



6th Conference on



Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

www.CO2-chemistry.eu

CO₂ as chemical feedstock – a challenge for sustainable chemistry

15–16 March 2018, Maternushaus, Cologne (Germany)

Conference Journal



1st Day, 15 March 2018: Political Framework & Visions

- Innovation and Strategy
- Sustainability and Policy
- CO₂ Capture and
New Technologies



2nd Day, 16 March 2018: Chemicals & Energy from CO₂

- CO₂ for Chemicals and Polymers
- CO₂ for Fuels

One of the leading events on Carbon Capture and Utilization (CCU) in the world

Big visions – and also real potential! The usage of carbon dioxide, among experts referred to as Carbon Capture & Utilization (CCU), is gaining momentum. First commercial production of CO₂-based polymers has been launched, several additional technologies have progressed so far to allow production on an industrial scale in the near future – with advanced biotechnology and chemical catalysis. At the same time are renewable energy from solar, wind and hydro becoming cheaper each year and the latest plants at favourable locations are already at the same price level as fossil energy sources and even below. A perfect situation for combining cheap and abundant renewables with carbon utilization to store energy, to produce renewable fuels and chemicals. Renewable energy and CCU will reshape the energy system of the future and the chemical industry, too. Join the revolution, visit the conference, meet the leading entrepreneurs of the new industry.

Organiser



www.nova-institute.eu

Patronage

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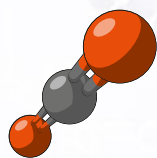
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Michael Carus
Managing Director



Achim Raschka
Head of Technology
and Markets

Dear participants,

The “Carbon, Capture and Utilisation (CCU)” sector has been caught in stormy waters. The conference in Cologne is now bringing together the leading figures of the industry to share and discuss the very latest developments. From a technological point of view, considerable advancements have been made in recent years. Thanks to a number of research projects, it is becoming more apparent which mature technologies can be successful and what the economic situation looks like. From an ecological point of view, there is still considerable need for discussion as to how CCU processes can be assessed. The framework conditions and the specific applications have a significant influence on the ecological assessment of a technology. Accordingly, it remains difficult for politicians to determine which CCU technologies should be promoted and what kind of funding they ought to receive. Nevertheless, scientists and companies are pushing ahead with implementing and improving CO₂ utilisation. Exciting times – and the conference will bring you up to date.

Look forward to new information, inspirations and exciting discussions during conference sessions and in one-to-one matchmaking meetings.

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

Kind regards,

Michael Carus
Managing Director

Achim Raschka
Head of Technology and Markets

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





6th Conference on CO₂

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6th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers

North Rhine-Westphalia's chemical sector stands for cutting edge, high tech and innovation. It is a key enabling industry for all other sectors and one of the mainstays of our economic success. No other region in Germany is home to a larger concentration of chemical companies, with so many employees and such a wide range of products. Summing up, the chemical sector is generating our state's future.

At the same time, the industry is facing new tasks and some drastically changing framework conditions. Energy transition, transport issues, resource efficiency, those are major challenges our societies are confronted with in this day and age. It is not enough to simply face up to these challenges; we need to embrace and exploit them for the opportunities they provide.

In times of global warming and the Paris Agreement, it is especially the energy-intensive chemical sector which has to deal with enormous structural changes. The main challenge will be to pave the way for prudent and responsible use of resources, with the ultimate objective of a low-emission – or even zero-emission – industry.

It is increasingly important not only to reduce carbon dioxide but to recycle it as well. Transforming and widening the raw materials base will help steer us towards a sustainable future, with greater competitiveness, innovation prowess and sustainability for the chemical industry.

Carbon dioxide can be profitably used as a raw material for the production of chemicals and polymers. A number of research institutes and businesses in North Rhine-Westphalia have been working on this for quite a while. Here, too, the concentration and the know-how of players from many different areas and disciplines are unique in Germany.

That is why the chemical sector as a key enabling industry is so important for our whole economy and the effort to utilise carbon dioxide as a raw material, with a view to lessening the carbon footprint along the value chain.

Patronage

**Ministry of Economic
Affairs, Innovation,
Digitalization and
Energy of the State of
North Rhine-Westphalia** 

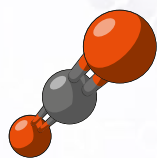
Ministry of Economic Affairs,
Innovation, Digitalization and Energy of the
State of North Rhine-Westphalia



The conference is under the
patronage of

Prof. Dr. Andreas Pinkwart
Minister for Economic Affairs, Innovation,
Digitalization and Energy of the State of
North Rhine-Westphalia

6th Conference on



Carbon Dioxide
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PROGRAMME OF THE 1st DAY, 15 MARCH 2018



10:00 Conference Opening
nova-Institut GmbH
Michael Carus



10:10 Opening Words: Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia
Minister Prof. Dr. Andreas Pinkwart

Carbon Dioxide as a Raw Material of the Future – Perspectives for the North Rhine-Westphalian Industry

INNOVATION AND STRATEGY | Chairman: Bruce Dannenberg, Phytonix Inc.



10:30 European Commission
Jürgen Tiedje
CCU in the EU Policy Framework of the Decarbonisation of Industry



11:10 VITO
Linsey Garcia-Gonzalez
Heleen de Wever
Carbon Capture and Utilization (CCU): Current Status, Challenges and Way Forward



10:50 Federal Ministry of Education and Research
Dr. rer. nat. Helmut Löwe
CO₂ Valorisation – new Developments in Germany and Europe



11:30 CO₂ Value Europe Uniper SE
Dr. Stefanie Kesting
CO₂ Value Europe, the New Industry Association Dedicated to CCU

12:15 Lunch Break

SUSTAINABILITY AND POLICY

Chairpersons: Aleksandar Lozanovski, University of Stuttgart | Michael Carus, nova-Institut GmbH



13:30 Lappeenranta University of Technology
Prof. Christian Breyer
The Potential for a Global Renewable Energy System and the Implications for Synthetic Fuels and Chemicals



14:20 sunfire GmbH
Nils Aldag
e-Fuels in the EU Regulatory Framework and Sustainability Issues



14:00 nova-Institut GmbH
Michael Carus
Sustainability of Carbon Capture and Utilization

14:40 Coffee Break



15:10 German Environment Agency (UBA)
Lisa Buchner
CCU in the Framework of the EU Emissions Trading System (EU ETS) Today and Tomorrow



15:50 VTT
Dr. Sc. Juha-Pekka Pitkänen
Production of Single-cell Protein from CO₂ and Electricity



15:30 Energy Research Centre of the Netherlands (ECN)
Dr. Remko J. Detz
The Future of Solar Fuels: When Could They Become Competitive?

16:10 Panel Discussion: CCU and Sustainability

16:40 Coffee Break

CO₂ CAPTURE AND NEW TECHNOLOGIES | Chairman: Jaap Vente, ECN



17:10 Climeworks AG
Daniel Egger
Direct Air Capture for Sustainable Carbon Capture and Utilisation Processes



17:50 University of Antwerp
Marleen Ramakers
Carbon Dioxide as Feedstock for Value-Added Chemicals and Fuels in a Gliding Arc Plasmatron



17:30 University of York
Prof. Dr. Michael North
CO₂ Capture and Electrochemical Mineralisation

18:10 Cold Beer on Tap in the Exhibition Space

20:00 Champagne Reception and Dinner Buffet by COVESTRO

22:00 Live Musik

23:00 German Bowling & Bar



6th Conference on CO₂

Carbon Dioxide
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PROGRAMME OF THE 2nd DAY, 16 MARCH 2018

CO₂ FOR CHEMICALS AND POLYMERS

Chairpersons: Prof. Dr. Haralabos Zorbas, IBB | Dr. Cornelia Baehr, CLIB2021 / BIG C



09:00 ICIQ/ICREA
Prof. Dr. Arjan Kleij

*Where Carbon Dioxide and Terpenes Merge into Biopolymers:
Creating Potential as Platform Molecules for the Polymer Industry*



09:40 CO₂ solutions
Ph.D. Louis Fradette

*Valorisation Carbone Québec: A unique CO₂ Capture and
Utilization Project*



09:20 Wageningen University
David Strik

*CO₂ to N-Caproate: Bioelectrochemicals Chain Elongation
to New Platform Chemical*



10:00 Nordic Blue Crude
Gunnar Holen

*Renewable Oil Substitutes: On the Way to a First
Commercial Blue Crude Production in Norway*



sunfire GmbH
Nils Aldag

10:30 Coffee Break



11:00 Covestro AG
Dr. Jochen Norwig

CO₂ – A Versatile Building Block for a Broad Range of Applications



11:30 Avantium
Dr. Klaas Jan Schouten

*CO₂ Electrocatalysis as Key Technology for the Production
of High Value Chemicals*

CO₂ FOR FUELS

Chairpersons: Dr. Holger Bengs, BCNP Consultants | Dr. Ing. Frank Köster, EnergieAgentur.NRW



11:50 EnergieAgentur.NRW
Dr. Ing. Frank Köster

Green Growth and Bioeconomy from a Regional Perspective



**12:30 Mitsubishi Hitachi Power Systems
Europe GmbH**

Dr.-Ing. Muhammad Majid
University of Stuttgart
Aleksandar Lozanovski

*OptiMeH – Optimised Process Chain for a
Resource-efficient Methanol Synthesis*



12:10 Harp Process Chemistry Consulting
Dr. Günter Harp

*Methanol as Key for Industrial Symbiosis between
Chemistry and Steel*

13:00 Lunch Break



14:30 Phytonix Inc.
Bruce Dannenberg

*Phytonix Latest Developments and the Challenging Process of
Moving Towards Pilot and Commercial Scale-up*



15:30 VTT
Dr. Pekka Simell

*SOLETAIR – Fuels and Chemicals from the Sun and Air:
Experiences from the Integration and Test Campaigns*



15:00 Thyssenkrupp AG
Dr. Markus Oles

Fraunhofer UMSICHT
Prof. Dr.-Ing. Görgo Deerberg

*Carbon2Chem – Valorising Emissions
from the Steel Industry*



15:50 Fraunhofer-Institut für Solare Energiesysteme
Dr.-Ing. Achim Schaadt

*A Hybridised Approach to Oxymethylene Ethers (OME) Synthesis –
Designer Oxygenated Fuels and Solvents*

* Copyright © Fraunhofer UMSICHT –
Ilka Drnovsek

16:10 Coffee Break



16:40 SkyNRG
Misha Valk

*Sustainable Aviation Fuels, the Challenges and Opportunities
for CO₂ Based Technologies*



17:00 bse Engineering Leipzig GmbH
Christian Schweitzer

System Relevant Energy Consumption for CO₂ Processing Fuels

17:20 Networking Reception

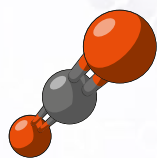
NEW

Newsticker on Carbon Capture and Utilization!

Free Access: <http://news.bio-based.eu/ccu>



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Exhibitors

Booth No. 2: Zeton BV 

Booth No. 3: VTT Technical Research Centre of Finland Ltd. 

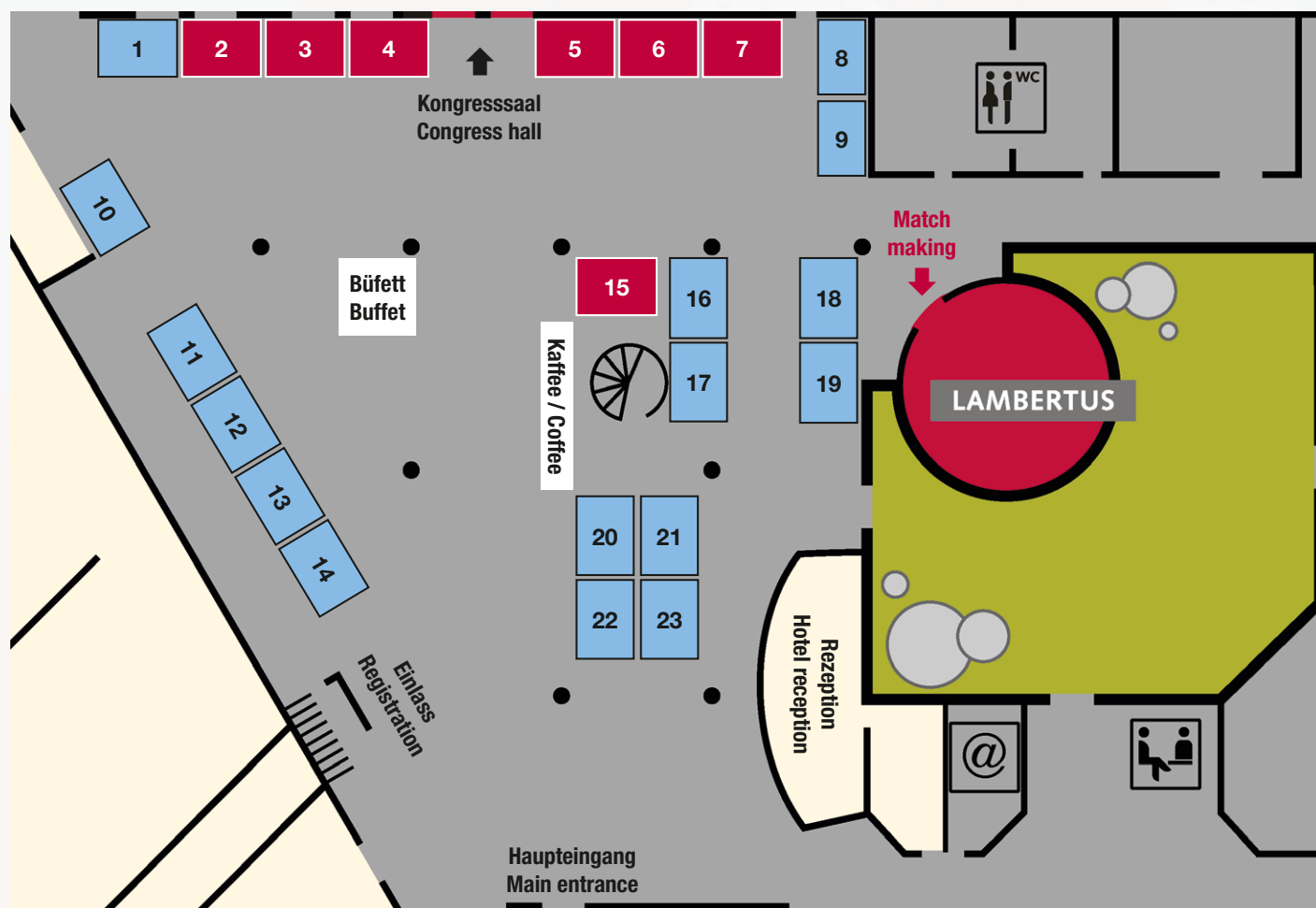
Booth No. 4: Covestro Deutschland AG 

Booth No. 5: EnergyAgency.NRW 

Booth No. 6: Media Table

Booth No. 7: nova-Institut GmbH 

Booth No. 15: Phytonix Corporation 





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

Klaas Jan Schouten, Avantium N.V. 


“Avantium is developing a powerful electrocatalytic technology platform to convert carbon dioxide to chemical building blocks.”

Dr. Stefanie Kesting,
CO₂ Value Europe  / **Uniper SE** 


“CO₂ Value Europe was created end of 2017 to connect all stakeholders along the CO₂ value chains and across sectors, and to support the development of CO₂ transformation technologies into viable and scalable business models. The Association aims to change the perception of CO₂ to a valuable feedstock.”

Dr. R. J. Detz,
Energy Research Centre of the Netherlands (ECN) 

“In this study we have calculated the current and future production costs of seven selected “solar fuel” manufacturing routes. Our techno-economic analysis gives insight in whether, how, and when these renewable fuels might become competitive alternatives for fossil fuels.”

Christian Breyer, Ph.D.,
Lappeenranta University of Technology 

“The electricity system can be run on a 100% renewable energy basis. Due to the very low cost of solar and wind energy in places of excellent resources it will be also possible to convert electricity, water and air to synthetic fuels and all major feedstock chemicals, sooner than many expect.”

Dr.-Ing. Muhammad Majid,
Mitsubishi Hitachi Power Systems Europe GmbH 

“We are on the way to optimise the route of Methanol production based on renewable energies. Furthermore, connecting different sectors in this field will be presented.”

Michael Carus, nova-Institut GmbH 

“From an ecological point of view, there is still considerable need for discussion as to how CCU processes can be assessed. The framework conditions and the specific applications have a significant influence on the ecological assessment of the CCU technology.”

Bruce Dannenberg, Phytonix Inc. 

“Phytonix’s Technology leverages the ancient and highly evolved process of natural photosynthesis with the cutting edge 21st century science of synthetic biology. With this approach we have created a commercial process, powered by the sun, that utilizes industrial carbon dioxide emissions as the sole feedstock for the production of dramatically carbon-negative, cost leadership industrial chemicals such as Butanol and Octanol.”

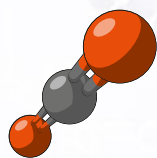
Michael North, University of York 

“The separation of CO₂ from other gases can be realised by using biomass derived carbonaceous materials. The electrochemical mineralisation of CO₂ is already attracting substantial interest from both the scientific press and global news agencies due to its ability to convert CO₂ into an inert solid using just scrap metal, sea water and renewable energy.”

Pekka Simell, VTT 

“Latest findings on the pilot scale process to make liquid fuels by FT-synthesis from renewable hydrogen, based on FT-synthesis by a novel microstructured heat exchanger reactor, direct air capture unit used for CO₂ and PEM electrolyzer for H₂.”

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Phytonix Corporation

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Bruce Dannenberg
Founder & CEO
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bruce@phytonix.com

Gold Sponsor Phytonix Corporation

Phytonix Corporation is a renewable-chemical company headquartered in North Carolina, USA. With an additional business office in Vancouver, Canada and development laboratories and partners in Sweden, Belgium, The Netherlands, Virginia and Nova Scotia, Canada, we are branching out globally. Phytonix is commercializing a patented process using cyanobacteria and photosynthesis to produce butanol, an industrial chemical with a \$10B/year market, from industrial CO₂ emissions at < 1/2 the current cost of using propylene, a petroleum derivative. Current methods of producing butanol from propylene or fermentation are expensive (≈\$4.75/gallon) and carry an extremely large carbon footprint. The Phytonix technology platform will enable low-cost production of other industrial chemicals from CO₂ with a process that will aid in the elimination of greenhouse gas emissions from industrial manufacturing facilities. The butanol that is produced by Phytonix and secreted from its engineered cyanobacteria microbes is the same chemical as the industrial grade (99% pure) butanol produced by incumbent producers from propylene. The difference is our butanol has a carbon negative footprint.

Our cyanobacteria use a modified form of photosynthesis to directly produce pure butanol from CO₂. In order to produce 1 gallon of butanol we feed our cyanobacteria about 18 pounds of CO₂ and use 40 gallons of water, of which roughly 95% is recycled and reused. This process generates a small amount of CO₂ which means that we consume, on a net basis, 16.3 pounds of CO₂ for every gallon of butanol produced. This is the same as consuming 1 ton of CO₂ for every 125 gallons of butanol that we make. Furthermore, in making 1 gallon of butanol, we create 17½ pounds of oxygen as a by-product.

Competition

Chemical companies such as BASF, DOW/DuPont, OXEA and Eastman use propylene feedstock to produce butanol at a cost of approximately \$4.75/gallon (at the current price of crude oil of ≈ \$62/barrel). The cost of propylene feedstock in January 2018 equates to about \$2.75/gallon of butanol produced. These processes are extremely carbon and energy intensive.

In comparison, the feedstock for the Phytonix process, carbon dioxide, equates to about \$0.35/gallon of butanol produced assuming that Phytonix has to purchase CO₂ at \$40/ton. This gives Phytonix a huge cost advantage. In most cases the cost of CO₂ will be much less than \$40/ton, and in areas where GHG reductions can be monetized, the cost of CO₂ may be negative. Most of the energy to drive the Phytonix process is from the sun, which gives Phytonix an additional cost advantage in comparison to incumbent producers that use an energy-intensive process.

Issued Patents

Patents for the Phytonix process are issued in the USA, the EU, Eurasia, South Africa, Hong Kong and Australia with others pending in major world markets including China and India. New patents have recently been allowed in Canada. The technology has been proven at bench scale and work has been initiated with two industrial partners to host and fund pilot plants to scale up the process. Phytonix is the global leader in solar chemicals development and commercialization.



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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.

EnergieAgentur.NRW

EnergieAgentur.NRW

Fuels and Drives of the
Future Network

Dr. Frank Köster

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11th International Conference on Bio-based Materials

15-16 May 2018, Maternushaus, Cologne, Germany



15-16 May 2018
Maternushaus, Cologne, Germany
www.bio-based-conference.com

European Industrial Hemp Association (EIHA)

15th International Conference | 12th - 13th June 2018



12-13 June 2018
Maternushaus, Cologne, Germany
www.eiha-conference.org



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High-tech strategy for a future food and biomass supply



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www.REFAB.info



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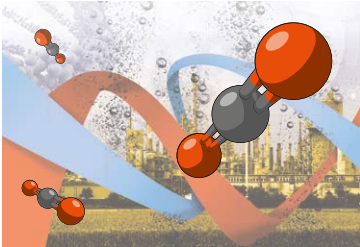
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Bio-based Polymers & Building Blocks

The best market reports available



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



Authors: Achim Raschka, Barbara Dommemuth, Jan Ravenstijn and Michael Carus
nova-Institut GmbH, Germany
March 2018
This and other reports on the bio-based economy are available at www.bio-based.eu/reports



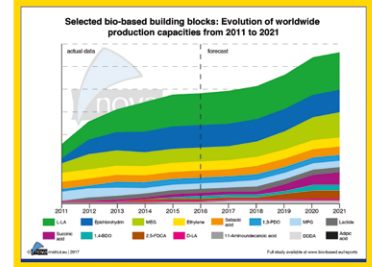
Succinic acid: New bio-based building block with a huge market and environmental potential?

Pharmaceutical/Cosmetic	Industrial
<ul style="list-style-type: none"> Acidic ingredient for denture cleanser/foolpaste Asorbate Calcium succinate is anticarcinogenic Effervescent tablets Intermediate for perfume Pharmaceutical intermediates (pesticides, antiparasitic/antiparasitic, antibacterial, disinfectant) Preservative for toiletries Removes fish odour Used in the preparation of vitamin A 	<ul style="list-style-type: none"> De-icer Engineering plastics and epoxy curing agents/hardeners Herbicides, fungicides, regulators of plant growth Intermediate for lacquers + photoresistive chemicals Plasticizer (replaces phthalates, adipic acid) Polymers Solvents, lubricants Surface cleaning agent (metal/electronic/semiconductor industry)
Food	Other
<ul style="list-style-type: none"> Bread-softening agent Flavour-enhancer Flavouring agent and acidic seasoning in bread/cake/food Microncapsulation of flavouring oils Preservative (chicken, dog food) Protein gelatinisation and in dry gelatine desiccant/cake flavourings Used in synthesis of modified starch 	<ul style="list-style-type: none"> Anodizing Aluminium Chemical metal plating, electroplating baths Coatings, inks, pigments (oxidation/radiation-curable coating, resins for water-based paint, cyan intermediates, photo-curable ink, foams) Adhesive finish, dyeing aid for fibres Part of animal treatment for hairy seeds Preservative for cut flowers Sol-cleaning agent

Authors: Raj Chintalapalli, Kerstin Pfaff, Florence Aeschelmann, Achim Raschka, Michael Carus, nova-Institut GmbH, Germany
February 2018
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, Tecnora OrbisChem, United Kingdom
July 2017
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Standards and labels for bio-based products

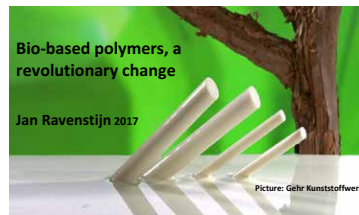


Authors: Lara Dammer, Michael Carus and Dr. Asta Partanen
nova-Institut GmbH, Germany
May 2017
This and other reports on the bio-based economy are available at www.bio-based.eu/reports



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



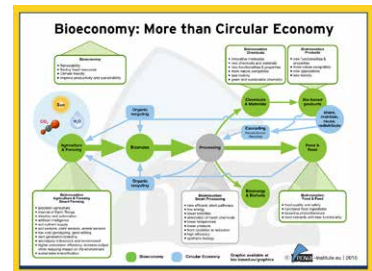
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Author: Jan Ravenstijn, Jan Ravenstijn Consulting, the Netherlands
April 2017
This and other reports on the bio-based economy are available at www.bio-based.eu/reports



Policies impacting bio-based plastics market development

and plastic bags legislation in Europe



Authors: Dirk Carnez, Clever Consult, Belgium
Jim Philip, OECD, France
Dr. Harald Kaeb, naroon 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

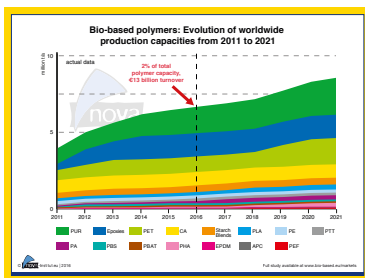
Data for 2016

European bioplastics



Bio-based Building Blocks and Polymers

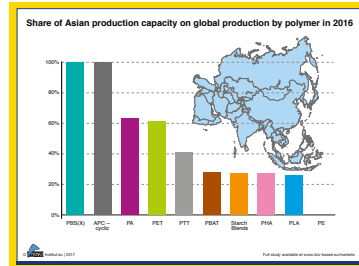
Global Capacities and Trends 2016–2021



Authors: Florence Aeschelmann (nova-Institute), Michael Carus (nova-Institute) and ten renowned international experts
February 2017
This is the short version of the market study (249 pages, € 2.000). Both are available at www.bio-based.eu/reports.



Asian markets for bio-based chemical building blocks and polymers



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



naroon
Innovation Consulting GmbH

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 Kaeb (naroon, lead), Florence Aeschelmann, Lara Dammer, Michael Carus (nova-Institute)
April 2016

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

www.bio-based.eu/reports





6th Conference on CO₂

Carbon Dioxide
as Feedstock for
Fuels, Chemistry
and Polymers

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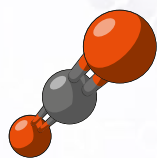


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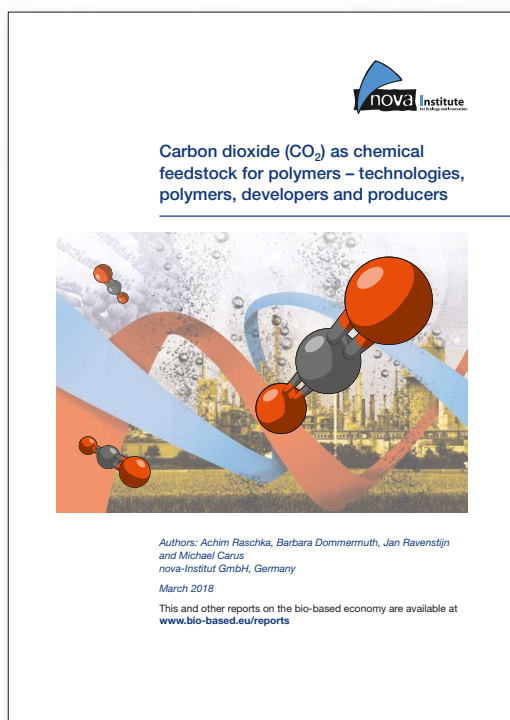


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6th Conference on



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

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

A worldwide first

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 a study on this topic: “Carbon dioxide (CO₂) as a chemical feedstock for polymers – technologies, polymers, developers and producers”.

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), polypropylene carbonate (PPC), polyethylene carbonate (PEC), polylimonene carbonate (PLimC) and polyurethanes (PUR).

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.

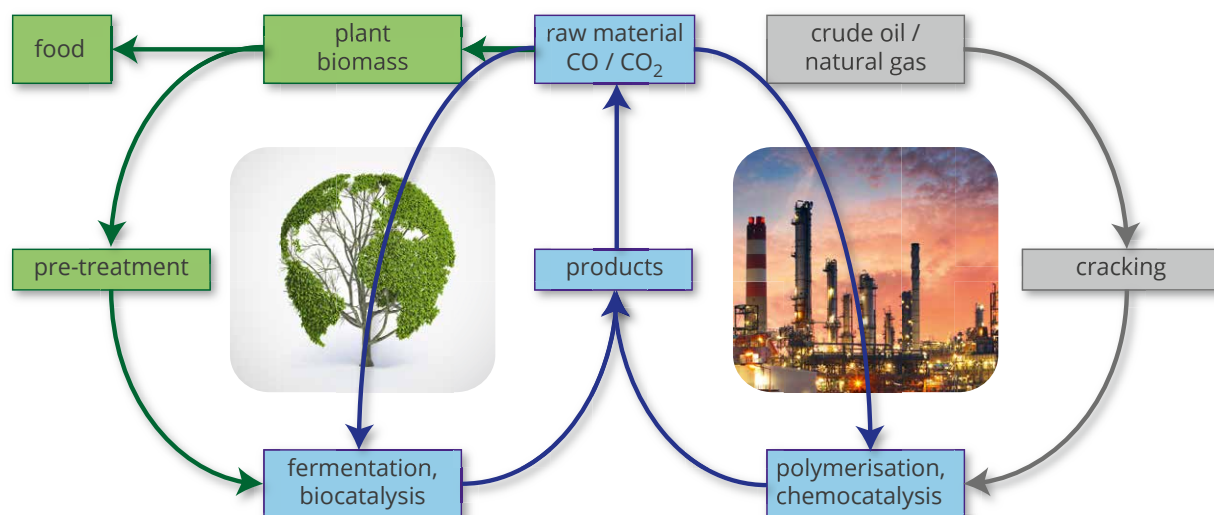
YOU CAN'T TURN CO₂ INTO A MATTRESS. WHY NOT?

#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 crude oil with CO₂. Find out more about high-tech polymers by Covestro that push sustainability to make the world a brighter place. covestro.com

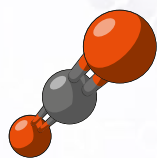


In cooperation with the recognised publisher Springer, CLIB prepares the comprehensive textbook
"CO₂ and CO – sustainable carbon sources for the circular economy"



- Featuring a comprehensive overview on the material utilisation of carbon-containing emissions
- The book will give a comparative overview on suitable sources and processes as well as on the resulting options for emitting industries.
- Besides technical aspects, focus lies on economic, ecological as well as social impacts.

6th Conference on



Carbon Dioxide
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Use the unique opportunity to present your innovative products to an international audience. The fee of a booth (6 m²) is 500 EUR (excl. 19% VAT). We provide you a table, table cloths, a pin board, a chair and a power connection. You are welcome to use your own booth system. Please submit Mr. Dominik Vogt your preferred booth number (<http://co2-chemistry.eu/exhibitorinfo>), a printable logo and a company profile.

Call for posters

You are welcome to present your scientific poster to inform the participants about your projects and results. If you would like to present your work in the field of carbon dioxide as a feedstock for chemistry and polymers please send an abstract to Mr. Achim Raschka.

Leading event on Carbon Capture & Utilization (CCU)

More than 150 leading international experts in CO₂ utilization 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
Register now!



Venue & Accommodation

Maternushaus
Kardinal-Frings-Straße 1
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The venue is located within twelve minutes walking distance from Cologne central station.

Entrance Fee

1 st Day of Conference 15 March 2018	2 nd Day of Conference 16 March 2018
545 €	495 €
845 €	

(Conference incl. Catering, 19% VAT exclusive)

2018-03-07