

Press release

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First pilot and demonstration plants for CO₂ -based fuels and polymers in use – commercial production closer than expected

The vision of using carbon dioxide in a circular economy as a raw material and energy carrier becomes more and more of a reality. The utilization of CO₂ is a promising option for the production of synthetic fuels as well as conventional and new chemical building blocks and polymers (PPC, PEC, CO₂-based polyurethanes). This has immense potential for the coming decade – much faster than expected. At the leading international conference on Carbon Dioxide as Feedstock for Chemistry and Polymers www.co2-chemistry.eu almost 140 leading minds from the world of CCU (Carbon Capture & Utilization) – from 26 countries – discussed this potential with special focus on the opportunities and properties of new CO₂-based building blocks, polymers and fuels along with their applications, such as aviation fuels. Proceedings will be available mid-January at www.bio-based.eu/proceedings/#CO2Conference2014.

While carbon dioxide is generally seen as a “climate killer” which should best be avoided, a growing number of scientists and engineers are considering how this abundant carbon source can be used or recycled as a fuel or chemical feedstock (Carbon Capture and Utilization). One of the main reasons for this is the supply of CO₂ – it is available everywhere and it could prove to be an excellent opportunity to recycle it back to use, while reducing greenhouse gas emissions. Two of the main hurdles are the necessity to capture, clean and concentrate the gas, and the amount of energy required to utilize the carbon dioxide as a stable molecule. Smart ideas are needed to overcome this. Worldwide research projects and industries are working on this topic with high priority and there are several concepts to convert CO₂ to a valuable synthetic fuel or chemical building block for the future. Many pilot and demonstration facilities and the first commercial plants for carbon capture, hydrogen generation and also carbon utilization are already up and running.

Leading players of the CO₂ economy showcased new and enhanced applications using carbon dioxide as feedstock at the third conference “CO₂ as Feedstock for Chemistry and Polymers”, 2- 3 December 2014, in Essen, Germany, sponsored by EnergyRegion.NRW. The event was opened by Dr. Lothar Mennicken from the German Ministry of Education and Research (BMBF) with a message of greeting from the patron of the conference German Federal Minister of Education and Research Prof. Dr. Johanna Wanka. Dr. Mennicken elaborated on the strategic support of R&D in Germany, which has, with 100 million €, the world’s largest CCU research program and currently supports 150 CCU projects. This makes Germany the leading country in development and implementation of CCU technologies (power to gas, Power-to-Liquid and polymers), followed by the U.S. and the UK – the UK has the biggest CCU research network in the world is based.

The European Commission's Andreas Pilzecker introduced the participants to the role of CCU in EU policy and the latest activities to overcome hurdles to include CCU-based fuels and chemicals into the existing policy framework of the EU, including the Renewable Energy Directive (RED). The speakers that followed took up the assessments of the potential of CO₂ utilization for the green economy and introduced their own visions for a sustainable future, discussing the existing political frameworks on a national and international level. Michael Carus, CEO of nova-Institute, gave a broader view on implementation strategies, followed by three speakers from the UK, Guy Lomax from Virgin Earth Challenge and Prof. Dr. Peter Styring of the international CO₂Chem Network. Roger Lee from Tecnon OrbiChem topped off this session with an overview on the CO₂-based chemical developments of the last years. Michael Carus called for research and implementation budgets to be transferred to CO₂ utilization as soon as possible. While Styring and Lomax also emphasized the need for more funding for CCU, they both still see the need for CCS in a wider mix of climate mitigation options to meet global carbon budgets.

After discussing visions and political frameworks, the first conference day went on with presentations on CO₂ Capture and Purification and H₂ Generation. Olaf Christoph from the German company Linde Engineering Dresden (high scale CO₂ capture for urea production) and Jan Wurzbacher from the innovative Swiss start-up Climeworks (capture of atmospheric CO₂) gave insights into their CO₂ capture technologies before Christian von Olshausen of sunfire demonstrated the activities of their highly efficient technology for hydrogen generation and Power-to-Liquid technology, which just started pilot production of synthetic fuels in East Germany. Denis Thomas from Hydronenics Europe and Thomas Fischer (University Cologne) from the EU-funded project SOLARGENIX closed the first day with two alternative technology routes for hydrogen production such as photocatalytic production of hydrogen.

CO₂-based fuels, chemicals & building blocks and polymers were the topics of the second day. In the field of fuels and chemicals especially the syngas production from the Israel-based company NewCO₂Fuels impressed; Julie Horn gave insights into the process. This was accompanied by presentations from Christian Schweitzer of bse Engineering Leipzig, Germany, with a concept of CCU integration in methanol plants, and insights into the research of Solid Oxide Electrolysis Cells for hydrogen production by Prof. Dr. Mogens Bjerg Mogensen from the Technical University of Denmark. The U.S. biotechnology company Phytonix Corporation was represented by Bruce Dannenberg who introduced their approach of direct photobiological conversion of carbon dioxide feedstock into renewable chemicals and fuels. Grainne Smith showcased the development of the world's leading company in biotechnological flue gas conversion LanzaTech, from New Zealand. Prof. Dr. Guido Saracco from the Politecnico di Torino (Italy) held a presentation on high-efficiency photo-electron-chemical reactors and artificial photosynthesis for CCU production. He also leads the EU-funded project Eco²CO₂, of which Klaas Jan Schouten from Avantium (The Netherlands) gave some insights into the catalytic production of specialty chemicals based on furans and CO₂-based methanol. Katy Armstrong from the UK Centre for Carbon Dioxide Utilization opened the field for a more general topic: In the EU-funded project SCOT, Ms Armstrong and her colleagues are working on a strategic European research and innovation agenda for research in the CCU area.

To round up the whole subject area, the closing session of the conference concentrated on the production of polyols and polymers from CO₂. Simon Waddington from the American company Novomer (US) and Dr. Christoph Gürtler, Bayer MaterialScience (Germany), demonstrated the impressive potential of CO₂-based polymers and materials for commercial

production in coming years, while Dr. Rulande Henderson and her company Eonic Technologies (UK) are mainly working on improved catalysts for polymer production.

As the conference clearly demonstrated, new technologies are raring to go, and there are many options that are being developed and are just waiting for commercial implementation. By using sun or wind power, combining it with CO₂ and water, one can produce almost anything wanted or needed: fuels, chemicals and polymers, or even food and feed. In a world with growing demands and limited resources, CO₂ with its low environmental impact and abundant availability will take an essential role in the economy of the future. Today this is still a dream, but there is a real chance that tomorrow CO₂ recycling will become a reality.

Patron of the conference was German Federal Minister of Education and Research Prof. Dr. Johanna Wanka. It was sponsored by EnergyRegion.NRW who was delegated by the state government of North Rhine-Westphalia to take responsibility for and manage the cluster to promote innovations and growth and to secure the settlement of new companies in EnergyRegion.NRW.

Presentations will be available mid-January. Pre-order now at <http://www.bio-based.eu/proceedings/#CO2Conference2014> (150 € excluding VAT).

Please find attached photos from the conference on “CO₂ as chemical feedstock – a challenge for sustainable chemistry” (please include the photographer’s name). Use of the material is free of charge for press purposes.

http://co2-chemistry.eu/media/files/3rd_Conference_on_CO2_2014_Pictures.zip

The zip-file includes the following pictures:

- 14-12-03_confernce_audience.jpg: Participants during presentations (nova/Winkler)
- 14-12-03_conference_audience2.jpg: Participants during presentations (nova/Winkler)
- 14-12-03_conference_audience_close-up.jpg: Guy Lomax, Prof. Dr. Peter Styring (f.l.t.r.) listening to a presentation (nova/Winkler)
- 14-12-03_panel_discussion.jpg: Expert panel during discussion: Katy Armstrong, Dr. Lothar Mennicken, Andreas Pilzecker (f.l.t.r.) (nova/Winkler)
- 14-12-03_panel_discussion2.jpg: Katy Armstrong, Dr. Lothar Mennicken, Andreas Pilzecker, Dr. Frank Köster (f.l.t.r.) (nova/Winkler)

Responsible under press legislation (V.i.S.d.P.):

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nova-Institute is a private and independent institute, founded in 1994; nova offers research and consultancy with a focus on bio-based and CO₂-based economy in the fields of feedstock, techno-economic evaluation, markets, LCA, dissemination, B2B communication and policy. Today, nova-Institute has 25 employees and an annual turnover of more than 2 million €.