



BioSC | Newsletter | 01/2019



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5th BioSC Spotlight: “Moving the BioEconomy from mind to market”

On February 4th, 2019, the fifth BioSC Spotlight took place in Bonn. This time, the focus was on factors determining whether a new technology actually comes onto market, such as value-added partners, competitors and public and private standards. Scientists from academia and industry held a total of eight specialist lectures. The “Transfer of bio-based inventions into the market” World Café provided a platform for intensive discussions for the more than 50 participants.



Photos: Forschungszentrum Jülich

[Download Agenda](#)

In her welcome address, Prof. Dr. Stefanie Bröring (University of Bonn) emphasized the crucial importance of technology development and transfer for the development and implementation of a bioeconomy. In the first thematic session, “Technology development“, Prof. Dr. Martin Möhrle (University of Bremen) used the example of the development of cameras to demonstrate how new application fields differentiate and in doing so drive new technological developments. Using industrial biotechnology as an example, Dr. Sven Wydra (Fraunhofer ISI, Karlsruhe) discussed the challenges to be met on the way to a broad application of key enabling technologies. Lukas Aaldering (University of Münster) presented a foresight study on the convergence of bioeconomy-relevant markets based on the methods of machine learning.

In the second thematic session, “Technology commercialization“, Prof. Dr. Nathalie Sick (University of Sydney) analyzed the influence of social, geographical and technological distance on the success of cooperations and knowledge transfer. Joana Wensing (University of Bonn) presented the results of the [InducTomE](#) BioSC project, in which the production of bioactive natural substances was evaluated. In her lecture, she presented the factors that influence the willingness of farmers to participate in such a cascade use. Shohana Islam (RWTH Aachen University) presented the [greenRelease](#) BioSC project, in which a new technology platform is developed for the controlled release of active substances, such as fertilizer, using microgels. In addition, she introduced the planned “Aachen|Proteineers“ incubator, which should help startup founders validate the market potential of new business ideas in the field biotechnology at an early stage.

Then, in the framework of the “Transfer of bio-based inventions into the market” World Café, discussions

were held in two groups about which mechanisms can effectively support the transfer of innovations into the market. This included wide-ranging topics such as the integration of new products into existing value-added chains, sustainability and social compatibility of the use of biomass or acceptance of new technologies.

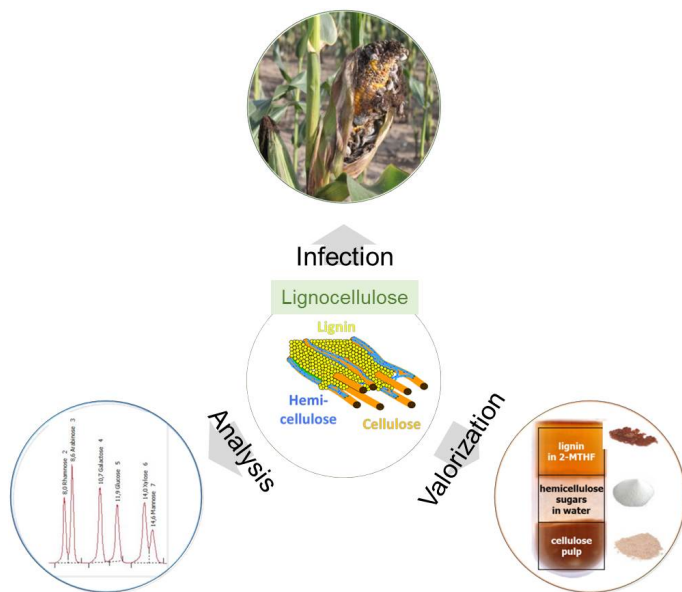
In the third thematic session, “Best practices”, two lectures were given on the success story of natural rubber made of Russian dandelion as alternative to the tropical rubber tree. Dr. Christian Schulze Gronover from the Fraunhofer Institute for Molecular Ecology presented the research ongoing since 2013, which ranges from the physiology of the rubber synthesis through breeding and cultivation techniques to the harvesting and processing of the plants. Dr. Carla Recker from the Continental company reported how the first tire prototypes made of natural rubber from dandelion were produced in 2014 and 2016 and presented a new company research and experimental laboratory with 30,000 m² testing acreage. It is planned that dandelion rubber will enter serial production within ten years.

A lively and engaging exchange took place among the over 50 participants from a variety of different areas of academia and industry. Additional BioSC Spotlights are planned to again offer a framework for inter- and transdisciplinary exchange on topics relating to the bioeconomy; details will be announced in advance on the BioSC website.

SEED FUND 2.0: New Projects

There were two SEED FUND calls in 2018 as part of phase 2 of the NRW BioSC strategy project. The OPEN Call was without thematic restrictions while the LINK call focused on topics related to the FocusLabs. Five projects were selected and started at the end of 2018.

SEED FUND 2.0 - OPEN projects



iBiomass - Improve maize biomass for processing applying OrganoCat technology

Project coordination: Dr. Vera Göhre, Prof. Dr. Michael Feldbrügge, Microbiology, HHU Düsseldorf

Partners:

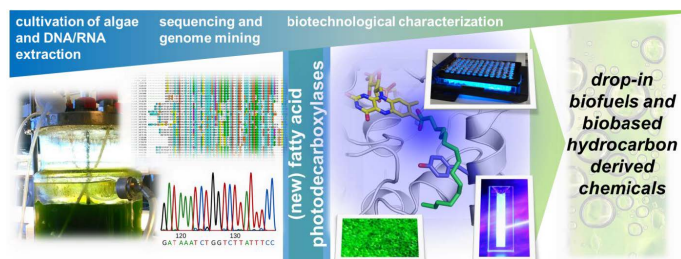
Dr. Vicente Ramirez; Prof. Dr. Markus Pauly, Plant Cell Biology and Biotechnology, HHU Düsseldorf

Prof. Walter Leitner, Technical and Petrol Chemistry, RWTH Aachen

Plant lignocellulosic material represents approximately one third of crop biomass, but its digestion into sugars is often under very harsh conditions, limiting its suitability for the production of chemicals. Therefore, maize mutant lines with optimized lignocellulosic composition were generated. However, such changes might reduce disease resistance, since the cell wall is the first physical barrier against pathogen attack. In the iBiomass project, infection experiments are carried out on optimized maize lines with smut

fungi. The maize lines are classified according to vulnerability (infection) and analyzed according to cell wall composition (analysis); the homogenate of the infected biomass is tested in the OrganoCat process (valorization). With this approach, the usability of new biomass plants under increasing pathogen pressure will be comprehensively evaluated.

Duration: 12 months



HySyn - Fatty acid photodecarboxylases for hydrocarbon synthesis

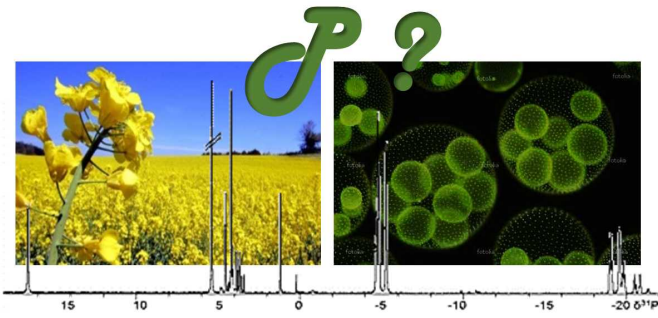
Project coordination: Dr. Ulrich Krauss, Prof. Dr. Karl-Erich Jaeger, Molecular Enzyme Technology, HHU Düsseldorf

Partners:

Prof. Dr. Björn Usadel, Botany and Molecular Genetics, RWTH Aachen
Dr. Holger Klose, Prof. Dr. Ulrich Schurr, IBG-2 Plant Sciences, Forschungszentrum Jülich

Alkanes and alkenes are one of the most important classes of hydrocarbons for the production of next-generation drop-in biofuels and plastics. Recently, a new class of alkane/alkene synthesizing photoenzyme was discovered in the algae *Chlorella variabilis* and *Chlamydomonas reinhardtii*, which for catalysis relies on blue-light illumination (fatty acid photodecarboxylases; FAPs). Despite their promise as efficient alkane/alkene-producing biocatalysts, important biotechnologically relevant properties remain largely uncharacterized and their phylogenetic distribution is unknown; hence alternative FAPs, with potentially superior biotechnologically-relevant properties, remain to be identified and explored. In the HySyn project, the two currently known FAPs of *C. variabilis* and *C. reinhardtii*, as well as new FAP enzymes identified by gene mining and sequencing of related/resilient microalgae, will be analyzed with regard to their biotechnologically relevant properties.

Duration: 12 months



QuantiP - P-quantification in vivo and in vitro by Raman spectroscopy and NMR

Project coordination: Dr. Anna Joëlle Ruff, Prof. Dr. Ulrich Schwaneberg, Biotechnology, RWTH Aachen

Partners:

Dr. Ladislav Nedbal, Dr. Christina Kuchenberg, Prof.

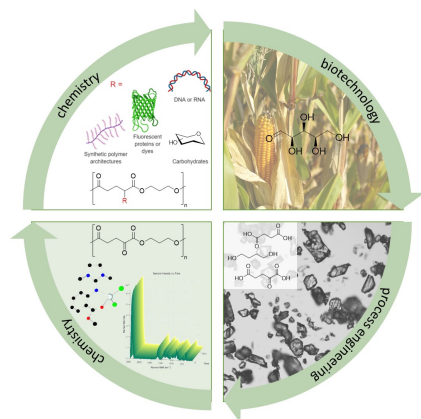
Dr. Ulrich Schurr, IBG-2 Plant Sciences,
Forschungszentrum Jülich

Dr. Sabine Willbold, Dr. Stephan Küppers, ZEA-3
Analytics, Forschungszentrum Jülich

Phosphate is a main component of fertilizers. Consequently, recycling concepts for phosphorus are essential for ensuring self-sustaining food production in Europe and avoiding rapid depletion of concentrated natural deposits. QuantiP will contribute to phosphate stewardship by developing a novel P-quantification platform that will strengthen the development of P-recovery concepts. QuantiP aims to achieve a sophisticated and unmatched quantification of P-storage forms through a combination of ^{31}P -NMR spectroscopy and Raman spectroscopy. Quantification and discrimination among P-storage molecules - in algae and yeast cells as well as in enzymatic treated plant materials samples - will be implemented to allow P-uptake in algae to be monitored and to determine P-content in plant materials from phytate hydrolysis (e.g. rapeseeds press cakes) and polyphosphate accumulation (yeast and algae).

Duration: 12 months

SEED FUND 2.0 - LINK projects



R2HPBio - Renewables to high-performance bioplastics through sustainable production ways

- linked to FocusLabs *HylmPAct* and *greenRelease* -

Project coordination: Prof. Dr. Sonja Herres-Pawlis,
Bioinorganic Chemistry, RWTH Aachen

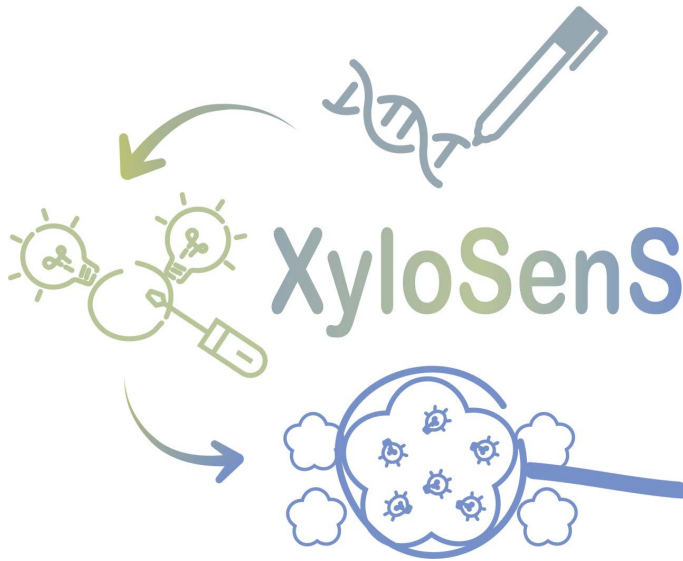
Partners:

Prof. Dr. Laura Hartmann, Macromolecular Chemistry,
HHU Düsseldorf

Prof. Dr. Andreas Jupke, Fluid Process Engineering,
RWTH Aachen

This project comprises the full life-cycle of novel bioplastics, starting from biotechnologically produced platform chemicals, purification by novel electrochemical separation technology and polymerization via tailored robust metal catalysts. Subsequently, these polymers will be refined by state-of-the-art macromolecular methods and their biodegradability will be tested. The FocusLab *HylmPAct* provides biotechnologically produced chemicals such as succinic acid, 1,4-butanediol, ketoglutarate and protocatechuic acid. Finally, biofunctionalized bioplastics (bio2plastics) will be obtained that can be useful for drug delivery tests in the FocusLab *greenRelease*.

Duration: 24 months



XyloSenS - Development of a xylose sensor toolbox for microbial process monitoring and control

-linked to FocusLabs HyImPAct und AP³ -

Project coordination: Prof. Dr. Martina Pohl, Core Group Prof. Dr. Wolfgang Wiechert, IBG-1 Biotechnology, Forschungszentrum Jülich

Partners:

Dr. Bernd König, Prof. Dr. Dieter Willbold, Physical and Structural Biology, HHU Düsseldorf
Prof. Dr. Jochen Büchs, Biochemical Engineering, RWTH Aachen

The use of xylose from lignocellulose in addition to glucose is mandatory for developing economical biomass-based processes. For the development of corresponding microbial strains, adopting this pentose sugar as a C-source, XyloSenS will unlock new analytical tools.

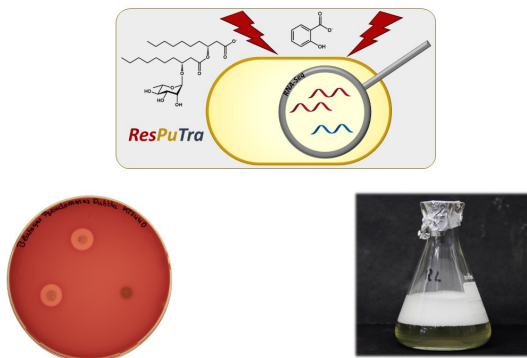
Genetically encoded FRET-based biosensors are a cutting-edge technology to measure metabolite concentrations inside living cells. Recently, the project partners developed the tools to make them available for extracellular measurements. XyloSenS will develop a toolbox of FRET-based xylose sensors that enable the detection of xylose as an alternative C source in microcultivation devices.

The project is linked to the [HyImPAct](#) FocusLab and can also contribute valuable results to the [AP³](#) FocusLab.

Duration: 24 months

New: Interdisciplinary PhD projects

At the end of 2018, PhD students in the FocusLabs had the opportunity to apply for interdisciplinary mini-projects. Four projects were selected and started at the beginning of 2019.



ResPuTra - Elucidation of the response of *Pseudomonas putida* KT2440 on production of stressing metabolites by whole-transcriptome sequencing (RNA-Seq)

Partners:

Sonja Kubicki, Core Group Prof. Jaeger

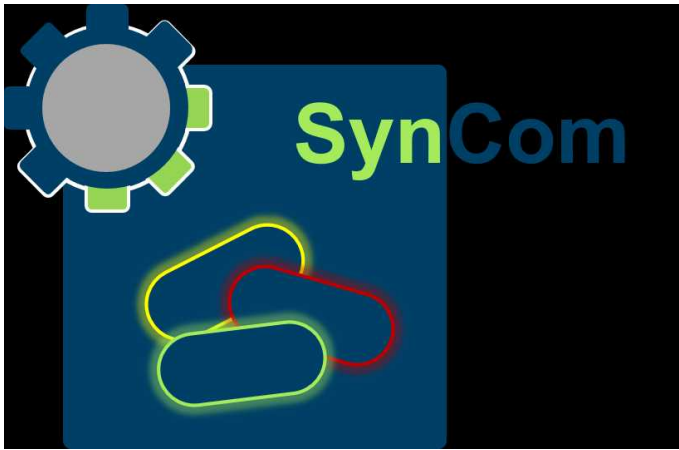
Maximilian Schelden, Core Group Prof. Büchs

Jan Gebauer, Core Group Prof. Pietruszka

Robin Weihmann, Core Group Prof. Jaeger

The heterologous production of various high-value secondary metabolites in *Pseudomonas putida* is a main goal of the Bio² and CombiCom BioSC FocusLabs. Although this organism is used for example for heterologous rhamnolipid production, key questions such as the response to stressing metabolites remain unanswered.

Identifying traits that contribute to chemical stress tolerance along with the respective regulatory elements is the main objective of ResPuTra. We try to achieve this via RNA sequencing. The results may ultimately be applied to optimize production by knock-out or overexpression of identified genes and to establish biosensors for rhamnolipid production based on rhamnolipid inducible promoters.



SynCom – Characterization and optimization of cell growth and heterologous gene expression within synthetic bacterial consortia

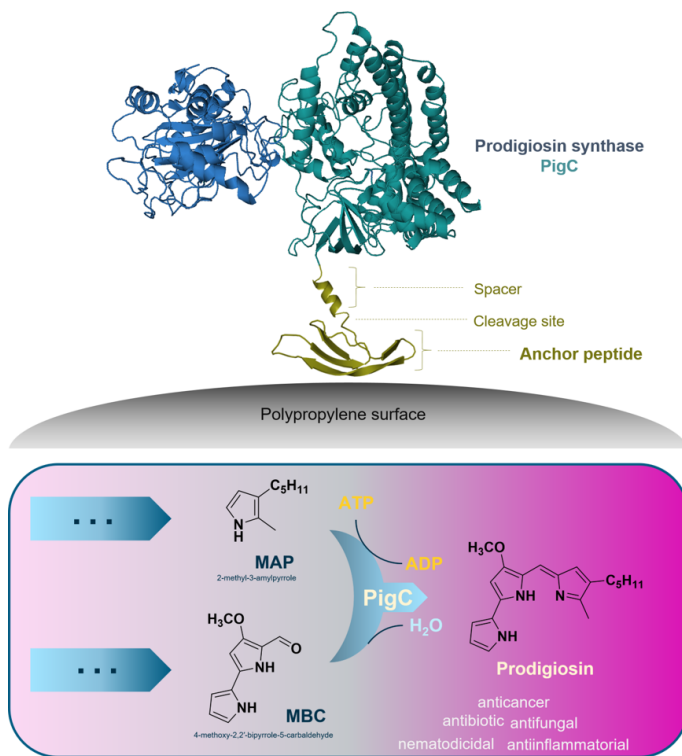
Partners:

Robin Weihmann, Core Group Prof. Jaeger

Fabienne Hilgers, Core Group Prof. Jaeger

Carl Brehl, Core Group Prof. Büchs

Co-cultivation of bacteria with different physiological properties can offer several benefits for industrial biotechnology. However, cell growth and gene expression within synthetic microbial consortia need to be monitored and tightly controlled. The SynCom project therefore aims to develop a model co-cultivation platform for synthetic microbial consortia in which growth performance of individual *Pseudomonas putida* strains and selective target gene expression of different fluorescence reporters will be monitored online during co-cultivation. In the future, this system can be applied to the production of pharmacologically relevant secondary metabolites such as prodigiosin and its derivatives in the context of the CombiCom BioSC FocusLab.



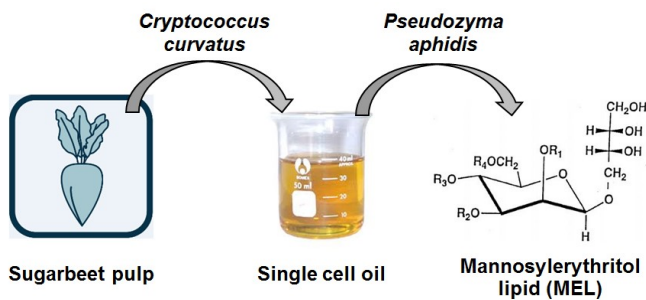
ProdAnchor - Immobilization and purification of prodigiosin synthase PigC by anchor peptide fusion

Partners:

Stefanie Brands, Core Group Prof. Schwaneberg
Liudmyla Goncharenko, Core Group Prof. Schwaneberg

Prodiginines are deep red bacterial secondary metabolites and a prominent example of a class of bioactive natural compounds. The prodigiosin synthase PigC catalyzes the final step of the bifurcated biosynthesis pathway of prodigiosin in *Serratia marcescens*. As a key enzyme in prodigiosin biosynthesis, its activity is an important bottleneck for prodiginine production. To date, the membrane-associated enzyme has not been purified with high purity and maintenance of activity. The ProdAnchor BioSC mini-project therefore envisions the establishment of an innovative purification method for PigC. The basic idea comprises immobilization of PigC on polypropylene surfaces using anchor peptides, which will be attached terminally to the PigC sequence. In ProdAnchor, technologies of two FocusLabs, CombiCom and greenRelease, will be

merged for synergistic effect.



MELOBEE - Production of Mannosylerythritol lipids (MEL) from single cell oil obtained from sugarbeet pulp

Partners:

Maximilian Schelden, Core Group Prof. Büchs
Johannes Brockkötter, Core Group Prof. Jupke
Andreas Biselli, Core Group Prof. Jupke
Isabel Bator, Core Group Prof. Blank

Mannosylerythritol lipids (MEL) are prominent biosurfactants with excellent properties. MEL can be efficiently produced with the smut fungus *Pseudozyma aphidis*, although larger quantities are formed only when oils are used as a substrate. When sugars are used instead, productivity and yield drop drastically. Here, a conflict arises because oils are food and should not be used as feedstock for bioprocesses. Thus, in the first part of this project, microbial oil will be produced sustainably from sugarbeet pulp using the oleaginous yeast *Cryptococcus curvatus*. The resulting oil will be isolated from cells using supercritical CO₂ extraction and then used as a substrate for MEL production with *P. aphidis* in the second part of the project. MELOBEE is related to the FocusLab Bio².

"BIO-raffiniert X" at Fraunhofer UMSICHT

The 10th "BIO-raffiniert" conference took place from February 26th to 27th, 2019 at Fraunhofer UMSICHT in Oberhausen. This year's theme "New ways to use biogenic resources?", which was also the topic of the first "BIO-raffiniert" conference in 2003, was examined from different perspectives. Two of the presentations were given by BioSC members Dr. Nina Ihling (RWTH Aachen University) and Dr. Arnd Kuhn (Forschungszentrum Jülich).



Photos: Forschungszentrum Jülich

In the first keynote lecture, Jörg Rothermel (Association of the German Chemical Industry) and Dietmar Peters (Agency for Renewable Resources, FNR) summarized the material use of renewable resources over the last 20 years. Whereas the share of cultivation of renewable resources has remained about the same, their use has increased. The higher demand is covered by imports such as palm oil. The use of CO₂ as a sole carbon source would represent a major challenge due to the high demand for hydrogen and the large amounts of power needed for its production. Coverage of the demand for biogenic carbon and the necessary closing of the carbon cycle will require a mix of different sources.

In the second keynote, Harald Gröger (University of Bielefeld) presented new ways and practical examples for producing chemicals relevant to industry by linking chemo- and biocatalysis. Uwe W. Fritsche (International Institute for Sustainability Analysis and Strategy) highlighted the sustainability aspect in the bioeconomy in the third keynote lecture, which was further elaborated in a subsequent workshop. Here, the importance of the bioeconomy for achieving the UN Sustainable Development Goals (SDGs) was discussed; the lack of action to concretize the bioeconomy and SDGs was also featured. The bioeconomy is not always sustainable per se. It is also important to bring the bioeconomy into people's everyday lives, integrate them in its development and implement the bioeconomy in towns, where material flows are considerable. In two other workshops, discussion focused on "Modern plant breeding techniques in the bioeconomy - the wrong path or the way forward!" and "Synthesis gas: platform of the future or technology impasse?".

In another session, "The role of biorefineries in the bioeconomy" was highlighted. Among other topics, Regina Palkovits (RWTH Aachen University) presented manufacturing routes for new valuable substances made of cellulose and hemicellulose through the use of heterogenic catalysis and electrocatalysis.

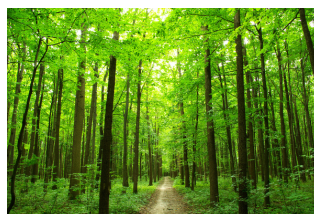
On the second day of the conference, various projects and practical examples were presented by

representatives from science and industry. Amongst others, Nina Ihling (RWTH Aachen University) explained the [Bio²BioSC FocusLab](#), a multidisciplinary joint project of the Bioeconomy Science Center, the goal of which is to develop a new process for the production of biosurfactants on the basis of renewable resources. Another representative from the BioSC, Arnd Kuhn (Forschungszentrum Jülich), presented the effect of biochar from pyrolysis and HTC processes as a soil additive for sustainable plant production.

In a World Café forum, current and future challenges for biorefineries as a technological platform were compiled and the results were summarized in a video message. In his keynote speech, Kurt Wagemann (DECHEMA) pointed out the important aspect of industrial symbiosis for shared value creation. The final session addressed the concept of "New products and business models through the use of biogenic raw materials". In impressive fashion, the 10th anniversary conference once again demonstrated the combination of research, application and policy that shapes the character of the longstanding series of conferences.

Sustainable bioeconomy as an opportunity for the future of the Rhenish lignite mining area

The end of the era of lignite production requires innovative concepts in the Rhenish lignite mining area in order to preserve economic power and quality of life in the region and to align towards sustainability. Here, the bioeconomy can make important contributions. Recent months have therefore seen the launch of explorations of regional bioeconomy potentials.



Photos: Forschungszentrum Jülich

The end of the lignite production has had a profound impact on regional development and the self-image of the people in the Rhenish district. Nevertheless, there are also great opportunities and potentials for a new, future-oriented regional identity.

The exceptionally good natural environment in the region, together with highly productive agriculture, designated bioeconomy research (e.g. BioSC, the PhenoRob cluster of excellence and CEPLAS) and an outstanding landscape for innovations in sustainable bioeconomy offers favorable conditions for the development of an exemplary bioeconomy model region ("bioeconomy district").

The region is characterized by sustainable value creation models, future-proof and diverse working places, a livable environment and a close connection with the cities along the Rhine and in the Euregio. The population, as well as the chemical sector and food industry are regional markets for agricultural products

(food and feed, biogenic goods). In addition, considerable quantities of biogenic waste and residue are generated in the cities; these streams can be diverted for use as raw materials in production processes or as fertilizer (a recycling economy).

It is now important to identify all relevant stakeholders from the various social sectors (economy, science, politics, municipalities, civil societies etc.) and along the value chain and network them in a targeted manner. This type of multi-player network should be the starting point for the development of pilot and demonstration projects or institutions leading to new business models and value added concepts (S2B) and can serve as the basis for a regional bioeconomy profile.

In recent months, the Jülich Research Center has positioned the bioeconomy as a potential field for structural change through a number of measures (e.g. the Sustainable Bioeconomy Future Forum and the Future Model Circular Bioeconomy Citizen Meeting); new cooperations have also been initiated, including successful participation in the funding program “Unternehmen Revier“ from which the “BioREVIER“ Project stems and which is coordinated by the “Zukunftsagentur Rheinisches Revier“. Its aim is an area-wide compilation of all relevant bioeconomy actors in the district as well as networking, development of projects, opening of a dialog with citizens and the development of a mission statement.

Over the coming months, the regional perspective will continue to play a role in BioSC activities as well. The BioSC plays a key role in the generation of innovative bioeconomy concepts; the “Bioökonomie-Revier“ can offer conditions in the sense of a real-world laboratory to implement practical tests for these concepts. The goal now is to pool all resources in the region for the bioeconomy and thus help achieve structural change in the region.

Contacts:

Prof Dr. Ulrich Schurr and Dr. Christian Klar

More information: www.biorevier.de

The 20th BioSC Lecture: “Towards a climate effective bioeconomy - Using precision synthetic biology tools for conversion of CO₂ and chemically complex biomass”

On March 13th, the 20th BioSthC Lecture took place at Forschungszentrum Jülich. Prof. Dr. Thomas Brück, holder of the Werner Siemens Chair for synthetic biotechnology and director of the AlgaeTec Center at the Technical University of Munich, presented different bioprocesses for fixation, valorization and storage of CO₂.



Photos: Forschungszentrum Jülich

Prof. Brück began by naming urgent global challenges, especially the effects of climate change, that are already noticeable today. In his view, measures to combat climate change have been inadequate largely because economic motivation is too low. He emphasized that scientific questions must lead to economic opportunities. He therefore presented some successful examples from his research.

Many high-quality chemicals and materials are produced on the basis of lipids. Microalgae and yeasts can produce large quantities of lipids without competing with food production and without causing land-use changes, as is the case for palm oil or even rapeseed oil, for example. Prof. Brück presented a patented process in which specific yeasts are co-fermented with hydrolyzed biomass from agricultural residue flows and acetate produced from CO₂ and electrolytically obtained hydrogen. As a result of this co-fermentation, yeasts can grow to a high density and produce large quantities of lipids. Water and biomass from the fermentation process are completely recycled and specialized enzymatic hydrolysis of the yeast cells allows a solvent-free lipid extraction. The price of the oil obtained in this way corresponds to the price of eco-certified palm oil and is thus competitive. In terms of life cycle analysis, the oil is within the range of plant oils.

The products to which lipids are processed range from plastics to lubricants and biodiesel up to carbon fibers. Today, the latter are mainly used in automobile production, but they are also suitable for construction elements in buildings or bridges, for example. This represents a highly effective opportunity to fight climate change, explained Prof. Brück. If lipids are produced in algae on a large scale, used in the construction sector and, after use, are ultimately stored in empty coal seams instead of burning them as it is done today, significant quantities of CO₂ could be permanently withdrawn from the atmosphere. This approach is deemed globally relevant in the current world climate report and Prof. Brück received an award for this work at the UN World Climate Conference 2018 in Katowice.

In addition, Prof. Brück presented two other biosyntheses established in his working group. For the production of the biodegradable plastic polyhydroxybutyrate (PHB) made of wheat bran, the Dahms synthetic pathway from *Pseudomonas* was introduced into *Ralstonia* in order to make the xylose in bran available. *Ralstonia* produces the monomer 3-hydroxybutyric acid that is subsequently polymerized to PHB using a cell-free enzyme cascade. The biodegradable insect repellent cembratrienol can also be produced from wheat bran by a metabolically engineered *E.coli* strain, which creates new possibilities for plant protection. All examples demonstrated impressive possibilities for establishing a sustainable bioeconomy.

Events and Calls

Events (selected)

German Biotech Days

April 9-10, 2019, Würzburg

Host: BIO Deutschland & Council of German BioRegions

[More Information](#)

Biobased Barcamp

April 11, 2019, Potsdam

Veranstalter: Enterprise Europe Network Berlin-Brandenburg and others

[More Information](#)

International BioSC Summer School 2019

September 9-13, 2019, Jülich

Opening of registration: End of April

Host: Bioeconomy Science Center

[More Information](#)

Klausurwoche Bioökonomie

September 23-27, 2019, Bonn

Deadline for Abstracts: Mai 1, 2019

Host: German Reference Centre for Ethics in the Life Sciences (DRZE), University of Bonn, and IBG-2 Plant Sciences, Forschungszentrum Jülich

[More Information](#)

BioMAT 2019: European Symposium & Exhibition on Biomaterials and Related Areas

May 8-9, 2019, Weimar

Host: Deutsche Gesellschaft für Materialkunde e.V. (DGM)

[More Information](#)

SynBio World Cafe

May 13, 2019, Darmstadt

Host: German Association for Synthetic Biology (GASB)

[More Information](#)

8th International Bioeconomy Conference

May 13-14, 2019, Halle/Saale

Host: ScienceCampus Halle and BioEconomy Cluster

[More Information](#)

Fuel Science: From production to propulsion

May 13-15, 2019, Aachen

Host: Cluster of Excellence The Fuel Science Center

[More Information](#)

12th International Conference on Bio-based Materials

May 15-16, 2019, Cologne

Host: nova-Institut GmbH

[More Information](#)

Plant Based Summit

May 22-24, 2019, Lyon

Hosts: Association for Plant Based Chemistry (ACDV), IAR- The French Bioeconomy Cluster and others

[More Information](#)

Circular Bioeconomy Days

June 25-27, Aarhus

Host: Centre for Circular Bioeconomy (CBIO), Aarhus University

[More Information](#)

Open Day

July 7, 2019, Forschungszentrum Jülich

[More Information](#)

Calls (selected)

UMSICHT Science Award

Deadline: March 31, 2019

The UMSICHT Friends and Patrons Group honors people who support the dialog between science and society through their work.

[More Information](#)

Förderung von Projekten für inter- und transdisziplinär arbeitende Nachwuchsgruppen in der Sozial-ökologischen Forschung (BMBF)

April 29, 2019 (first phase)

Innerhalb des Rahmenprogramms „Forschung für Nachhaltige Entwicklung“ (FONA3) werden Nachwuchswissenschaftlerinnen und Nachwuchswissenschaftler gefördert, die sich auf dem Gebiet der gesellschaftsbezogenen Nachhaltigkeitsforschung bzw. der Leitung von inter- und transdisziplinären Forschungsgruppen qualifizieren wollen.

[More Information](#)

BBI-JU Call for Proposals 2019 - *Opening: April 4*

September 4, 2019

[More Information](#)

Future Food Initiative: Postdoctoral fellowships

The Swiss Research Initiative "Future Food" provides three-year postdoctoral fellowships. Applications can be submitted at any time.

[More Information](#)