. Vidinha ¹ ; M. Gothe ¹ ; J. Rozendo ¹ ; A. L. Figueredo ¹ ; M. Villegas ¹ ; M. Infante ¹ ; J. Peloso ¹ ; F. Perez ¹ ; C. Gambini ¹ ; C. Oller ¹ ; L. Rossi ¹ ; R. Bazito ¹ ; ¹ University of Sao Paulo/BR	10:10	Greenhouse gas emissions accounting for CO₂ capture and utilisation (CCU) technologies P. Zakkour ¹ ; G. Cook ¹ ; M. Akai ¹ ; K. Itaoka ¹ ; S. Chae ¹ ; J. Kemper ¹ ; ¹ Carbon Counts, Palgrave/UK; ² IzCNER, Kyushu University, Fukuoka/J; ³ QJ Science, Yokohama/J; ⁴ IEAGHG, Cheltenham/UK
10:30	Mechanistic studies of CO₂ reduction to hydrogenation using homogenous catalysis J. Rozendo de Lima ¹ ; ¹ University of Sao Paulo, São Paulo/BR	10:30	The UN Sustainable Development Goals and CCU Technologies B. Olfe-Krättelein ¹ ; ¹ Institute for Advanced Sustainability Studies, Potsdam/D
10:50	Towards a circular carbon economy with separation-enhanced processes for the capture and utilisation of CO₂ J. Boon ¹ ; ¹ TNO, Petten/NL	10:50	Incentivizing Carbon Utilization Research A. Chavez ¹ ; ¹ Northern Kentucky University, Highland Heights, KY/USA
11:10	Coffee break	11:10	
CO₂ TO CHEMICALS CO ₂ to Oxygenates		WORKSHOP Public perceptions, acceptance, and communication design for CCU Products	
Chair: A. Kleij, Istitute of Chemical Research of Catalonia, Tarragona/ES		Chair: K. Arning, RWTH Aachen University, Aachen/D	
11:30	An Intensified Electro-Catalytic Process for Production of Formic Acid from Power Plant CO₂ Emissions K. Liu ¹ ; ¹ University of Kentucky, Lexington/USA	11:30	Introduction: K. Arning ¹ ; A. Linzenich ¹ ; ¹ RWTH Aachen University, Aachen/D
11:50	Reductive CO₂ homocoupling: de novo synthesis of a C₃ carbohydrate S. Bontemps ¹ ; ¹ LCC-CNRS, Toulouse/F	11:50	Topics of the workshop: What is it good for? Drivers of CCU product acceptance and purchase intentions
12:10	An Alternative Approach towards Formaldehyde: Univariate and Multivariate Analysis in the Ruthenium-Catalyzed Transformation of Carbon Dioxide to Dimethoxymethane M. Siebert ¹ ; M. Seibicke ¹ ; O. Trapp ¹ ; ¹ LMU Munich, München/D	11:50	Putting CCU risks into perspective: A comparison of risk perception across nine energy technologies
12:30	Methyl formate from CO₂: a model based parameter study with experimental validation T. Kaiser ¹ ; M. Scott ¹ ; C. Westhues ¹ ; G. Franciò ¹ ; W. Leitner ¹ ; W. Leitner ² ; A. Jupke ¹ ; ¹ RWTH Aachen University, AVT - Fluid Process Engineering, Aachen/D; ² RWTH Aachen University, ITMC, Aachen/D; ³ MPI for Chemical Energy Conversion, Mülheim an der Ruhr/D	11:50	Towards an informative, comprehensible CCU product label: An empirical study on requirements for CCU labeling
12:50	Photo-thermal coupling factor achieving CO₂ reduction based on palladium-nanoparticle-loaded TiO₂ W. Huang ¹ ; C. Xu ¹ ; Z. Li ¹ ; B. Deng ¹ ; Y. Zhang ¹ ; ¹ Zhejiang University, Hangzhou/CN	12:50	
13:10	Lunch break	13:10	
PHOTOCALYSIS		ROADMAP AND GUIDELINES	
Chair: A. Bocarsly, Princeton University, Princeton, NJ/USA		Chair: S. Roth, PTJ, Berlin/D	
14:10	In₂O₃/Yellow TiO₂ Microspheres for CO₂ photocatalytic Reduction J. Fan ¹ ; M. Maroto-Valer ¹ ; p. renones brasa ² ; V. A. de la Peña ² ; f. fresno garcia ² ; ¹ Heriot-Watt University, Edinburgh/UK; ² Institute IMDEA Energy, Madrid/E	14:10	Promising options and perspectives for supplying chemical and polymer industries with recycled carbon S. Bringezu ¹ ; ¹ University of Kassel, Kassel/D
14:30	Highly Concentrated CO Evolution for Photocatalytic Conversion of CO₂ by H₂O as an Electron Donor K. Teramura ¹ ; ¹ Kyoto University, Kyoto/J	14:30	
14:50	Photocatalytic CO₂ Conversion by ordered mesoporous ternary compound semiconductor materials H. Jung ¹ ; J. Joo ¹ ; K. Lee ¹ ; Y. Kang ¹ ; ¹ Korea University, Seoul/ROK	14:50	
15:10	Light-driven CO₂ reduction to formate with the system of biocatalyst and semiconductor based photocatalyst Y. Amao ¹ ; T. Ishibashi ¹ ; S. Ikeda ² ; ¹ Osaka City University, Osaka/J; ² Konan University, Kobe/J	15:10	
15:30	Coffee break	15:30	
ELECTROCATALYSIS		ROADMAP AND GUIDELINES	
Chair: K. Teramura, Kyoto University, Kyoto/J		Chair: S. Roth, PTJ, Berlin/D	
15:50	Electrocatalytic Reduction of Carbon Dioxide with Earth Abundant Materials: On the Route to Industrial-Scale Applications K. Torbensen ¹ ; B. Boudry ¹ ; W. Braun ¹ ; C. Haegel ² ; M. Robert ¹ ; ¹ Université Paris Diderot, Paris/F; ² Air Liquide, Frankfurt/D	15:50	Temporary storage of CO₂ for CO₂-based products A. Sternberg ¹ ; C. Hank ¹ ; A. Schaad ¹ ; C. Hebling ¹ ; ¹ Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg/D
16:10	Non-aqueous Electrochemical CO₂ Reduction to Oxalic Acid using gas diffusion electrodes M. König ¹ ; E. Klemm ² ; D. Pant ¹ ; ¹ Flemish Institute for Technological Research (VITO), MOL/B; ² University of Stuttgart/D	16:10	Consequential life cycle assessment of carbon capture and use alternatives within the chemical industry N. Thonemann ¹ ; M. Pizzol ² ; ¹ Fraunhofer-Institute for Environmental, Safety, and Energy Technology UMSICHT, Oberhausen/D; ² Aalborg University, Aalborg/DK
16:30	Enhanced selectivity of carbonaceous products from electrochemical reduction of CO₂ in aqueous media E. Yu ¹ ; H. Xiang ¹ ; ¹ Newcastle University, Newcastle upon Tyne/UK	16:30	
16:50	Metal Alloy Electrocatalysis for the Synthesis of Higher Order Organics from CO₂ A. Bocarsly ¹ ; A. Paris ¹ ; ¹ Princeton University, Princeton, NJ/USA	16:50	

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WEDNESDAY, 26 JUNE 2019

LECTURE PROGRAMME

Room: Brüssel		Room: Brüssel	
Chair: W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D			
08:30	PLENARY LECTURE Sustainable polymers based on CO ₂ H. Bach ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D	08:30	PLENARY LECTURE Sustainable polymers based on CO ₂ H. Bach ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D
Room: Brüssel		Room: K 2	
CO ₂ TO CHEMICALS CO ₂ to Hydrocarbons		CO ₂ TO CHEMICALS CO ₂ for organic synthesis	
Chair: E. Dinjus		Chair: A. Park, Columbia University, New York/USA	
09:20	Fe-Cu Bimetallic Catalysts for CO ₂ Hydrogenation to C ₂ + Hydrocarbons C. Song ² ; N. Boreriboon ¹ ; W. Wang ¹ ; X. Jiang ¹ ; X. Nie ¹ ; G. Zhang ¹ ; X. Guo ² ; P. Prasassarakich ³ ; ¹ Pennsylvania State University, University Park, Pennsylvania/USA; ² Dalian University of Technology, Dalian/CN; ³ Chulalongkorn University, Bangkok/T	09:20	New Catalytic Approaches for CO ₂ Valorization into Heterocycles A. Kleij ¹ ; The Institute of Chemical Research of Catalonia (ICIQ), Tarragona/E
09:40	Utilization of captured industrial carbon dioxide for chemicals N. Heikkinen ¹ ; N. Kaisalo ¹ ; P. Eskelinen ¹ ; M. Reinikainen ¹ ; ¹ VTT Technical Research Centre of Finland Ltd, Espoo/FIN	09:40	Reaction of CO ₂ with aziridines M. North ¹ ; ¹ University of York, Green Chemistry Center of Excellence, York/UK
10:00	Roadmap for improving zeolite-based catalysts properties for their application in CO ₂ methanation M.C. Bacariza ² ; S. Amjad ¹ ; J.M. Lopes ¹ ; C. Henriques ¹ ; ¹ Instituto Superior Técnico, Lisbon/P; ² Centro de Química Estrutural, Instituto Superior Técnico, Lisbon/P	10:00	CO ₂ Utilization in Organic Synthesis D. Yu ¹ ; ¹ Sichuan University, Chengdu/CN
10:20	Coffee break	10:20	Coffee break
CO ₂ TO POLYMERS		CO ₂ REFORMING	
Chair: C. Gürtler, Covestro, Leverkusen/D		Chair: P. Sanderson, University of Sheffield, Sheffield/UK	
11:00	Turning CO ₂ -containing industrial waste gases into valuable polyurethanes M. Machat ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D	11:00	Bi-reforming of methane with steam and carbon dioxide : effect of operating conditions M. Damacherla ¹ ; S. G ² ; R. M Badhe ² ; A. Sharma ² ; K. Dr G S ² ; ¹ Indian Oil Corporation Ltd., R&D Centre., Faridabad/IND; ² IOCL R&D Centre, Faridabad/IND
11:20	Carbon dioxide: A valuable raw material for textile industry J. Norwig ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D	11:20	Ce-enhanced Fe ₂ O ₃ /Al ₂ O ₃ for CO ₂ utilization in chemical looping partial oxidation of methane D. Kang ¹ ; M. Lee ¹ ; H. Lim ¹ ; J. Lee ¹ ; ¹ Korea Advanced Institute of Science and Technology (KAIST), Daejeon/ROK
11:40	Fossil free polycarbonate polyols from captured carbon dioxide J. Lehtonen ¹ ; K. Melin ² ; ¹ VTT Technical Research Centre of Finland Ltd, Espoo/FIN; ² VTT Technical Research Centre of Finland, Espoo/FIN	11:40	Advances on CO ₂ sorption and subsequent catalytic conversion to added value products, using alkaline ceramics H. Pfeiffer ¹ ; ¹ Universidad Nacional Autónoma de México, Mexico City/MEX
12:00	Upgrading CO ₂ into novel families of regioregular and functional polymers B. Grignard ¹ ; ¹ University of Liege, Liege/B	12:00	
12:20	Copolymerization of CO ₂ and α,ω -diols using CeO ₂ and 2-furonitrile Y. Gu ¹ ; ¹ Graduate School of Engineering, Tohoku University, Sendai/J	12:20	
12:40	Metal-Free Copolymerization of CO ₂ and Epoxides: From Super High Molar Mass Polycarbonates to Low Molar Mass Polyols X. Feng ¹ ; ¹ King Abdullah University of Science and Technology (KAUST), Thuwal/SAR	12:40	
13:00	Lunch break	13:00	Lunch break
CO ₂ TO CHEMICALS CO ₂ for organic synthesis		CO ₂ REFORMING	
Chair: S. Müller, DECHEMA e.V., Frankfurt am Main/D		Chair: P. Sanderson, University of Sheffield, Sheffield/UK	
14:00	Carboxylation of terminal alkynes with CO ₂ over Ag loaded ZIF-8 N. Sun ¹ ; J. Shi ¹ ; L. Zhang ¹ ; Q. Shen ¹ ; Q. Gao ¹ ; W. Wei ¹ ; Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai/CN	14:00	Bi-reforming of methane with steam and carbon dioxide : effect of operating conditions M. Damacherla ¹ ; S. G ² ; R. M Badhe ² ; A. Sharma ² ; K. Dr G S ² ; ¹ Indian Oil Corporation Ltd., R&D Centre., Faridabad/IND; ² IOCL R&D Centre, Faridabad/IND
14:20	Direct methyl N-phenylcarbamate synthesis from CO ₂ , aniline and methanol using a combination catalyst of CeO ₂ and 2-cyanopyridine M. Tamura ¹ ; ¹ Tohoku University, Aramaki, Aoba-ku, Sendai, Miyagi/J	14:20	Ce-enhanced Fe ₂ O ₃ /Al ₂ O ₃ for CO ₂ utilization in chemical looping partial oxidation of methane D. Kang ¹ ; M. Lee ¹ ; H. Lim ¹ ; J. Lee ¹ ; ¹ Korea Advanced Institute of Science and Technology (KAIST), Daejeon/ROK
14:40	Sodium Acrylate from CO ₂ and Ethylene T. Schaub ¹ ; ¹ BASF SE, Ludwigshafen am Rhein/D	14:40	Advances on CO ₂ sorption and subsequent catalytic conversion to added value products, using alkaline ceramics H. Pfeiffer ¹ ; ¹ Universidad Nacional Autónoma de México, Mexico City/MEX
15:00	Stereo/Regio-Divergent Synthesis with CO ₂ C. Maquilon ¹ ; ¹ ICIQ, Tarragona/E	15:00	
15:20	Coffee break	15:20	Coffee break
START-UP WORKSHOP, DISCUSSION		PLASMA TECHNOLOGIES FOR CO ₂ CONVERSION	
Chair: V. Sick, University of Michigan, Michigan/USA		Chair: R. Rothman, University of Sheffield, Sheffield/UK	
15:50	V. Sick, University of Michigan, Ann Arbor/USA G. W. Quance, Solid Carbon Products, Salt Lake City/USA M. Kember, Eonic Technologies Ltd., Macclesfield/UK	15:50	Plasma and Fluidic Oscillation Assisted Electrolysis of CO ₂ Using a Solid Oxide Cell A. Call ¹ ; T. Holmes ² ; P. Desai ² ; W. Zimmerman ¹ ; R. Rothman ¹ ; ¹ The University of Sheffield, Sheffield/UK; ² Perlemax, Sheffield/UK
		16:10	Low-Temperature CO ₂ Methanation: Understanding the role of Ni in plasma – catalyst synergism F. Ahmad ¹ ; E. Lovell ¹ ; J. Scott ¹ ; R. Amal ¹ ; ¹ Particle and Catalysis Research Group, University of New South Wales, Sydney/AUS
		16:30	Integrated Membrane Separation and Non-thermal Plasma (NTP) Assisted Catalysis Process for Upgrading Biogas Y. Mu ¹ ; H. Chen ¹ ; X. Fan ¹ ; C. Hardacre ¹ ; ¹ University of Manchester, The Mill, Manchester/UK
		16:50	Core-Shell SiO ₂ @TiO ₂ beads for Plasma Catalytic CO ₂ Dissociation in a Packed bed DBD reactor P. Kaliyappan ¹ ; K. Leyssens ² ; P. Samyn ¹ ; V. Meynen ² ; A. Hardy ¹ ; M. K. Van Bael ¹ ; ¹ Universiteit Hasselt/B; ² University of Antwerp/B
		17:10	CO ₂ activation by Cu/ γ -Al ₂ O ₃ promoted DBD plasma D. Ray ¹ ; S. Ch. ¹ ; ¹ Indian Institute of Technology Hyderabad, Sangareddy/IND
19:30	CONFERENCE DINNER (19:30 – 23:00) Saal Europa	19:30	CONFERENCE DINNER (19:30 – 23:00) Saal Europa

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LECTURE PROGRAMME

WEDNESDAY, 26 JUNE 2019

Room: Brüssel		Room: Brüssel	
Chair: W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D			
08:30	PLENARY LECTURE Sustainable polymers based on CO ₂ H. Bach ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D	08:30	PLENARY LECTURE Sustainable polymers based on CO ₂ H. Bach ¹ ; ¹ Covestro Deutschland AG, Leverkusen/D
Room: K 3		Room: K 4	
ELECTROCATALYSIS		LCA/TEA	
Chair: E. Gyenge, Agora Energy Technologies Ltd., Vancouver/CDN		Chair: K. Armstrong, The University of Sheffield, Sheffield/UK	
09:20	Fe ₄ Ni ₄ S ₈ Electrocatalysts: A Promising Material for the Hydrogen Evolution and CO ₂ Reduction Reactions S. Piontek ¹ ; M. Smialkowski ¹ ; K. Junge Puring ² ; D. Tetzlaff ² ; D. Siegmund ² ; U. Apfel ¹ ; ¹ Ruhr-University Bochum/D; ² Fraunhofer UMSICHT, Oberhausen/D	09:20	Carbon ₂ Chem® Co-simulation framework as a tool for CCU technology assessments T. Wich ¹ ; H. Wagner ¹ ; M. Oles ² ; A. Diekmann ² ; J. Grundler ² ; G. Deerberg ⁴ ; ¹ thyssenkrupp AG/Ruhr-Universität Bochum, Essen/D; ² thyssenkrupp AG TCCT, München/D; ³ thyssenkrupp AG, Essen/D; ⁴ Fraunhofer UMSICHT/Ruhr-Universität Bochum, Oberhausen/D
09:40	Study of copper/copper sulfide composites as catalysts for electrochemical reduction of carbon dioxide S. Stojković ¹ ; M. Najdoski ² ; V. Koleva ³ ; M. Mayer ¹ ; ¹ Helmholtz Zentrum Berlin für Materialien und Energie, Berlin/D; ² Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje/MK; ³ Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, Sofia/BG	09:40	Environmentally optimal conversion pathways for gaseous carbon waste streams from steel mills J. Kleinekorte ¹ ; A. Kalousdian ¹ ; A. Bardow ² ; ¹ Institute of Technical Thermodynamics, RWTH Aachen University, Aachen/D; ² Institute of Technical Thermodynamics, RWTH Aachen University & Institute of Energy and Climate Research - Energy Systems Engineering (IEK-10), Forschungszentrum Jülich GmbH, Aachen/ Jülich/D
10:00	Preparation and Evaluation of Copper Gas Diffusion Electrodes for Electrochemical CO ₂ Reduction K. Junge Puring ¹ ; P. Derks ² ; U. Apfel ¹ ; ¹ Fraunhofer UMSICHT/Ruhr University Bochum, Oberhausen/Bochum/D; ² Fraunhofer UMSICHT, Oberhausen/D	10:00	Environmentally optimal conversion pathways for gaseous carbon waste streams from steel mills J. Kleinekorte ¹ ; A. Kalousdian ¹ ; A. Bardow ² ; ¹ Institute of Technical Thermodynamics, RWTH Aachen University, Aachen/D; ² Institute of Technical Thermodynamics, RWTH Aachen University & Institute of Energy and Climate Research - Energy Systems Engineering (IEK-10), Forschungszentrum Jülich GmbH, Aachen/ Jülich/D
10:20	Coffee break	10:20	Coffee break
CATALYSIS		LCA/TEA	
Chair: R. Heyn, Sintef Industry, Oslo/N		Chair: A. Bardow, RWTH Aachen/D	
11:00	Manganese(I) Hydridocarbonyl Catalysts for Homogeneous CO ₂ Reduction to Formate and Methanol Under Mild Conditions L. Gonsalvi ¹ ; F. Bertini ¹ ; M. Peruzzini ¹ ; M. Glatz ² ; N. Gorgas ² ; B. Stoeger ² ; K. Kirchner ² ; L. Veiros ³ ; ¹ Consiglio Nazionale delle Ricerche - Istituto di Chimica dei Composti Organometallici (ICCOM-CNR), Sesto Fiorentino/I; ² TU Wien/A; ³ IST-University of Lisbon/P	11:00	The cost of OME ₃₋₅ e-fuels from CO ₂ and electricity, a comparative TEA A. Zimmermann ¹ ; E. Gençer ² ; F. O'Sullivan ² ; R. Schomäcker ¹ ; ¹ TU Berlin, Berlin/D; ² MIT, Cambridge/USA
11:20	Hydrogenation of CO ₂ Catalyzed by Iridium Complexes with Proton-Responsive Ligands Y. Himeda ¹ ; ¹ National Institute of Advanced Industrial Science and Technology, Tsukuba/J	11:20	Techno-economic analysis of renewable jet fuel through co-valorisation of CO ₂ and wood pellets B. Kolosz ¹ ; B. Xu ¹ ; S. Ahmad ¹ ; M. Maroto-Valer ¹ ; J. Andresen ¹ ; ¹ Heriot-Watt University, Edinburgh/UK
11:40	RWGS over In ₂ O ₃ with different crystal phases and the phase transition under reaction conditions J. Wang ¹ ; G. Zhang ¹ ; C. Song ² ; X. Guo ¹ ; ¹ Dalian University of Technology, Dalian/CN; ² Pennsylvania State University, University Park/USA	11:40	Comparative cross-sectoral life-cycle cost and value chain analysis of production, use and recycling of CO ₂ based products S. Turnau ¹ ; S. Bringezu ¹ ; ¹ University of Kassel/D
12:00	The structural dynamics of supported vanadia catalysts: a comparative study of CO ₂ and O ₂ during propane ODH by using operando UV Raman spectroscopy S. Rogg ¹ ; M. Mathes ¹ ; C. Hess ¹ ; ¹ Eduard-Zintl-Institut, TU Darmstadt, Darmstadt/D	12:00	Integrating LCA and TEA for analysis of CCU processes K. Armstrong ¹ ; J. Wunderlich ² ; P. Styring ¹ ; ¹ The University of Sheffield/UK; ² TU Berlin/D
12:20	Low Alkane Oxidation Hydrogenation with CO ₂ as Soft Oxidant S. Park ¹ ; ¹ Inha University, Incheon/ROK	12:20	Direct conversion of carbon dioxide to liquid fuels and synthetic natural gas using renewable power: Techno-economic analysis C. Zhang ¹ ; K. Jun ¹ ; S. Kim ¹ ; S. Hwang ¹ ; H. Park ¹ ; ¹ Korea Research Institute of Chemical Technology, Daejeon/ROK
12:40	Interconversion between CO ₂ and HCOOH catalyzed by PdAu nanoparticles supported by graphene oxide under high-pressure conditions H. Kawanami ¹ ; ¹ National Institute of Advanced Industrial Science and Technology, Sendai, Miyagi/J	12:40	Practical use of the Global CO ₂ Initiative TEA and LCA Guidelines for CO ₂ Utilization: Mineralization of CO ₂ Worked Example S. McCord ¹ ; A. Villa Zaragoza ² ; P. Sanderson ¹ ; K. Armstrong ¹ ; P. Styring ¹ ; ¹ University of Sheffield/UK
13:00	Lunch break	13:00	Lunch break
BIOTECHNOLOGICAL CO ₂ -CONVERSION		LCA	
Chair: H. de Wever, Flemish Institute for Technological Research (VITO), Mol/B		Chair: B. Olfe-Kräutlein, Institute for Advanced Sustainability Studies, Potsdam/D	
14:00	Enzymatic CO ₂ reduction to formate: towards a biocatalyst for the use of the abundant atmospheric CO ₂ L. Maia ¹ ; J. Moura ¹ ; ¹ LAQV, REQUIMTE, FCT NOVA, Portugal, Caparica/P	14:00	A world made from CO ₂ ? A life-cycle perspective on the potential of carbon capture and utilization A. Bardow ¹ ; ¹ RWTH Aachen University, Aachen/D
14:20	Continuous Syngas Fermentation at Elevated Pressure L. Stoll ¹ ; N. Boukis ¹ ; J. Sauer ¹ ; ¹ Karlsruhe Institute of Technology (KIT), Institute of Catalysis Research and Technology (IKFT), Eggenstein-Leopoldshafen/D	14:20	
14:40	Using a thermoacidophilic cathodic biofilm to drive waste gas driven polyhydroxyalkanoate production T. Jung ¹ ; J. Reiner ¹ ; M. Hackbarth ² ; M. Fink ³ ; C. Lapp ¹ ; H. Horn ² ; S. Kerzenmacher ³ ; J. Gescher ¹ ; ¹ Department of Applied Biology, Karlsruhe Institute of Technology (KIT), Karlsruhe/D; ² Engler-Bunte-Institut, Karlsruhe Institute of Technology (KIT), Karlsruhe/D; ³ Center for Environmental Research and Sustainable Technology (UFT), University of Bremen/D	14:40	LCA of CCU-Chain Demonstration in the ALIGN-CCUS project – Poly(oxyethylene) Dimethyl Ethers from H ₂ and CO ₂ S. Troy ¹ ; P. Zapp ¹ ; P. Moser ² ; G. Wiechers ² ; M. Majid ³ ; A. Heberle ³ ; H. Kakhira ⁴ ; M. Manuyama ⁵ ; R. Peters ⁵ ; S. Weiske ⁵ ; B. Lehrheuer ⁵ ; M. Neumann ⁵ ; T. Schnorbus ⁵ ; E. Gotheer ⁷ ; ¹ Forschungszentrum Jülich/D; ² RWE Power AG, Essen/D; ³ Mitsubishi Hitachi Power Systems Europe GmbH, Duisburg/D; ⁴ Asahi Kasei Europe GmbH, Düsseldorf/D; ⁵ VKA, RWTH Aachen University, Aachen/D; ⁶ FEV Europe GmbH, Aachen/D; ⁷ TNO, Delft/NL
15:00	Converting CO ₂ to Fuels and Chemicals with Microbial electrosynthesis (MES) E. Yu ¹ ; P. Izadi ¹ ; ¹ Newcastle University, Newcastle upon Tyne/UK	15:00	Life Cycle Assessment of a commercial scale CO ₂ – Direct Air Capture Plant A. Lozanovski ¹ ; M. Held ² ; T. Betten ¹ ; ¹ University of Stuttgart/D; ² Fraunhofer Institute for Building Physics, Stuttgart/D
15:20	Coffee break	15:20	Coffee break
CO ₂ TO CHEMICALS CO ₂ to methanol		LCA	
Chair: T. E. Müller, Ruhr-Universität Bochum, Bochum/D		Chair: B. Olfe-Kräutlein, Institute for Advanced Sustainability Studies, Potsdam/D	
15:50	Mesoporous Indium Oxide as a Superior Catalyst for Methanol Synthesis by CO ₂ Hydrogenation J. Wang ¹ ; ¹ Dalian University of Technology, Dalian/CN	15:50	
16:10	Electron-Mediated Photonic Synergism in Industrial Cu/ZnO/Al ₂ O ₃ Catalyst for Enhanced Methanol Production B. Xie ¹ ; R. Wong ¹ ; T. Tan ² ; J. Scott ¹ ; K. Aguey-Zinsou ¹ ; R. Amal ¹ ; ¹ University of New South Wales, Sydney/AUS; ² Kyushu University, Sydney/AUS	16:10	
16:30	ZnO/Cu core-shell nanoparticles for CO ₂ hydrogenation N. Podrojková ¹ ; A. Oriňák ¹ ; R. Oriňák ¹ ; Pavol Jozef Šafárik University in Košice/SK	16:30	
16:50	Cold plasma-catalytic process for methanol synthesis from CO ₂ hydrogenation at room temperature and ambient pressure L. Wang ¹ ; Y. Wang ¹ ; X. Tu ¹ ; ¹ University of Liverpool/UK	16:50	
17:10	Recent Advances in CO ₂ Hydrogenation to Methanol on In ₂ O ₃ Supported Catalysts C. Liu ¹ ; ¹ Tianjin University, Tianjin/CN	17:10	
19:30	CONFERENCE DINNER (19:30 – 23:00) Saal Europa	19:30	CONFERENCE DINNER (19:30 – 23:00) Saal Europa

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THURSDAY, 27 JUNE 2019

LECTURE PROGRAMME

Room: Brüssel		Room: K 2	
POWER TO X		BIOTECHNOLOGICAL CO ₂ CONVERSION	
<i>Chair: A. Varone, Center for Advanced Studies Research and Development, Sardinia, Pula/It</i>		<i>Chair: E. Yu, Newcastle University, Newcastle upon Tyne/UK</i>	
09:30	Coupling of power, fuels, chemicals: techno-economical aspects of green chemicals production H. Schramm ¹ ; R. Schneider ¹ ; I. Pyc ² ; G. Zimmermann ² ; ¹ Siemens AG, Frankfurt am Main/D; ² Siemens AG, Erlangen/D	09:30	Bite-sizing the challenge: a modular approach for the biotechnological valorization of CO₂ J. Mampel ¹ ; G. Meurer ¹ ; ¹ BRAIN AG, Zwingenberg/D
09:50	CO₂ for PtX processes in Germany: Volumes & utilization costs E. Ortloff ¹ ; J. Schäffer ¹ ; F. Graf ¹ ; T. Kolb ¹ ; C. Imberg ² ; J. Senner ² ; U. Lubenau ³ ; ¹ Engler-Bunte-Institut, KIT, Karlsruhe/D; ² Gas- und Wärmeinstitut (GWI), Essen/D; ³ Deutsches Brennstoffinstitut (DBI), Leipzig/D	09:50	Carbon Capture and Utilization (CCU) in Flanders with special focus on the role of biotechnology for CO₂ conversion H. De Wever ¹ ; ¹ VITO - Flemish Institute for Technological Research, Mol/B
10:10	Towards a Clean and Economic Production of OME, from CO₂ and H₂: Process Development and Analysis J. Burre ¹ ; D. Bongartz ¹ ; A. Ziegler ² ; S. Deutz ³ ; A. Bardow ³ ; A. Mitsos ¹ ; ¹ Aachener Verfahrenstechnik - Process Systems Engineering, RWTH Aachen University, Aachen/D; ² RWTH Aachen University, Aachen/D; ³ Institute of Technical Thermodynamics, RWTH Aachen University, Aachen/D	10:10	Biotechnological conversion of CO₂ and off-gases to various products – What is possible from lab over demonstration to commercial scale? P. Skoczinski ¹ ; A. Raschka ¹ ; ¹ nova-Institut GmbH, Hürth/D
10:30	Coffee break		10:30
POWER TO X		BIOTECHNOLOGICAL CO ₂ CONVERSION AND LCA	
<i>Chair: F. Ortloff, Engler-Bunte-Institut, KIT, Karlsruhe/D</i>		<i>Chair: D. Krämer, DECHEMA e.V., Frankfurt am Main/D</i>	
11:00	Power-to-X within the CCUS activities of TOTAL K. Hortmann, Total Research & Technology Feluy, Senefee/BE	11:00	Microbial CO₂ Utilization within the Carboxylate Platform L. Rachbauer ¹ ; M. Lesniak ¹ ; B. Drosig ¹ ; W. Fuchs ² ; G. Bochmann ² ; ¹ Bioenergy2020+, Tulln/A; ² University of Natural Resources and Life Sciences, Vienna, Tulln/A
11:20	Design, implementation and upscaling of a Power-to-X process G. Herz ¹ ; ¹ Fraunhofer IKTS, Dresden/D	11:20	Technological advances in CO₂ Electrobiorefinery: Linking Bioelectrochemical CO₂ reduction with Renewable Energy H. De Wever ¹ ; D. Pant ¹ ; ¹ Flemish Institute for Technological Research (VITO), MOL/B
11:40	Closing the loop: From waste and residues to bio-SNG A. Varone ¹ ; ¹ CRS4, Loc. Piscina Manna, Pula/I	11:40	Combined Life Cycle Assessment of CO₂ and Biomass as Renewable Carbon Feedstocks for Polymers M. Bachmann ¹ ; L. Müller ¹ ; B. Winter ¹ ; R. Meys ¹ ; A. Bardow ² ; ¹ RWTH Aachen University, Aachen/D; ² RWTH Aachen University and Forschungszentrum Jülich GmbH, Aachen/D
Room: Brüssel			
12:10	Closing remarks (12:10 – 13:10) W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D; C. Song, Pennsylvania State University/USA		12:10

LECTURE PROGRAMME

THURSDAY, 27 JUNE 2019

Room: K 3		Room: K 4	
CAPTURE AND SEPARATION		LCA/TEA	
<i>Chair: C. Song, Pennsylvania State University, University Park, Pennsylvania/USA</i>		<i>Chair: A. Zimmermann, TU Berlin, Berlin/D</i>	
09:30	Precipitation Study of the CO₂-loaded Glycinate Solution with the Introduction of Ethanol as an Antisolvent S. Chen ¹ ; ¹ Qingdao University/CN	09:30	Life cycle assessment of carbon capture and utilization by mineralization H. Ostovari ¹ ; ¹ RWTH, Aachen/D
09:50	Optimisation of CO₂ Capture into Flowing Aqueous NaOH Solution W. Pragot ¹ ; W. Afzal ¹ ; M. Imbabi ¹ ; F. Glasser ² ; ¹ University of Aberdeen, School of Engineering/UK; ² University of Aberdeen, School of Chemistry/UK	09:50	Potentials and limits of Carbon Capture and Usage to close the carbon cycle in the German chemical and polymer sector S. Kaiser ¹ ; S. Bringezu ¹ ; ¹ University of Kassel, Kassel/D
10:10	Improvement of CaO Sorbents Stability for Ca-Looping CO₂ Capture in the Cement Industry Using Coal Fly Ashes and Spent FCC Catalysts P. Teixeira ¹ ; I. Mohamed ¹ ; A. Fernandes ¹ ; F. Ribeiro ¹ ; C. Pinheiro ¹ ; ¹ CQE, Instituto Superior Técnico, Universidade de Lisboa, Lisboa/P	10:10	Interpreting and Commissioning LCA and TEA K. Armstrong ¹ ; H. Naims ² ; P. Styring ³ ; ¹ The University of Sheffield, Sheffield/UK; ² IASS, Potsdam/D
10:30	Coffee break		10:30
CAPTURE AND SEPARATION		CO ₂ TO CHEMICALS CO ₂ to methanol	
<i>Chair: O. Hurtig, DECHEMA e.V., Frankfurt am Main/D</i>		<i>Chair: J. Boon, TNO, Petten/NL</i>	
11:00	Integrating CCUS Technology into the UK's Hydrogen Agenda: Towards a Conceptual Framework R. Edwards ¹ ; C. Palma ² ; T. Tomlinson ³ ; ¹ University of Chester, CHESTER/UK; ² University of Chester, Chester/UK; ³ Costain, Manchester/UK	11:00	Development of CO₂-to-Methanol at Air Liquide T. Schuhmann ¹ ; ¹ Air Liquide Forschung und Entwicklung Gm, Frankfurt/D
11:20	CO₂ Capture at High Temperature and Low CO₂ Concentration Using Slag – Derived Lithium Silicates B. Alcántar Vázquez ¹ ; R. Ramírez-Zamora ¹ ; ¹ Instituto de Ingeniería, Universidad Nacional Autónoma de México, Mexico city/MEX	11:20	Rational development of catalysts for CO₂ hydrogenation using design of experiments D. Curulla-Ferré ¹ ; J. Stewart ¹ ; M. Frei ² ; C. Mondelli ² ; J. Pérez-Ramírez ² ; ¹ Total, Feluy/B; ² ETH, Zürich/CH
11:40	The Carbon Dioxide Removal Potential of Liquid Air Energy Storage: a high-level technical and economic appraisal A. Lockley ¹ ; ¹ Andrew Lockley, Milton Keynes/UK	11:40	Reduction of CO₂ to methanol using a supercritical flow process M. Gothe ¹ ; A. L. Figueredo ¹ ; M. Villegas ¹ ; L. Rossi ¹ ; P. Vidinha ¹ ; ¹ University of Sao Paulo/BR
Room: Brüssel			
12:10	Closing remarks (12:10 – 13:10) W. Leitner, RWTH Aachen/D; MPI for Chemical Energy Conversion, Mülheim/D; C. Song, Pennsylvania State University/USA		12:10

POSTER PROGRAMME

- P 1 **Metal-conjugated poly(triphenylamine) networks for CO₂ capture and electrochemical conversion**
V. Del Angel Hernandez¹; G. Gobaille-Shaw¹; D. Fermin¹; C. Faul¹; ¹ University of Bristol, Bristol/UK
- P 2 **Life-Cycle Assessment of Direct Air Capture (DAC) via Temperature-Vacuum Swing Adsorption**
S. Deutz¹; A. Bardow¹; ¹ Institute of Technical Thermodynamics, RWTH Aachen University, Aachen/D
- P 3 **Scalable synthesis of a novel Li₄SiO₄-based high-temperature CO₂ sorbent**
Y. Zhang¹; Y. Gao¹; Q. Wang¹; ¹ Beijing Forestry University, Beijing/CN
- P 4 **Synthesis of Porous Mg/Chitosan/Sponge Composite for CO₂ sorption at elevated temperature**
Yi-jiun Chen¹; M.-C. Wu¹; I.-M. Shu¹; C.-Y. Lu¹; ¹ Chung Shan Medical University, Taichung/RC
- P 5 **CO₂ Capture by Aqueous NH₃ Combined with High Quality CaCO₃ Formation and Red Mud Neutralization**
F. Barzagli¹; C. Giorgi²; F. Mani²; M. Peruzzini³; ¹ CNR - National Research Council of Italy, Florence/I; ² University of Florence, Department of Chemistry, Florence/I; ³ CNR - National Research Council of Italy, Rome/I
- P 6 **Microwave-assisted regeneration of activated carbon and zeolite based adsorbents loaded with captured CO₂, capture process intensification**
M. Yassin¹; ¹ University of Aberdeen, Aberdeen/UK
- P 7 **Thermochemical CO₂ split and methane partial oxidation through an oxygen carrier of NiFe₂O₄ in a perovskite shell**
H. Lim¹; D. Kang¹; M. Lee¹; J. Lee¹; ¹ Korea Advanced Institute of Science and Technology (KAIST), Daejeon/ROK
- P 8 **Production of syngas with an optimized ratio on the Ni-Fe₂O₃/Al₂O₃ by chemical looping partial oxidation with CH₄-CO₂ mixture feed**
D. Kang¹; H. Lim¹; M. Lee¹; J. Lee¹; ¹ Korea Advanced Institute of Science and Technology (KAIST), Daejeon/ROK
- P 9 **Single step room temperature activation of carbon dioxide with methane into liquid chemicals in a plasma-catalytic reactor**
L. Wang¹; Y. Wang¹; X. Tu¹; ¹ University of Liverpool, Liverpool/UK
- P 10 **Cooperative catalysts for the selective synthesis of alkylidene cyclic carbonates from CO₂ and propargylic alcohols**
C. Ngassam¹; B. Grignard¹; C. Jérôme²; T. Tassaing²; C. Detrembleur¹; ¹ University of Liege, Liege/B; ² universit  de bordeaux, Bordeaux/F
- P 11 **Experimental Study on Synthesis of Precipitated Calcium Carbonate using Aqueous Amino Acid Salts**
K. Kim¹; ¹ Korea Institute of Industrial Technology (KITECH), Ulsan/ROK
- P 12 **CO₂ mineralization with concentrated seawater: Chemical absorption-conversion method**
S. Park¹; C. Jeon¹; ¹ Korea Institute of Geoscience and Mineral Resources, Daejeon/ROK
- P 13 **The low-cost disposal and calcium carbonation of alkaline paper mill waste sludge by acid digestion and amine added mineral carbonation**
c. jeon¹; ¹ korea institutes of geoscience and mineral resources, yusung-gu, daejeon, south korea/ROK
- P 14 **The economics of accelerated carbonation routes using captured CO₂**
T. Strunge¹; H. Naims¹; ¹ IASS Potsdam, Potsdam/D
- P 15 **Valorization of CO₂ using electrospun supported nickel – lanthanide catalysts**
A. Ferreira¹; J. Branco¹; ¹ Centro de Ci ncias e Tecnologias Nucleares, IST, ULisboa, Bobadela/P
- P 16 **Selective Anti-Markovnikov Hydrocarboxylation of Styrenes**
A. Alkayal¹; ¹ Loughborough University, Leicestershire/UK
- P 17 **Hetero-Triphos Ligands in the Selective Ruthenium-Catalyzed Transformation of Carbon Dioxide to Dimethoxymethane**
M. Seibicke¹; M. Siebert¹; O. Trapp¹; ¹ LMU Munich, M nchen/D
- P 18 **The influence of Y doping on the catalytic performance of Cu-based catalyst via hydrogenation of CO₂ to methanol**
T. Qi¹; S. Chen²; Y. Zhang²; ¹ Dalian university of technology, Section B, Dpartment of Industrial Catalysis, School of Chemical Engineering, dalian university of technology/CN; ² Dalian university of technology, Dalian/CN
- P 19 **Density functional theory study on the reactivity of Cu/ZrO₂ in the hydrogenation of CO₂ to methanol**
S. Polierer¹; J. Jelic¹; S. Pitter¹; F. Studt¹; ¹ Karlsruhe Institute of Technology (KIT), Karlsruhe/D
- P 20 **CO₂-Insertion into Si-N Bonds of Aromatic Aminosilanes**
F. Gr ndler¹; S. Schwarzer¹; E. Kroke¹; ¹ TU Bergakademie Freiberg, Freiberg/D
- P 21 **Mono-Insertion of CO₂ into Aminosilanes**
M. Baumhardt¹; M. Herbig¹; L. Gevorgyan¹; S. Schwarzer¹; E. Kroke¹; ¹ Technische Universit t Bergakademie Freiberg, Freiberg/D

TOTAL group

With over **150 nationalities** represented, a presence in over **130 countries**, and more than 650 business-related competencies, the Group is a global player. More than **104,000 employees** are committed to contributing to supply to as many people as possible, a more affordable, more available and cleaner energy.

In that way, TOTAL's ambition is to become the **responsible energy major**. The purpose of the CCUS transverse program is to enable the Group to become a major player in this area and throughout the value chain so that it can contribute to the reduction in global CO₂ emissions and prepare new business opportunities.

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CCUS PROGRAM

Carbon Capture Utilization and Storage

CAPTURE

Capture CO₂ from all sources

Develop disruptive technologies to decrease costs

TRANSPORT

Development of integrated offers thanks to our know-how & operational expertise

UTILIZATION

Develop a portfolio of CO₂-based products

Acquire operational expertise on CO₂-EOR (Enhanced Oil Recovery)

STORAGE

Operate and manage projects of an industrial scale

Leverage TOTAL's existing expertise to solve key storage issues

SUSTAINABLE
CCUS VALUE CHAIN

Techno economic and environmental performance

Integrated Risk Management
Social license to operate



POSTER PROGRAMME

- P 22 **CO₂-H₂O-co-Electrolysis to Formic Acid for Microbial Conversion**
M. Stoll¹; E. Klemm¹; A. Löwe¹; ¹ Universität Stuttgart, Stuttgart/D
- P 23 **Selective Anti-Markovnikov Hydrocarboxylation of Dienes**
A. Sheta¹; ¹ Loughborough University, Loughborough, Leicestershire/UK
- P 24 **COZMOS – Efficient CO₂ conversion over multisite Zeolite-Metal nanocatalysts to fuels and OlefinS**
R. Heyn¹; U. Olsbye²; ¹ SINTEF Industry, Oslo/N; ² University of Oslo, Oslo/N
- P 25 **Novel trends in flat panel photobioreactor's designing**
L. Kratky¹; ¹ Czech Technical University in Prague, Faculty of Mechanical Engineering, Prague/CZ
- P 26 **Bio-electrochemical reduction of carbon dioxide to methane in parallel with wastewater treatment**
M. Haberbauer¹; S. Thallner¹; H. Seelajaroen²; A. Ragossnig³; ¹ ACIB GmbH, Linz/A; ² LIOS-JKU, Linz/A; ³ RM Umweltkonsulten ZT GmbH, Wien/A
- P 27 **Mass transport effects in electrocatalytic CO₂ reduction on copper**
J. Geisler¹; ¹ Friedrich Schiller University Jena, Jena/D
- P 28 **Controlling the Textural Properties of Mesoporous Zirconia for the Methanation of Carbon Dioxide**
K. Abel¹; P. Seidel¹; J. Titus¹; R. Gläser¹; ¹ Universität Leipzig, Institute of Chemical Technology, Leipzig/D
- P 29 **Advanced Microreactors for the Water-Gas Shift Reaction in the Jet Fuel Production from Plasma Splitting of CO₂**
T. Stadler¹; F. Vidal Vázquez¹; P. Pfeifer¹; Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen/D
- P 30 **Multi-criteria decision methods for selecting Carbon Capture and Utilization pathways**
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K. Roh¹; J. Burre¹; D. Bongartz¹; S. Lee²; W. Chung²; D. Han²; A. König¹; S. Deutz³; A. Bardow³; J. Lee²; A. Mitsos⁴; ¹ RWTH Aachen University, Aachener Verfahrenstechnik, Lehrstuhl für Systemverfahrenstechnik, Aachen/D; ² KAIST, Department of Chemical and Biomolecular Engineering, Daejeon/ROK; ³ RWTH Aachen University, Lehrstuhl für Technische Thermodynamik, Aachen/D
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J. Kim¹; ¹ Korea Research Institute of Chemical Technology (KRICT), Taejeon, Korea/ROK
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J. Kim¹; ¹ Korea Research Institute of Chemical Technology (KRICT), Taejeon, Korea/ROK
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J. Kang¹; S. Seo²; K. Kim³; D. Kang²; H. Song¹; ¹ Korea Institute of Industrial Technology (KITECH), Ulsan/ROK; ² Korea Institute of Industrial Technology (KITECH), Pusan National University, Pusan/ROK; ³ Korea Institute of Industrial Technology (KITECH), Yonsei University, Seoul/ROK
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Y. Lee¹; W. Choi²; Y. Seo²; ¹ GEOMAR - Helmholtz-Zentrum für Ozeanforschung Kiel, Kiel/D; ² Ulsan National Institute of Science and Technology (UNIST), Ulsan/ROK
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A. Lockley¹; ¹ Andrew Lockley, Milton Keynes/UK
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S. Park¹; ¹ Inha University, Incheon/ROK
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R. Schwiedernoch¹; M. Wu¹; S. Streiff¹; H. Shu¹; ¹ Solvay (China) Co., Ltd., Shanghai/CN
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M. Roeb¹; ¹ DLR - German Aerospace Center, Köln/D
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F. Brown¹; ¹ Ingenza Ltd, Roslin/UK
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N. Westhues¹; ¹ RWTH Aachen, Aachen/D
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J. Maina¹; ¹ Deakin University, Waurin Ponds, Victoria, Australia/AUS
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H. Lepaumier¹; J. Mertens²; H. Bergocol³; F. Chandezon⁴; C. Faber⁵; L. Lopez⁶; H. de Groot⁷; ¹ ENGIE Laborelec, Linkebeek/B; ² ENGIE, Paris/F; ³ CEA, Paris-Saclay/F; ⁴ CEA Grenoble, Grenoble/F; ⁵ UCL, Louvain/B; ⁶ ICIQ, Tarragona/E; ⁷ Leiden University, Leiden/NL
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P. Kant¹; M. Klumpp¹; G. Ozin²; R. Dittmeyer¹; ¹ Karlsruhe Institute of Technology (KIT), Institut für Mikroverfahrenstechnik (IMVT), Karlsruhe/D; ² University of Toronto, Toronto/CDN
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T. Möller¹; T. Ngo Thanh²; Z. Jovanov²; P. Strasser²; ¹ Technische Universität Berlin / Institut für Chemie, Berlin/D; ² Technische Universität Berlin, Berlin/D
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D. Pangotra¹; S. Perry²; L. Vieira³; L. Wang⁴; C. Ponce de León⁴; V. Sieber¹; ¹ Fraunhofer IGB/Technical University of Munich, Straubing/D; ² Electrochemical Engineering Laboratory, Faculty of Engineering and Physical Sciences, University of Southampton, Southampton/UK; ³ Fraunhofer IGB, Straubing/D; ⁴ National Centre of Advanced Tribology at Southampton (nCATS), Faculty of Engineering and Physical Sciences, University of Southampton, Southampton/UK
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A. Adamu¹; X. Low¹; G. Highsted¹; K. Boodhoo¹; F. Russo Abegão²; ¹ Newcastle University, Newcastle upon Tyne/UK; ² Newcastle University, Newcastle upon Tyne/UK
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P. Sanderson¹; K. Armstrong¹; P. Styring¹; ¹ University of Sheffield, Sheffield/UK
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O. Osterthun¹; J. Klankermayer¹; ¹ RWTH Aachen University - Institut für Technische und Makromolekulare Chemie (ITMC), Aachen/D
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H. Huynh¹; ¹ University of Stavanger, Stavanger/N
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R. Krause¹; C. Reller¹; D. Reinisch¹; D. Taroata¹; K. Vetter¹; G. Schmid¹; ¹ Siemens AG Corporate Technology, Erlangen/D
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S. Fogel¹; H. Kryk¹; U. Hampel¹; ¹ Helmholtz-Zentrum Dresden-Rossendorf e.V., Dresden/D
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A. Chanin¹; ¹ Institute for Advanced Sustainability Studies e.V. (IASS), Potsdam/D
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C. Nielsen¹; A. S. Meyer²; ¹ DTU, Kgs. Lyngby/DK; ² DTU Bioengineering, Kgs. Lyngby/DK
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C. Nielsen¹; J. Morth²; A. S. Meyer²; ¹ DTU, Kgs. Lyngby/DK; ² DTU Bioengineering, Kgs. Lyngby/DK

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 V. Agostino¹; L. Tarraran²; A. Abdel Azim³; A. Cordara³; N. Vasile³; V. Margaria³; A. Re³; F. Pirri²; G. Saracco¹; ¹ DISAT, Politecnico di Torino, Turin/I; ² Centre for Sustainable Future Technologies, Fondazione Istituto Italiano di Tecnologia; DISAT, Politecnico di Torino, Turin/I; ³ Centre for Sustainable Future Technologies, Fondazione Istituto Italiano di Tecnologia, Turin/I
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 S. Schmitz¹; ¹ iAMB - Institute of Applied Microbiology, ABBt – Aachen Biology and Biotechnology, RWTH Aachen University, Aachen/D
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- P 68 **Surface modified membrane and absorbent blends for CO₂ removal in a flat-sheet membrane contactor**
 Y. Seo¹; H. Song²; S. Kim²; ¹ Korea Institute of Industrial Technology (KITECH), Pusan National University, Ulsan/ROK; ² Korea Institute of Industrial Technology (KITECH), Ulsan/ROK

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CONGRESS OFFICE

Sunday, 23 June 2019	16:00 – 19:00
Monday, 24 June 2019	09:00 – 18:00
Tuesday, 25 June 2019	08:00 – 17:15
Wednesday, 26 June 2019	08:00 – 17:30
Thursday, 27 June 2019	09:00 – 12:30

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