



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

CO₂ as chemical feedstock – a challenge for sustainable chemistry

20–21 March 2019, Maternushaus, Cologne (Germany)

Conference Journal



1st Day, 20 March 2019

- Innovation and Strategy
- Sustainability and Policy
- Hydrogen production & Carbon Capture
- Innovation Award



2nd Day, 21 March 2019

- CO₂ for Chemicals and Materials
- Special Parallel Session:
Workshop on Carbon Capture
Technologies
- CO₂ for Fuels

Organiser



Award Sponsor



Premium-Partner



Gold Sponsor



Silver Sponsor



7th Conference on



Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

nova-Institute



Michael Carus
Managing Director



Achim Raschka
Head of Technology
and Markets



Table of Contents

Programme of the 1 st Day	04
Programme of the 2 nd Day	06
Innovation Award	08
Exhibitors	12
14 valuable comments on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers	13
CCU Session	14
Hitchhiker's Guide to Carbon Capture and Utilisation	20
How renewable carbon from CCU will conquer the fossil-based plastic production – a future scenario for the plastics industry	22
nova-Institute's Services	23
Updated Version: Trend Report on Carbon Dioxide (CO ₂)	30

Dear participants,

It is impressive how dynamically the Carbon Capture and Utilisation (CCU) sector is developing: Not only a rapid technical and logistical development, but also new investments in pilot plants and even (semi-) commercial plants. Future-oriented political framework conditions through the first integration of CCU fuels into the Renewable Energy Directive. When the so-called RED II comes into force in 2020, investors will be ready. And in emission trading (ETS), the course seems to have been set for an opening for CCU. The high diversity of the developments is also demonstrated by the Innovation Award "Best CO₂ Utilisation 2019" sponsored by Covestro and organised by nova, which will be presented for the first time this year. At first, we were worried that we wouldn't get enough submissions – in the end we were overwhelmed with good ideas, from which six are nominated and now stand for election.

At the conference, which is one of the largest CCU conferences in the world, you will meet the industry's leading personalities and companies to present and discuss their latest developments and implementations. Many of them are now professionally organised in the association "CO₂ Value Europe", which is a partner of the conference. We would like to take this opportunity to express our sincere thanks to our sponsors and premium partners: Covestro AG (Innovation Award Sponsor), Phytionix Corporation (Gold), Enviro Ambient (Silver) and EnergieAgentur.NRW (Premium Partner).

At the conference you will learn about new technologies and plants as well as comprehensive political framework conditions and strategies such as "Renewable Carbon is the Key". A parallel expert workshop will bring you up to date on various carbon capture technologies, which represent the first step of CCU.

Look forward to new information, inspiration and exciting discussions during the conference and in individual discussions. Take a big look into the future.

The nova team wishes you a successful and pleasant conference visit!

Yours sincerely

Michael Carus, Achim Raschka and Pia Skoczinski

P.S.: Do you need support for your CCU projects? The nova-Institut does much more than conferences: Our experts are innovation scouts and market researchers, work on economic and sustainability analyses, carry out life cycle assessments and know the political framework conditions in detail. We will be happy to support you with your CCU projects.



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

WWW.CO2-chemistry.eu

Greeting from the Patron

North Rhine-Westphalia is a proud industrial state which, over the past one and a half centuries, has produced a multitude of innovative products that are used all over the world. The chemical industry in particular has been a central pillar of this development and has laid the core foundations for the success of North Rhine-Westphalia's economy and its role as an industry hub.

Our shared responsibility for achieving the international climate targets makes it necessary to strengthen this innovative spirit and to advance our state into a forward-looking centre of industry ready to compete with the world's top players.

The energy-intensive companies in the chemical industry in particular are facing serious upheavals when it comes to implementing a prudent and responsible use of resources en route to a low-emission or even zero-emission industry.

Not only the reduction, but also increasingly the utilisation of carbon dioxide is of importance. On the path to a sustainable future, the transformation and expansion of the resource base in particular provides enormous opportunities for better competitiveness, innovative strength and sustainability of the chemical industry.

CO₂ can be profitably used as a carbon source – i.e. resource base – for the production of chemicals, polymers and fuel. Numerous NRW-based institutes, research establishments and companies are conducting research in this area. The concentration of skills and expertise across a wide spectrum in North Rhine-Westphalia is quite unique in Germany.

So, the chemical sector as a key enabling industry is of particular significance to our entire economy's capability to use carbon dioxide as a raw material and improve the climate record along the full value chain.

Prof. Dr. Andreas Pinkwart

Minister for the Economy, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia

Patronage

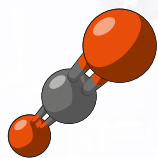


The conference is under the patronage of

Prof. Dr. Andreas Pinkwart

Minister for the Economy, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia

7th Conference on



CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

PROGRAMME OF THE 1st DAY, 20 MARCH 2019



10:00 **Conference Opening**
Michael Carus
nova-Institut

INNOVATION AND STRATEGY



Chairman
Damien Dallemagne
CO₂ Value Europe



11:00 **Enrico Barsch**
German Federal Ministry of Education and Research
*Carbon Dioxide as a Sustainable Carbon Source –
Activities of the German Federal Ministry of Education
and Research*



10:10 **Stefanie Kesting**
CO₂ Value Europe
*Achievements and Perspectives for
CO₂ Utilisation in Europe*



11:20 **Michael Carus**
nova-Institut
*Renewable Carbon is Key to a Sustainable and
Future-Oriented Chemical Industry*



10:40 **Carmine Marzano**
European Commission
EU R&I Activities in the Framework of CO₂ Utilisation

11:50 **Discussion**

12:00 **Lunch Break**

SUSTAINABILITY AND POLICY



Chairman
Michael Carus
nova-Institut



13:50 **Volker Sick**
University of Michigan / Global CO₂ Initiative
The Global CO₂ Initiative at the University of Michigan



13:30 **Nils Rettenmaier**
ifeu-Institut
*Scientifically Sound Life Cycle Assessments for
CCU Technologies: Towards a Realistic Picture of
the Environmental Impacts*



14:10 **Lara Dammer**
nova-Institut
The new EU policy landscape for CCU: REDII and ETS

14:30 **Discussion**

14:40 **Coffee Break**



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

PROGRAMME OF THE 1st DAY, 20 MARCH 2019

HYDROGEN PRODUCTION AND CARBON CAPTURE



Chairman
Haralabos Zorbas
IBB-Netzwerk



15:40 Amelie Carron
Air Liquide
Blue Hydrogen – Production of Low Carbon Hydrogen



15:10 Arnaud de Lhoneux
Hydrogenics
*Large Scale PEM Water Electrolysis,
Ready for CCU Projects*



16:00 Christian Schweitzer
bse Engineering Leipzig



Oscar Graff
Aker Solutions
*Modular Carbon Capture Units for
Small-Scale Methanol Plants*

16:20 Discussion

INNOVATION AWARD



16:30 Chairpersons
**Michael Carus &
Asta Partanen**
nova-Institut



17:10 Uta Hermes
Gensoric
*willpower energy® – Innovative Process Technology in
Domestic Heating Systems*



16:40 Frank Kensy
b.fab
Process for Formate Bioeconomy



17:20 Christophe Mihalcea
LanzaTech
*Unique Process to Convert CO₂ into Isopropanol
and Acetone*



16:50 Andrew Schmidt
Carbicrete Inc.
*Carbicrete – Production of Cement-Free,
Carbon-Negative Concrete*



17:30 Gunnar Hølen
Nordic Blue Crude AS
*Nordic Blue Crude – Plan is to Produce Synthetic Crude
from Renewable Power, Water and CO₂*



17:00 Peter Hammond
CCm Technologies Ltd.
*CCm Growth – Captured Carbon Dioxide to
Produce Nitrogen-Based Biogenic Fertilisers*

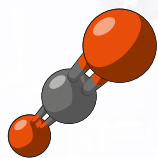


17:40 Innovation Award Sponsor
Markus Steilemann
Covestro
*A Dream Comes True – Driving Resource Efficiency and
Circular Economy with CO₂-Based Plastics*

18:00 Cold Beer on Tap in the Exhibition Space
INNOVATION AWARD CEREMONY IN THE EXHIBITION HALL

20:00 Gala Dinner Buffet

7th Conference on



CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

PROGRAMME OF THE 2nd DAY, 21 MARCH 2019

CO₂ FOR CHEMICALS AND MATERIALS



Chairwoman
Sarah Refai
CLIB



09:40 Paul E. King
Enviro Ambient
Matching Carbon Conversion Technologies to Carbon Capture Technologies to Catalyze the Carbon Economy



09:00 Dennis Krämer
DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V.
CarbonNext – Evaluation of CCU Along the Value Chain



10:00 Jörg Mampel
B.R.A.I.N.
Bite-sizing the Challenge: A Modular Approach for the Biotechnological Valorization of CO₂



09:20 Sophia Hamblin Wang
Mineral Carbonation International
Transforming CO₂ Emissions into Valuable Products for Use in Industry and Building Products

10:20 Discussion

10:30 Coffee Break



Chairman
Bruce Dannenberg
Phytonix Corporation



11:40 Chae-Hwan Hong
Hyundai Motor Group
Synthesis of CO₂ Based Polycarbonate Polyol and Its Application



11:00 Achim Raschka
nova-Institut
Polymers Based on CO₂ – An Overview on Possible Technologies



12:00 Richard French
Econic Technologies
Harnessing the Endless Potential of CO₂



11:20 Persefoni Hilken
Covestro
New Developments in the Field of CO₂ Based Materials



12:20 Willemijn Witteveen
Avantium
Reducing CO₂ Producing Chemicals: The Potential of Electrochemistry

12:40 Discussion



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

PROGRAMME OF THE 2nd DAY, 21 MARCH 2019

SPECIAL PARALLEL SESSION: WORKSHOP ON CARBON CAPTURE TECHNOLOGIES (11:00 – 12:50) Room Laurentius



11:00 Chairwoman:
Pia Skoczinski
nova-Institut



Gaurav Rajen
Green Fire Technologies



**Torsten Buddenberg &
Marc D. Jedamzik**
Mitsubishi Hitachi Power Systems Europe



Dirk Nuber
climeworks
*CO₂ Capture from Air: A Breakthrough Sustainable
Carbon Source for Synthetic Fuels*



Paul E. King
Enviro Ambient
*Matching Carbon Conversion Technologies to Carbon
Capture Technologies to Catalyze the Carbon Economy.*



Brett Henkel
Inventys
*Building a CO₂ Marketplace for Cement's CO₂ Emissions
with the eCO₂ Source Capture System*

12:40 Discussion

12:50 Lunch Break

CO₂ FOR FUELS



Chairman
Frank Köster
EnergieAgentur.NRW



15:00 Bruce Dannenberg
Phytonix Corporation
*Utilizing Synthetic Biology to Address Global Challenges:
Climate Change and Sustainable Chemistry*



14:20 Frank Köster
EnergieAgentur.NRW
*Synthetic Fuels for Transport – Perspectives and
Projects from North Rhine-Westphalia*



15:20 Rudolf Dörpinghaus
IASA
*Greener Skies Ahead: PTL Fuels as a Kerosene Alternative
for Sustainable Aviation*



14:40 Peter Lindblad
Uppsala University
*CO₂-Fixation and Engineering for Increased CO₂-Fixation
in Photoautotrophic Organisms*



15:40 Benedikt Stefánsson
Carbon Recycling International
*Renewable Methanol from CO₂ and Electricity:
Commercial Scale Solution Ready to Meet Future Challenges*

16:00 Discussion

Network Reception

7th Conference on

CO₂

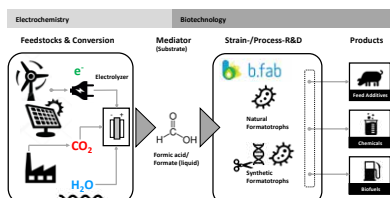
Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

Nominees for the Innovation Award “Best CO₂ Utilisation 2019”



b.fab GmbH (Germany) Process for Formate Bioeconomy



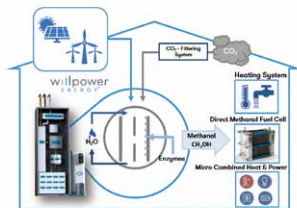
Carbicrete Inc. (Canada) Carbicrete



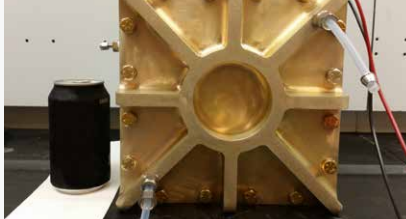
CCm Technologies Ltd (United Kingdom) CCm Growth



Gensoric GmbH (Germany) willpower energy®



LanzaTech (United States) Isopropanol and acetone



Nordic Blue Crude AS (Norway) Nordic Blue Crude



Sponsored by



Organiser





7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

Innovation Award

b.fab GmbH : Process for Formate Bioeconomy

b.fab has developed a disruptive process technology to efficiently convert CO₂, water and renewable energy into value-added chemicals. CO₂ and water are abundantly available and therefore it is the starting point to build a sustainable bioeconomy. Via electrochemistry, b.fab convert and store CO₂ and H₂ (made from water) in liquid form as formate. The formate is the feedstock for the bioprocesses and b.fab uses synthetic biology to design specific pathways and to convert formate into value-added chemicals. b.fab is dedicated to establishing a formate-based bioeconomy in the coming years, and thus, providing an economical and sustainable new way to produce value-added chemicals for various industries. One of the first products will be lactic acid which can be further processed to produce PLA biopolymers.

www.bfab.bio

Carbicrete Inc. : Carbicrete

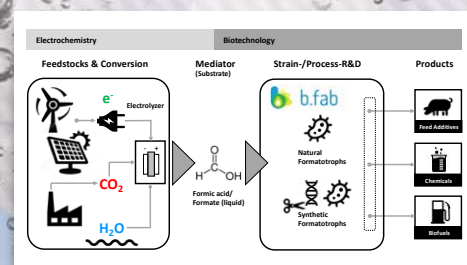
Carbicrete's patented process enables the production of cement-free, carbon-negative concrete. Cement is replaced in the concrete mix with ground steel slag and the concrete is cured with CO₂ instead of heat and steam. Their concrete has lower material costs (steel slag is less expensive than cement because it is essentially industrial waste) and better mechanical and durability properties (can withstand more freeze/thaw cycles and have up to 30 % higher compressive strength) than cement-based concrete. A standard-size 18 kg concrete masonry unit (CMU) made using this process captures 1 kg of CO₂ (2 kg of emissions are also avoided for every block produced). Adoption of this technology by a plant producing 25,000 CMUs per day would result in the use of 25,000 kg of captured CO₂ per day.

www.carbicrete.com

CCm Technologies Ltd : CCm Growth

CCm fertiliser production systems combine captured carbon dioxide with waste resources to produce a range of nitrogen-based biogenic fertilisers for agriculture and horticultural applications. CCm Growth has had five years of trials on agricultural land for a range of commodity crops. Trials were compared with industry standard, carbon intensive fertilisers. Results have shown growth yields of crops to be the same and in some cases better with CCm Growth product. Early soil trials show that CCm growth makes a significant impact on soil health; improved water retention, improved pH levels and increased families of microorganisms to name just a few benefits. 50 CCm Growth systems would save 2.3mT of CO₂ per annum. CCm Growth will contribute to a circular economy and to achieving future carbon reduction targets.

www.ccmtechnologies.co.uk



7th Conference on



Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

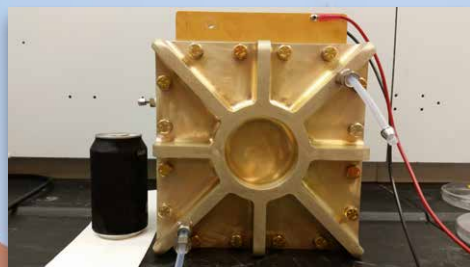
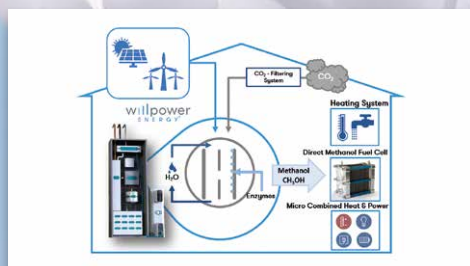
www.CO2-chemistry.eu

Innovation Award

Gensoric GmbH : willpower energy®

With the willpower energy project, the company Gensoric wants to make private homeowners completely independent of conventional fuel like natural gas or heating oil. For the first time, the developed system can produce your own fuel, in form of methanol, locally from CO₂ in order to have enough energy for hot water and heating supply. This technology, in combination with renewable electricity systems installed at your house, allows for complete self-sufficiency. At the same time, willpower energy can be considered a seasonal storage. If more energy is generated than is consumed in the summer, it can store this energy into the winter. So, it can be used when it is most needed. Under mild conditions (room temperature/low pressure) with relatively simple process technology, this can also take place in a non-industrial environment and private households.

www.willpower-energy.eu



LanzaTech : Isopropanol and acetone

LanzaTech have developed a process for direct CO₂ capture and utilisation in valuable chemical intermediates. This combines reduction of CO₂ to CO via zero carbon electrolysis with their CO fermentation capability. Chemical products, in this case acetone and isopropanol (IPA), are used in durable materials such as acrylic and polypropylene plastics, respectively. Given the longevity of these materials in the environment, this process valorises CO₂ while also sequestering it into materials. The process is unique as it enables 100 % conversion of CO₂ into products, which is not easily achieved in chemo-catalytic or biocatalytic processes.

www.lanzatech.com



Nordic Blue Crude AS : Nordic Blue Crude

The Nordic Blue Crude AS (NBC) business plan is to produce synthetic crude from renewable power, water and CO₂. The product is named Blue Crude and consists of high value wax for use in the cosmetics industry, middle distillate usable as high performance and quality diesel and kerosene and naphtha, refineable to gasoline. NBC has an exclusive license agreement with Sunfire AG for the use of their technology in Scandinavia, and agreements for localisation of a production unit at Herøya, Norway's largest industrial park. NBC has secured an off-take agreement for their entire production for different clients. Nordic Blue Crude AS has experienced management and board. They claim a sustainable competitive advantage with securing favourably priced renewable power and operating at a site with all industrial infrastructure.

www.nordicbluecrude.no



2.5 MWe demonstration unit

Our technology captures carbon dioxide at a 75+% lower cost than traditional amine-based solutions

Parasitic load approximately 4%

Works with all flue gasses: coal, natural gas, cement, steel

Back-end process implemented with minimal disruption

EAC's Dr. Paul King presents
Matching Carbon Conversion Technologies to Carbon Capture
21 March 2019, 9:40 AM
info@enviroambient.com for more information

Call for posters

You are welcome to present your latest products, technologies or developments in our poster session – please send us the title and an abstract of your proposed presentation as soon as possible. Hand in your application [here](http://co2-chemistry.eu/call-for-posters) <http://co2-chemistry.eu/call-for-posters>

Venue & Accommodation

Maternushaus
Kardinal-Frings-Straße 1
50668 Cologne
+49 (0)221 163 10

www.maternushaus.de

The venue is located within twelve minutes walking distance from Cologne central station.

Entrance Fee

1 st Day of Conference 20 March 2019	2 nd Day of Conference 21 March 2019
565 €	515 €
865 €	

(Conference incl. Catering, 19 % VAT exclusive)

2019-03-14

7th Conference on



CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

Members of the Advisory Board



Damien Dallemagne
CO₂ Value Europe



Bruce Dannenberg
Phytonix Corporation



Heleen De Wever
Flemish Institute for
Technological Research (VITO)



Christoph Gürtler
Covestro



Stefanie Kesting
CO₂ Value Europe



Frank Köster
EnergieAgentur.NRW



Peter Lindblad
Uppsala University/Phytonix
Corporation



Sarah Refai
CLIB



Christian Schweitzer
bse Engineering Leipzig



Peter Styring
University of Sheffield



Haralabos Zorbas
Industrielle Biotechnologie
Bayern Netzwerk GmbH (IBB)

Exhibition information

Exhibition will take place from
20–21 March 2019.

A booth (6m²) costs 500 EUR (excl. 19% VAT). Please submit Mr. Dominik Vogt a printable logo and a company profile. We provide you

- a table (1,40 m x 0,70 m)
- table cloths
- a pin board (2m high x 1,20m width, pinup area 1,50m (high) x 1,20m (width))
- a chair and
- a power connection.

You are welcome to use your own booth system. The exhibition is located in the lobby in front of the conference hall where the breaks will take place.

Book your booth now [here](http://co2-chemistry.eu/exhibition-booking)
[http://co2-chemistry.eu/
exhibition-booking](http://co2-chemistry.eu/exhibition-booking)

Setup times
19 March: 7 pm
20 March: 8 am

Register first to the conference
<http://co2-chemistry.eu/registration>
(select the 2-day entrance ticket for
845 EUR plus 19% VAT)!

Available for booking
Already sold
Reserved for sponsors



Exhibitors

Booth 4: Zeton BV
Booth 5: EnergyAgency.NRW
Booth 8: Media Table
Booth 11: VTT Technical Research
Centre of Finland

Booth 12/13: Innovation Award "Best
CO₂ Utilisation 2019"
Booth 14: nova-Institut
Booth 15: Phytonix Corporation
Booth 22: VITO



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

WWW.CO2-chemistry.eu

14 valuable comments on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers

Torsten Buddenberg,
Mitsubishi Hitachi Power Systems Europe

"Post Combustion Capture – State of the art carbon capture solution for industry and energy!"

Damien Dallemagne, CO₂ Value Europe

"Together, let's create the new CCU industry sector"

Bruce Dannenberg, Phytonix Corporation

"This presentation will provide an overview of how Phytonix is employing synthetic biology for carbon dioxide utilization to address the global challenges of climate change and the production of cost competitive, sustainable chemicals and fuels."

Rudolf Dörpinghaus, IASA

"In order to mitigate the impact on climate change and to limit global warming below 1,5°C, aviation has to switch step-by-step to sustainable fuels, preferably to so-called 'green electrofuels' (PtL)."

Richard French, Eonic Technologies

"The endless potential to create useful products with CO₂ using Eonic's catalyst system, products with performance potential, economic potential and environmental potential."

Dennis Krämer, DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V.

"Considering multiple pathways for CCU is crucial and needs to be explored cross-sectoral"

Prof. Dr. Peter Lindblad, Uppsala University

"Cyanobacteria engineered to fix more CO₂ produce more of an introduced capacity to make the compound and a higher compound to biomass ratio"

Jörg Mampel, B.R.A.I.N.

"By the combination of naturally evolved and genetically engineered microbes, a flexible roadmap from CO₂ to various value added products can be established."

Gaurav Rajen, Green Fire Technologies

"Let's make Amine systems fouling a friend: add metal catalysts to amine gas scrubbing systems to form liquid fuels and solid carbonates; recreate hydrothermal vent ecosystems."

Nils Rettenmaier, ifeu-Institut

"Life cycle assessment (LCA) is a powerful tool to quantify the environmental impacts of CCU products but further methodological guidance is needed to avoid pitfalls."

Christian Schweitzer & Oscar Graff,
bse Engineering Leipzig / Aker Solutions

"With the skid-mounted small-scale methanol plant 'FlexMethanol', it is economic to produce methanol from excess electricity and CO₂."

Benedikt Stefansson, Carbon Recycling International

"CRI's experience shows that large scale production of e-fuel from CO₂ and green energy can become a commercial reality and success."

Volker Sick,
University of Michigan / Global CO₂ Initiative

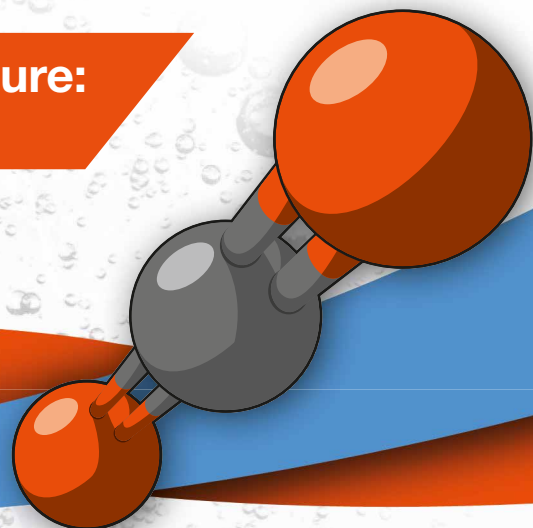
"Life cycle assessment (LCA) is a powerful tool to quantify the environmental impacts of CCU products but further methodological guidance is needed to avoid pitfalls."

Denis Thomas, Hydrogenics

"Review of ongoing power-to-X projects with CO₂ Utilization where Hydrogenics' large scale PEM electrolyzers are being used and the way forward to very large scale plants."

nova Session on technology of the future: Carbon Capture and Utilization (CCU)

24 September 2019 | 10:00 – 16:30h
Airport Cologne/Bonn



What makes the utilisation of CO₂ attractive? Which role will CCU and renewable carbon play for sustainable fuels and chemistry? nova experts discuss possible options of CCU technologies, latest developments and the political framework. In addition to nova-sessions, we also hold individual in-house workshops to facilitate discussions with your team.

The capture and usage of CO₂, among experts referred to as Carbon Capture & Utilisation (CCU), is gaining momentum. First commercial productions of CO₂-based fuels and polymers have been launched in the last years. Several additional technologies have progressed far enough to enable the production on an industrial scale in the near future – with advanced biotechnology and chemical catalysis. At the same time renewable energy from solar, wind and hydro are getting cheaper each year and the latest plants at favourable locations are already at the same price level as fossil energy sources or even below. A perfect situation for combining cheap and abundant renewables with carbon utilisation to store energy, to produce renewable fuels and chemicals. Furthermore, the need to find suitable solutions to meet emission goals and to find alternative and renewable carbon sources for fuels and for the chemical industry become more and more urgent.

Learn about the current state and future of CCU:

- What are the reasons for your company to give a thought to CCU?
What are the benefits and what is the business case for this?
- Which technologies for CO₂ capture and CO₂ utilisation are already available today?
On which Technology Readiness Level (TRL) are they available?
- What are the first applications for CCU? Which pilot, demonstration and commercial plants are already in place and what are the main areas in research and development? Which are leading countries, companies and institutes?
- Is a reduction of CO₂ (with a lot of energy) always necessary?
Are there other ways to utilise CO₂?
- Which role will CCU play in the political framework, in the Renewable Energy Directive (REDII) and the Emissions Trading System (ETS)?
- What are guidelines for economic and environmental assessment of CCU technologies?
- How will the CO₂-based and the bio-based economy interact?
What are the best ways for utilising renewable carbon?

As a participant of the nova Session on technology of the future:
Carbon Capture and Utilisation (CCU) you are invited to bring your questions and shape the discussion.

nova Sessions are an interactive and informative series of events around topical issues of the bio-based and CO₂-based economy organized by nova-Institute.

Please register here:

www.bio-based.eu/nova-sessions/registration

Participation fee 675 €



Achim Raschka,
nova-Institute

Biologist Achim Raschka is working at nova since 2008, in 2013 he became head of the Department of Technology and Markets.

He is involved in different national and international research programs concerning biotechnological and chemical processes, based on biomass and/or CO₂. Achim is one of the leading experts on CCU technologies in Europe.



Michael Carus,
Managing Director, nova-Institute

Physicist, from 1983 to 1994, he worked for the IT industry, environmental institutes and the solar industry. In 1994, he co-founded nova-Institute and has been functioning as owner and

Managing Director since then. More than 20 years experience in the field of bio-based economy, and six years in CO₂-based economy. His work focuses on market analysis, techno-economic and ecological evaluation, marketing support and creating a suitable political and economic framework for bio-based processes and applications.



Pia Skoczinski, nova-Institute

Pia Skoczinski is trained as a biologist and has joined nova in 2018 working for the Technology & Markets department. She has several years of research experience in optimisation of microbial cell factories, enzyme engineering and enzyme-catalysed polymerisation. After receiving her PhD in biology in 2016 from the Heinrich Heine University of Duesseldorf, she did a one-year postdoctoral research at the University of Groningen in Macromolecular and Polymer chemistry. In her daily work, she is focused on bio-based building blocks and polymers, Industrial Biotechnology and Carbon Capture and Utilisation.



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

Venue & Accommodation

Maternushaus

Kardinal-Frings-Straße 1
50668 Cologne
+49 (0)221 163 10

www.maternushaus.de

The venue is located within twelve minutes walking distance from Cologne central station.



© Maternushaus

Conference Team



Asta Partanen
Sponsoring

+49 (0) 151 11130128
asta.partanen@nova-institut.de



Achim Raschka
Programme & Poster Session

+49 (0)2233 4814-51
achim.raschka@nova-institut.de



Dominik Vogt
Conference Manager,
Organisation & Exhibition

+49 (0)2233 4814-49
dominik.vogt@nova-institut.de



Jutta Millich
Partners & Media Partners

+49 (0)561 503580-44
jutta.millich@nova-institut.de



Pia Skoczinski
Innovation Award

+49 (0)2233 4814-56
pia.skoczinski@nova-institut.de



Vanessa Kleinpeter
Registration & Contact

+49 (0)2233 4814-40
vanessa.kleinpeter@nova-institut.de



RealTime Comments

Join at [sli.do #2019CCU](https://sli.do/#2019CCU)

Twitter



#2019CCU

Free WIFI



Network ID: nova-conference
Password: nova2019

Leading event on Carbon Capture & Utilisation (CCU)

More than 200 leading international experts in CO₂ utilisation are expected to attend the conference and share their recent success stories, as well as new ideas and products in realization.



www.CO2-chemistry.eu

Match Making

We would like to draw your attention to our professional match making tool Pitch and Match we are using for the 7th Conference on CO₂ as Feedstock in Cologne.

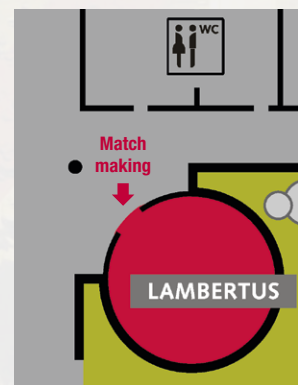
- Meet decision makers of the Industry – 1-on-1
- Find new networking and business opportunities
- Arrange meeting place & time with ease
- Manage all your meetings in one simple user-friendly environment
- Get email alerts for meeting requests

You are not yet registered?

To use our match making tool, please ask Ms. Svenja Geerken directly:



Svenja Geerken
svenja.geerken@nova-institut.de



YOU CAN'T FLY AROUND THE WORLD WITHOUT FUEL. WHY NOT?



#SolarImpulse #PushingBoundaries

At Covestro, we were fascinated by Bertrand Piccard's dream of flying around the world in a plane powered solely by the sun. And we stepped up to the mark by providing a range of highly innovative materials, many of which are now also used in our everyday lives, for example as extremely efficient insulation for refrigerators. 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

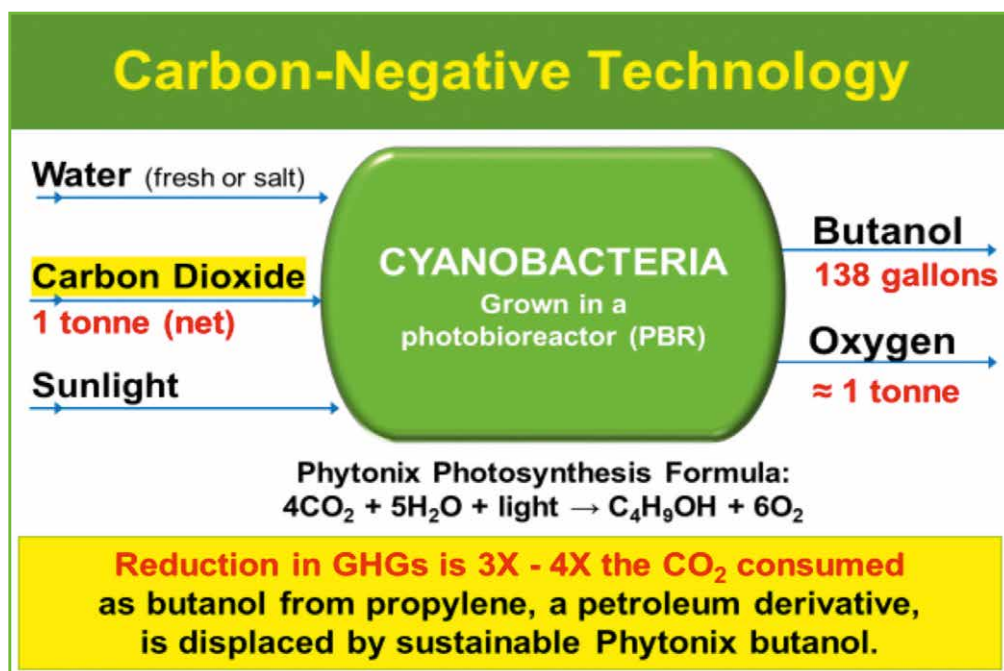




Powerful Biological Carbon Dioxide Utilization (CDU) Technology for the Production of Low Cost Industrial Chemicals Utilizing Photosynthesis

Phytonix Corporation is an industrial biotechnology company producing renewable chemicals directly from CO₂. The Company is headquartered in North Carolina, USA, with a corporate office in Vancouver, Canada, plus development laboratories and partners in Sweden, Germany, the United States, Nova Scotia and British Columbia, Canada, and The Netherlands. Phytonix Canada Corporation is a wholly owned subsidiary of Phytonix Corporation.

- Our solar chemical CDU technology utilizes photosynthesis to directly convert CO₂ into industrial chemicals and fuels
- Phytonix uses cyanobacteria to produce solar chemicals such as butanol and octanol from CO₂ feedstock
- The Phytonix process directly reduces greenhouse gas (GHG) emissions at the rate of one metric tonne of CO₂ per 137 gallons of biobutanol produced
- We expect our carbon negative process to produce cost leadership industrial chemicals at less than half the cost of the incumbent fossil producers
- Provides a solar energy storage solution far more economical and superior to batteries with a negative carbon footprint
- Full global deployment could significantly reduce annual anthropogenic carbon dioxide emissions and help slow climate change to manageable levels



Contact:

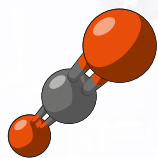
Phytonix Inc.

Bruce Dannenberg, M.S., M.B.A.

President & Chief Executive Officer

bruce@phytonix.com | www.phytonix.com

7th Conference on



Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

EnergieAgentur.NRW 

EnergieAgentur.NRW

Fuels and Drives of the
Future Network



Dr. Frank Köster

Munscheidstr. 14
45886 Gelsenkirchen

Phone: +49 209 167-2811
koester@energieagentur.nrw

[www.energieagentur.nrw/
mobilitaet](http://www.energieagentur.nrw/mobilitaet)

Premium Partner EnergieAgentur.NRW

The EnergyAgency.NRW works on behalf of the state government of North Rhine-Westphalia as an operative platform with broad expertise in the field of energy: from energy research, technical development, demonstration, market launch and energy consultancy to continuous vocational training. Many of its activities focus on energy efficiency and climate protection. In times of high energy prices it is more important than ever to forge ahead with the development of innovative energy technologies in NRW and to highlight from an impartial point of view how companies, local authorities and private individuals can handle energy more economically or make appropriate use of renewables.

The EnergyAgency.NRW operates with around 140 employees mainly from its locations in Düsseldorf, Gelsenkirchen and Wuppertal. It receives funding from, among others, the European Union's ERDF (European Regional Development Fund).

Cluster and Network Management

Acting on behalf of the Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia, the EnergyAgency.NRW manages the Clusters "EnergyRegion.NRW" and "CEF.NRW" and is responsible for high-powered networks for climate protection in a total of 27 individual assignments. These encompass, for example, the subjects of system transformation, energy infrastructure, energy market design, business and financing models, knowledge management, as well as the networks Foreign Trade, Biomass, Fuel Cells, Hydrogen and Electromobility, Energy Efficiency in Municipalities, Energy Efficiency in Companies, Geothermal Energy, CHP/ Local and District Heating, Future Fuels and Drives, Photovoltaics, Heat/ Buildings, Hydropower and Wind Energy. The EnergyAgency.NRW also organises the networks "Energy Economy" and "Mining Economy". The network operations focus on highly competitive co-operative ventures to initiate innovative projects and products, to speed up their market readiness and to exhaust all economic potentials.

Fuels and Drives of the Future Network

The EnergyAgency.NRW launched its Fuels and Drives of the Future Network in 2005. The aim is to muster all the forces along the respective value chains in order to develop joint solutions for future forms of climate-friendly mobility and liquid or gaseous transport fuels (e.g. synthetic fuels, biofuels). This also encompasses the development of new technologies and the testing of new business models.



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

Partners



www.bcnp-consultants.com



www.co2chem.com



www.globalco2initiative.org



www.kunststoffland-nrw.de



www.bigc-initiative.eu



www.clib-cluster.de



<https://nrweuropa.de>



www.stoffstroeme.de



www.bio.org/worldcongress



www.co2value.eu



www.ibbnetzwerk-gmbh.com

Media Partners



www.advancedbiofuelsusa.info



<https://fuelsandlubes.com>



www.inicop.org



www.plastixportal.co.za



<http://news.bio-based.eu>



www.goingpublic.de



www.k-zeitung.de



www.heise.de/tr



www.biobasedpress.eu



www.goingpublic.de



www.macplas.it



www.greenchemicalsblog.com



www.bioplasticsmagazine.com



<https://ilbioeconomista.com>



www.openchemistry.com



www.worldofchemicals.com



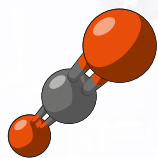
www.chemanager-online.com



<https://home.liebertpub.com>



www.plasticker.de



Hitchhiker's Guide to Carbon Capture and Utilisation

What does “Carbon Capture and Utilisation (CCU)” mean and what are the main benefits? nova-Institute's newest paper provides deep insights into all aspects of the use of CO₂: Concept and vision, (semi)commercial implementations, political framework, sustainability and economy.

For many, CCU is still a mystery and even experts often think that its implementation is for the distant future and will take 50 more years minimum. The nova paper explains the CCU concept comprehensibly and shows that even the use of fossil CO₂ emissions for CCU brings clear environmental advantages – although they are still greater for biogenic CO₂. It also showcases the first (semi)commercial plants that are in operation or under construction. The CCU revolution is already well underway! Additionally, the paper discusses the improved political framework conditions in REDII and the upcoming ETS, analyses the sustainability of the new technologies and describes the economic status of CCU: Where is it already worthwhile today and where will it be tomorrow? The Hitchhiker's guide is your chance to understand one of the most exciting technologies of the future.

Carbon Capture and Utilisation (CCU) stands for the capture and utilisation of carbon dioxide (CO₂) as a carbon source to be used as a feedstock in the production of fuels, carbonates, chemicals and polymers. The energy needed for the transformation of CO₂ must stem from renewable resources to provide an environmental benefit compared to other sources of carbon. Nine out of the 17 Sustainable Development Goals of the United Nations are directly addressed through CO₂ utilisation in combination with renewable energies.

As one example for aviation and long-distance shipping, liquid fuels like kerosene and diesel are and will be indispensable in the long run. In both cases, CCU fuels are by far the best choice compared with conventional and also biofuels. The production process for CCU kerosene compared to bio-based kerosene shows significant advantages: a lower carbon footprint, based on the use of emitted CO₂ as a feedstock, much lower space requirements compared to cultivated biomass needed for bio-based kerosene and optimal production conditions in the desert, based on the high and cost-efficient supply of solar energy as the necessary renewable energy source.

Also, the chemical industry can only become sustainable if it completely abandons fossil feedstocks such as crude oil, coal and natural gas and strictly uses only renewable carbon as a raw material for organic chemistry. So CCU is crucial for a future sustainable chemistry.



7th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

About 70 research projects, start-ups and established companies are currently using or planning to use CO₂ or off-gases for the production of fuels, chemicals, polymers, proteins and gases for energy storage and chemicals. In the nova paper a selection of the 12 most advanced projects and companies at commercial scale is shown to underline the fact that CCU technologies are already successfully performed and not only a possible perspective for the future.

Under current conditions, renewable carbon from CCU is generally more expensive than fossil carbon from crude oil or natural gas. The most decisive factor for the price difference is the price at which renewable energy can be obtained for hydrogen production in the CCU process – the discrepancy will decrease in the future. The nova paper discusses different factors determining economic feasibility and how fast price parity can be reached.

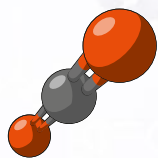
Political frameworks are decisive for the make or break of infant technologies. The new renewable energy framework of the European Union, coming into force in 2020, includes support measures for transport fuels won from carbon capture and utilisation. It is the first time that such measures are part of a regulatory document on EU level. During the negotiations preceding the agreement on the revised Renewable Energy Directive (REDII), it became clear that many policy makers were previously not aware of the potential of the technology. Within a relatively short time, the topic grew roots in Brussels' discourses.

The EU Emissions Trading System (ETS) is the largest greenhouse gas emission trading scheme in the world and a cornerstone of the European Union's efforts against climate change. Where Carbon Capture and Sequestration (CCS) applications have a special position within the ETS, the same is not the case for CCU applications, meaning that companies have to purchase emission allowances for emissions they capture and utilise again for another process or product. However, also in this policy area, awareness is increasing and one company has already successfully challenged these regulations in court. Potential changes in the ETS are highlighted in the paper.

You can download the full nova paper #11 "Hitchhiker's Guide to Carbon Capture Utilisation (CCU)" for free here: www.bio-based.eu/nova-papers

The nova paper will be presented and discussed at the "7th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers", 20–21 March 2019, Cologne, Germany: www.co2-chemistry.eu

7th Conference on

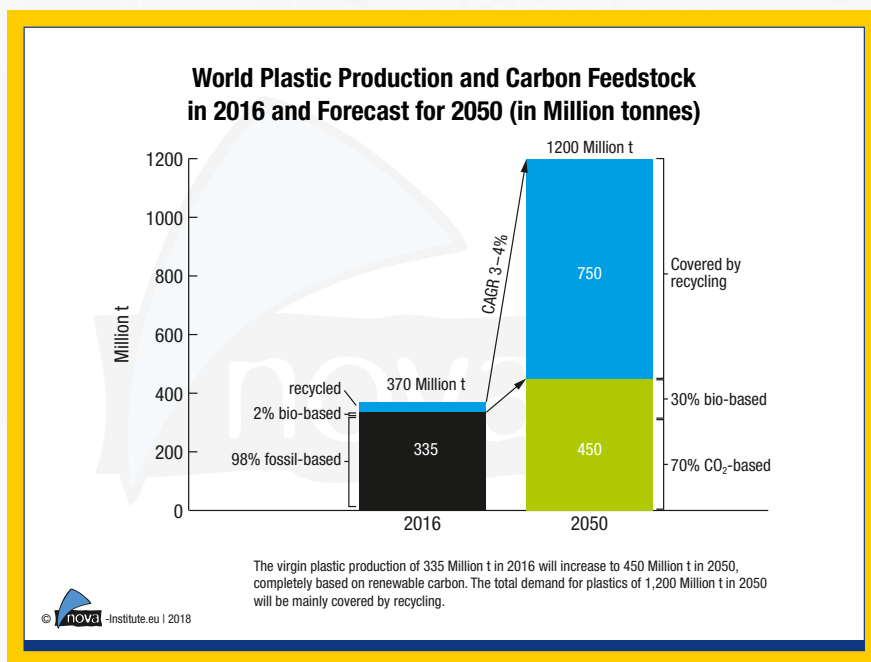


CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

How renewable carbon from CCU will conquer the fossil-based plastic production – a future scenario for the plastics industry



A future scenario for the plastics industry might look as follows: Due to its annual growth of three to four per cent, the global production of plastics will soon reach the mark of 400mn metric tonnes per year. Pronounced recycling efforts might hold the continuously growing demand for new plastics between 400 mn and 500 mn metric tonnes by 2050. This need could then be covered by, for example, 30 per cent biomass and 70 per cent direct CO₂ utilisation. The total of biomass required to do so would amount to roughly 1% of biomass currently used around the globe in all fields of application (13–14 bn metric tonnes, of which 60 per cent alone are attributable to animal feed for the production of milk and meat).

Download of the full nova-Paper #10: “Renewable Carbon is Key to a Sustainable and Future-Oriented Chemical Industry” here: <http://bio-based.eu/nova-papers>



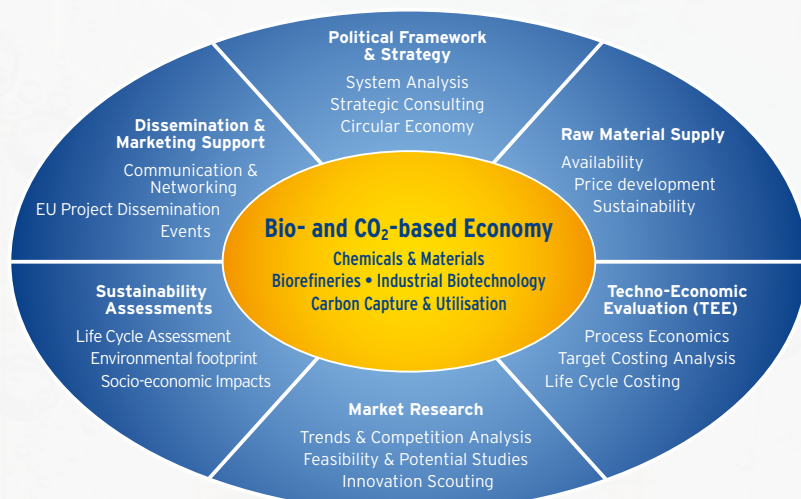
7th Conference on

CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

nova-Institute's Services in the bio-based Economy for Companies, Associations and Politics



nova-Institute (www.nova-institut.eu) is a private and independent research institute, founded in 1994; nova offers research and consultancy with a focus on bio-based and CO₂-based economy in the fields of food and feedstock, techno-economic evaluation, markets, sustainability, dissemination, B2B communication and policy. Every year, nova organises several large conferences on these topics; nova-Institute has 30 employees and an annual turnover of more than 3 million €.

Think outside the box.
Create tomorrow's innovations!



EUROPEAN CHEMISTRY PARTNERING

Unique speed dating for the chemical industry and all related business areas

Register now for:

4th ECP – 27 February 2020

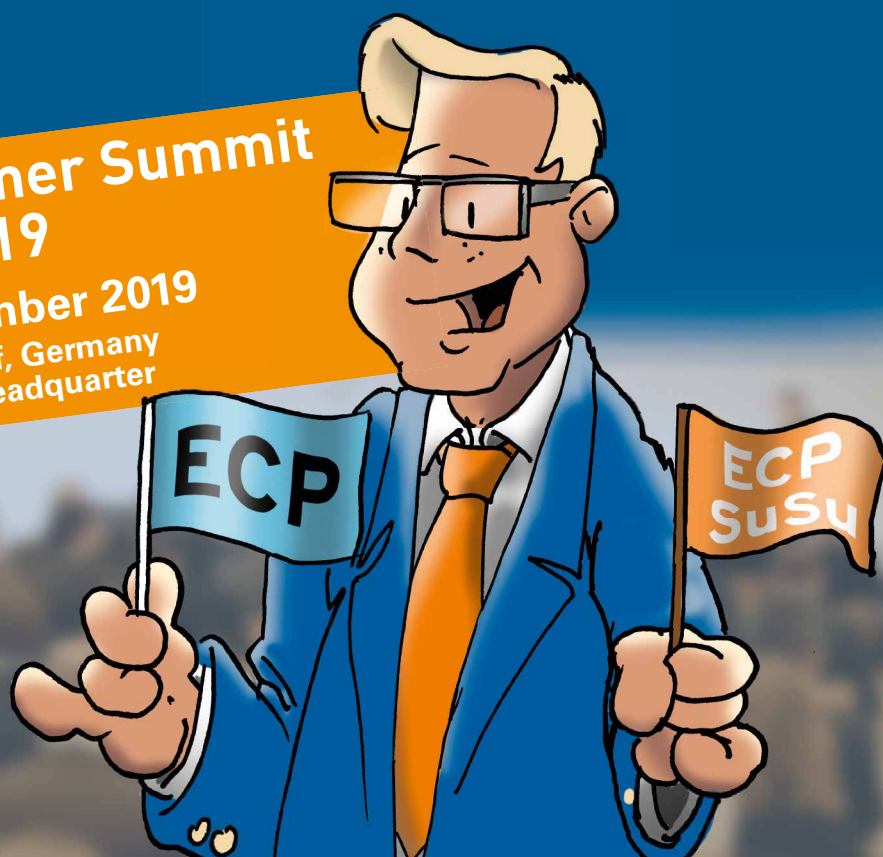
Frankfurt am Main, Germany

www.European-Chemistry-Partnering.com

2nd ECP Summer Summit
2019

26 September 2019

Düsseldorf, Germany
Henkel Headquarter





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](https://www.covestro.com)



7th Conference on

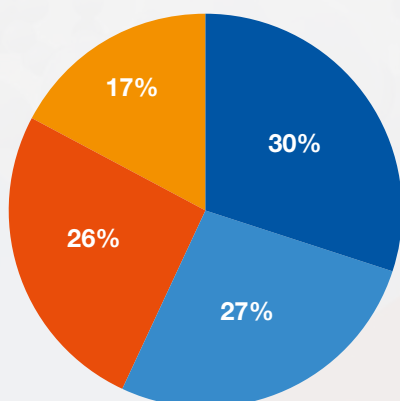


CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

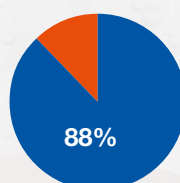
www.CO2-chemistry.eu

Attendees of the Conference 2018

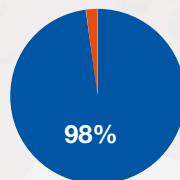


- Academia
- SME & Startup
- Larger companies
- Others

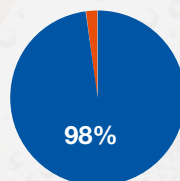
Our Conference – a Guarantee for Satisfied Customers



Networking Success
Good & Very Good



Venue Satisfaction
Good & Very Good



Overall Satisfaction
Good & Very Good

Networks of nova-Institute



Page Views

160,000

Bio-based News
news.bio-based.eu
Visitors per Month

50,000

International Directory for Bio-based Businesses
bio-based.eu/iBIB
Visitors per Year



Contacts

9,500

2,000

4,000

60,000

Business Networks

LinkedIn

XING



Industry Contacts



Keep up to date ...

Mailing list with 17 topics to choose from
(subscribe at bio-based.eu/email)

Bio-based Polymers & Building Blocks

The best market reports available



UPDATE 2018

Bio-based Building Blocks and Polymers – Global Capacities, Production and Trends 2018–2023

Authors:
Raj Chintapalli, Pia Skoczinski, Michael Carus, Wolfgang Batus,
Doris de Guzman, Harald Kaib, Achim Raschka, Jan Ravenstijn
February 2019

This and other reports on the bio- and CO₂-based economy are available at www.bio-based.eu/reports

UPDATE 2019

Carbon dioxide (CO₂) as chemical feedstock for polymers – technologies, polymers, developers and producers

Authors: Achim Raschka, Pia Skoczinski, Jan Ravenstijn and Michael Carus, nova-Institut GmbH, Germany
February 2019

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

UPDATE 2019

Succinic acid: New bio-based building block with a huge market and environmental potential?

Pharmaceutical/Cosmetic	Industrial
<ul style="list-style-type: none"> Acidic ingredient for denture cleaner/footpaste Adhesive Calcium succinate is anticarcinogenic Etherless tablets Intermediate for perfumes Pharmaceutical intermediates (insulin, antihypertensive, antitubercular, diuretic) Preservative for hairdyes Removes fish odour Used in the preparation of vitamin A 	<ul style="list-style-type: none"> De-icer Engineering plastics and epoxy casting agents/hardeners Herbicides, fungicides, regulators of plant growth Intermediate for lacquer + photographic chemicals Plasticizer (replaces phthalates, adipic acid) Polymers Solvents, lubricants Surface cleaning agent (metal/electronic/semiconductor industry)
Food	Succinic Acid
<ul style="list-style-type: none"> Bread softening agent Flavour enhancer Flavouring agent and acidic seasoning in beverages Microencapsulation of flavouring oils Preservative (vitamin, drug food) Protein gelatinisation and in dry gelatine desiccant flavourings Used in synthesis of modified starch 	<ul style="list-style-type: none"> Reducing Aluminium Chemical metal plating, electroplating baths Coatings, inks, pigments (powder/liquid-curable coating, resins for water-based paint, dye intermediate, photocurable ink, toner) Fabric finish, dyeing aid for fibres Part of antibiotic treatment for barley seeds Preservative for cut flowers Self-cleaning agent

Authors: Raj Chintapalli, Pia Skoczinski, Achim Raschka, Michael Carus, nova-Institut GmbH, Germany
Update March 2019

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Commercialisation updates on bio-based building blocks

Author: Doris de Guzman, Tecnicon OrbiChem, United Kingdom
July 2017

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Standards and labels for bio-based products

Authors: Lara Dammer, Michael Carus and Dr. Asta Partanen
nova-Institut GmbH, Germany
May 2017

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Bio-based polymers, a revolutionary change

Comprehensive trend report on PHA, PLA, PUR/TPU, PA and polymers based on FDCA and SA: Latest developments, producers, drivers and lessons learnt

Jan Ravenstijn 2017

E-mail: j.ravenstijn@kpm.nl
Mobile: +31.6.2247.8593

Author: Jan Ravenstijn, Jan Ravenstijn Consulting, the Netherlands
April 2017

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Policies impacting bio-based plastics market development and plastic bags legislation in Europe

Authors: Dirk Carrez, Clever Consult, Belgium
Jim Philip, OECD, France
Dr. Harald Kaib, narocon Innovation Consulting, Germany
Lara Dammer & Michael Carus, nova-Institut, Germany
March 2017

This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Asian markets for bio-based chemical building blocks and polymers

Author: Wolfgang Batus, Wobet Expedition Consultancy, Thailand
This and other reports on the bio-based economy are available at www.bio-based.eu/reports

Market study on the consumption of biodegradable and compostable plastic products in Europe 2015 and 2020

A comprehensive market research report including consumption figures by polymer and application types as well as by geography, plus analyses of key players, relevant policies and legislation and a special feature on biodegradation and composting standards and labels

Bestsellers

Authors: Harald Kaib (narocon, lead), Frieda Aeschermann, Lara Dammer, Michael Carus (nova-Institut)
April 2016

The full market study (more than 300 slides, 3,500€) is available at www.bio-based.eu/top-downloads

www.bio-based.eu/reports



Save the Date: nova-Institute Events in 2019



12th International Conference on Bio-based Materials

15–16 May 2019, Maternushaus, Cologne, Germany



15–16 May 2019
Maternushaus, Cologne, Germany
www.bio-based-conference.com

16th
by nova-Institute

**EIHA
HEMP
CONFERENCE**



5–6 June 2019
Maternushaus, Cologne, Germany
www.eiha-conference.org



Bio-based News - Daily news on Bio-based and CO₂-based Economy worldwide

- 20,000 reports
- 10,000 companies
- 160,000 readers monthly
- > 1,500 Twitter followers:
@Biobased_News



www.bio-based.eu/news



International Directory for Bio-based Businesses (iBIB)

Easy and direct access to producers, suppliers and experts in the Bio-based Economy worldwide.

Upload your company profile now for free, get visible for thousands of customers!



www.bio-based.eu/iBIB

Contact: Mr. Dominik Vogt, +49 (0) 2233 48 14 49, dominik.vogt@nova-institut.de

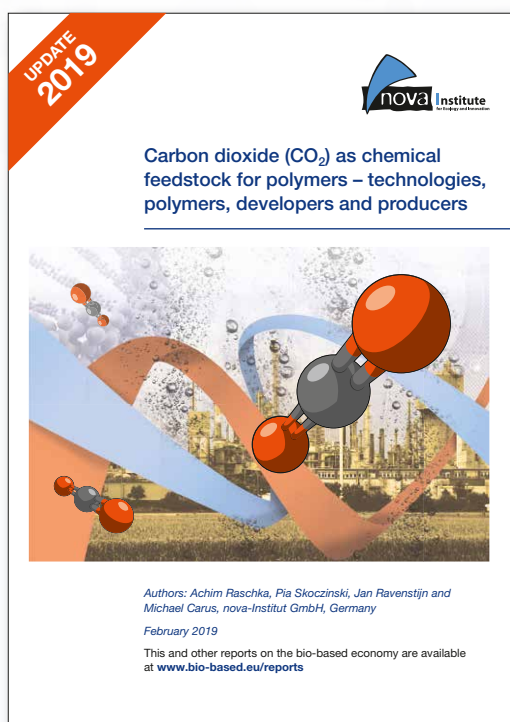
All conferences at www.bio-based.eu

news.bio-based.eu/ccu

7th Conference on



Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers



“Carbon dioxide (CO₂) as a chemical feedstock for polymers – technologies, polymers, developers and producers”

More information at
www.bio-based.eu/reports

Updated Version: Trend Report on Carbon Dioxide (CO₂)

Unique trend report on carbon dioxide (CO₂) as a chemical feedstock for a wide range of polymers. nova-Institute presents technologies, polymers, developers and producers in this growing sector with high economic and sustainability potential

As a worldwide first, the nova-Institute published in March 2018 the study on this topic: “Carbon dioxide (CO₂) as a chemical feedstock for polymers – technologies, polymers, developers and producers”. Due to dynamic developments an update a year later is already needed.

The study investigates which polymers can be produced from CO₂ from a technical point of view and which polymers are already being developed, produced and marketed by which company. A status report on a completely new and growing sector with high economic and sustainability potential.

Chemical catalytic processes are used to produce chemicals such as aliphatic polycarbonates (APC) like polypropylene carbonate (PPC) and polyethylene carbonate (PEC) as well as polyurethanes (PUR), polylimonene carbonate (PLimC) and glycerol carbonates.

Biotechnological approaches – fermentation of CO₂ or CO₂-rich syngases via microorganisms – lead to building blocks such as lactic acid and succinic acid, from which polymers such as polylactic acid (PLA) or polybutylene succinate (PBS) can be made. Polyhydroxy alkanoates (PHAs) are polymers which can be directly derived by fermentation of CO₂ without any intermediate building blocks.

Electrochemical pathways, for example to monoethylene glycol (MEG) which is used for the production polyethylene terephthalate (PET), are also described in the report.

Also using CO₂-based methanol can be a route to produce olefins via an already established process, the “Methanol to Olefin (MTO)” process and the use of synthetic Crude based on CO₂-based syngases (Blue Crude) can be another future option to produce already established polymers then based on carbon dioxide.