more than a
Conference Journal

- Full Programme of the Conference
- Abstracts of the Presentations
- Bio-based Material of the Year 2015
- Market Study on Bio-based Building Blocks and Polymers in the World
- Partners and Exhibitors

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**Venue**  
Maternushaus Cologne  
Kardinal-Frings-Str. 1–3  
50668 Cologne, Germany  
+49 (0) 221 16 310  
info@maternushaus.de
Dear Ladies and Gentlemen,

Welcome to our 8th International Conference on Bio-based Materials in Cologne!

This conference aims to provide major players from the European and Asian bio-based chemicals, plastics and composite industries with an opportunity to present and discuss their latest developments and strategies. Representatives of political bodies and associations will also have their say alongside leading companies. The highlights of the conference will be: High-level discussion about the right strategies for building and promoting the bio-based economy, the presentation of the first few running Asian and European biorefineries, latest development in bio-based building blocks and polymers, 3D printing, microparticles in the environment, and the vote for the winners of the Innovation Award “Bio-based Material of the Year 2015”.

After last year’s great success, the conference will for the second time include a third day specifically dedicated to start-ups presenting groundbreaking innovations. In cooperation with the German Federal Ministry of Education and Research (BMBF), the German Ministry of Economics and Energy (BMWi), the Cluster Industrial Biotechnology (CLIB2021) and the French Industries & Agro-Ressources (IAR) Cluster, the event is set to provide a perfect platform and meeting point for networking between start-ups, established companies and investors. Four introductory talks will discuss how start-ups can be successfully financed and launched on the market. The 12 selected start-ups from 6 countries will afterwards have a chance to present their innovations and get in contact with potential partners and investors.

It is one of the biggest conferences on this topic with more than 200 participants and 30 exhibitors from all over the world. Enjoy your networking, find new ideas and partners, let yourself be inspired by the open atmosphere of the city of Cologne. For the first time, we invite you on both nights into the party room under the Maternushaus, even with the opportunity to go bowling on the second night!

Michael Carus, Florence Aeschelmann & the nova team

Many thanks to our sponsors Coperion GmbH (Gold Sponsor Innovation Award) and InfraServ GmbH & Co. Knapsack KG (Silver Sponsor of the conference)!
Your Conference Team

Bio-based Economy

Bio-based Chemicals & Materials • Biorefineries • Industrial Biotechnology
Carbon Capture & Utilization

Sustainability

Raw Material Supply
Availability & Prices
Sustainability

Techno-Economic Evaluation (TEE)
Process Economics
Target Costing Analysis

Dissemination & Marketing Support
B2B communication
Conferences & Workshops
Marketing Strategies

Environmental Evaluation
Life Cycle Assessments (LCA)
Life Cycle Inventories
Meta-Analyses of LCAs

Market Research
Volumes & Trends
Competition Analysis
Feasibility and Potential Studies

Political Framework & Strategy
System Analysis
Strategic Consulting

You can find all conferences and information of the nova-Institute at:
www.bio-based.eu

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Wageningen UR
Christiaan Bolck

Flemish Institute for Technological Research (VITO)
Prof. Dr. Ludo Diels

Hochschule Bremen
Prof. Dr. Jörg Müssig

Jan Ravenstijn Consulting
Jan Ravenstijn

CLIB2021
Dr. Thomas Schwarz

IBB Netzwerk
Prof. Dr. Haralabos Zorbas
Public procurement in Europe represents an estimated 16 percent of total GDP and thus offers large potential as an instrument for creating demand for bio-based materials. A survey recently conducted among public procurement agents across Europe demonstrates that many organizations already practice green public procurement or engage in innovation-oriented public procurement. In the field of bio-based products, these procurement practices may play a substantial role in driving future public sector demand.

However, many public procurement agents are not sure whether specifications on bio-based content could be used for taking a procurement decision in their organizations. Against this background, two European research projects, Open-Bio and InnProBio aim at developing concrete measures to facilitate the public procurement of bio-based products. This includes among other things the creation of an online accessible database of bio-based products, which shall provide potential buyers at public organizations with the required information for procurement decision-making.

The workshop will present the envisioned architecture of the online information tool and outline the planned further development. We kindly invite providers of bio-based materials, products and services to attend this workshop, learn about the ongoing European activities in the field, and provide valuable feedback to the development of instruments that effectively support public demand.

Contribute your expertise to ensure that measures meet the needs of all interested stakeholders!

Participation at the workshop is free of charge. Please note that the workshop is limited to 25 persons!
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1st Day, 13 April 2015 – POLICY & INDUSTRY

09:00 Registration and welcome coffee

09:30 Conference Opening

Nova-Institut GmbH
Michael Carus

09:30 POLICY & MARKETS

Moderator: Director, ret. EU-Comission, Advisor and Member of the 1st German Bioeconomy Council
Dr. Dr. h.c. Christian Patermann

Ten years bio-based economy: looking back – lessons learnt

09:45 European Comission, DG Research and Innovation, Biobased Products and Processes Unit
Dr. Barend Verachtert

Bio-based economy – strategy of the new Commission

10:15 European Bioplastics e.V.
Kristy-Barbara Lange

Bioplastics in the EU – status and lobbying in Brussels, a field report

10:45 Coffee break

11:15 Honorary member and former chairman of The Biorenewable Business Platform
Ing. Ton Runneboom

Opportunities for the fermentation-based chemical industry: an analysis of the market potential and competitiveness of North-West Europe

11:45 BASF SE
Dr. Christine Stiehl

The use of renewable feedstock in chemical production

12:15 Lunch break

13:30 Nova-Institut GmbH
Michael Carus

Worldwide production capacities for bio-based building blocks and polymers, today and 2020

14:00 Roundtable on Sustainable Biomaterials (RSB)
Dr. Melanie Williams

Ensuring that bio-based chemicals are sustainable

14:30 Panel discussion & press conference with the speakers from the morning session

15:00 Wageningen University
Prof. Dr. Johan P.M. Sanders

Small scales for biorefineries and bio-based chemical production

15:30 PRECISE Corporation
Dr. Wolfgang Baltus

Biorefineries in Asia

16:00 BioEconomy Clustermanagement GmbH
Dr. Rainer Busch

The LCF-Biorefinery in Leuna as the cornerstone for the cascading use of woody biomass

16:30 Coffee break
17:00 Stora Enso Biomaterials
Axel Wizemann
Bio-based chemicals and materials: differentiation and diversification based on non-food competing biomass

INNOVATION AWARD “BIO-BASED MATERIAL OF THE YEAR 2015”

Moderators:
nova-Institut GmbH
Michael Carus & Florence Aeschelmann

17:30 Gold Sponsor Innovation Award: Coperion GmbH
Peter von Hoffmann
Coperion and compounding of bio-based materials

17:45 Bayer MaterialScience AG
Dr. Berta Vega Sánchez
DESMODUR® eco N – First bio-based polyurethane crosslinker in the market for high performance automotive coatings: polyisocyanate based on Pentamethylene Disocyanate (PDI)

17:55 EcoTechnilin Ltd
William Anthony
FibriRock 100% bio-sourced composite for aircraft applications comprising flax non-woven, basalt yarns and a sugar-based bioresin. Co-developed with TFC

18:05 Evonik Industries AG
Ralf Meier
100% bio-based high performance polyamide 12 based on palm kernel oil

18:15 HIB Trim Part Solutions GmbH
Uwe Schnabel
Nature 50 – Natural reinforced plastic (Hemp – PP) including a long fiber ratio > 50% for injection molding

18:25 INVISTA S.a.r.l.
Arnaud Tandonnet
LYCRA® T 162R fiber – Spandex yarn made using renewable butanediol as raw material with a lower CO₂ and fossil emissions footprint

18:35 twoBEars GbR
Benno Besler
bioFila – High performance PLA blends with outstanding optic and haptic for 3D printing

19:00 Voting

20:00 Dinner buffet & Innovation Award Ceremony

22:00–01:00 Get together in the party room beneath Maternushaus
BIO-BASED BUILDING BLOCKS, POLYMERS AND COMPOSITES

Moderator:
Wageningen UR  🇳🇱
Christiaan Bolck

09:00 Flemish Institute for Technological Research (VITO) 🇧🇪
Dr. Heleen De Wever
Highly functionalised lignin molecules: how to manage them and to turn them into innovative molecules and materials

09:30 Korea Institute of Industrial Technology (KITECH) 🇰🇷
Dr. Sangyong Kim
Diacids and diols as sources of precursor materials for biobased aromatics

10:00 Corbion 🇳🇱
Hugo Vuurens
Progress in lactic acid and PLA

11:00 Jan Ravenstijn Consulting 🇳🇱
Jan Ravenstijn
New (bio)polymers: lessons learnt

11:30 Bridgestone Technical Center Europe 🇧🇪
Dr. Barbara M. Secchi
Bridgestone actions towards use of sustainable materials

12:00 Coca-Cola Europe 🇧🇪
Dr. Klaus Stadler
Coca-Cola – leader in new bio-based polymers: the bio-PET and PEF story

12:30 Toyota Boshoku Europe N.V. Munich 🇪🇺
Tayfun Buzkan & Motoki Maekawa
Sustainable lightweight material in automotive industry: simultaneous back injection molding of natural fiber composites

14:00–15:30 Side Event: Open-Bio Workshop on Instruments for Public Procurement of Bio-based Products
**BIO-BASED 3D PRINTING**

Moderator: Jan Ravenstijn Consulting
Jan Ravenstijn

14:00 Institut für Kunststofftechnik (IKT) – Universität Stuttgart
Univ.-Prof. Dr.-Ing. Christian Bonten
3D printing of bio-based plastics

14:30 FKuR
Carmen Michels
Helian Polymers BV
Bio-based compounds for 3D printing: wood and bamboo with PLA

**BIO-BASED PLASTICS AND ENVIRONMENT**

Moderator: Sustainability Consult
Kathryn Sheridan

15:00 nova-Institut GmbH
Roland Essel
Microplastics in the environment: scientific background, sources and volumes

15:30 Ghent University
Lisbeth Van Cauwenberghene
Microplastics in marine environment and impacts on human consumption

16:00 Coffee break

16:30 Institut für Kunststofftechnik (IKT) – Universität Stuttgart
Univ.-Prof. Dr.-Ing. Christian Bonten
Degradation of plastics: risks and chances

17:00 Kaneka Corporation
Kenichiro Nishiza & Takahiko Sugaya
Market development of environmental friendly Kaneka biopolymer Aonilex®

17:30 Pharmafilter B.V.
Eduardo van den Berg & Peter Kelly (photo)
Pharmafilter, a bio-based curricular bio economy solution for hospitals

18:00 Panel discussion

19:00–00:00 Cologne buffet with local specialities in the party room & bowling alley beneath Maternushaus
3rd Day, 15 April 2015 – START-UPS & FUNDING

START-UPS FROM THE NOVA-INSTITUTE

Moderator:
BCNP Consultants GmbH
Tobias Kirchhoff

09:00
Sofinnova Partners
Josko Bobanovic
Building start-ups in renewable chemistry

09:20
Sinvestec LLC
Dr. John Williams
Why invest in bio-based materials?

09:40
BCNP Consultants GmbH
Tobias Kirchhoff
Biotech & chemistry start-ups: status quo and trends

10:00
InfraServ GmbH & Co. Knapsack KG
Gordana Hofmann-Jovic
Accelerating start-ups

10:20 Coffee break

10:50
EggPlant
Dr. Paolo Stufano
EggPlant. Not wasting life.

11:10
ZAZA bottles
Zuzana Cabejšková
Refillable water bottles: combining sustainability and beauty

11:30
GFBiochemicals Europe
Marcel van Berkel
Making levulinic acid happen

START-UPS FROM BMBF AND BMWI

BMBF: Bundesministerium für Bildung und Forschung
Federal Ministry of Education and Research

BMWi: Bundesministerium für Wirtschaft und Energie
Federal Ministry of Economics and Energy

Moderator:
Projekträger Jülich
Dr. Eva P. Waldvogel

11:50
dextrinova (Friedrich Schiller University Jena)
Dr. Tim Liebert
Starch esters – an innovative hot melt
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>12:10</td>
<td>JeNaCell GmbH</td>
<td>Christin Staffler</td>
<td>Products based on biotechnologically produced nanocellulose</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch break</td>
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<tr>
<td>13:50</td>
<td>ANiMOX GmbH</td>
<td>Thomas Grimm</td>
<td>Development and production of proteins for chemistry and biotechnology</td>
</tr>
<tr>
<td>14:10</td>
<td>Polymer Service GmbH Merseburg</td>
<td>Dr.-Ing. Ralf Lach</td>
<td>Mechanical performance of biomaterial modified polymers</td>
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<tr>
<td>14:30</td>
<td>SenseUp</td>
<td>Dr. Georg Schaumann</td>
<td>Microbial strain and production process development in ultra-high-throughput</td>
</tr>
<tr>
<td>14:50</td>
<td>Medical Adhesive Revolution GmbH</td>
<td>Steve Gotzen</td>
<td>Revolutionizing wound care with biodegradable surgical adhesives</td>
</tr>
<tr>
<td>15:10</td>
<td>Technische Universität München</td>
<td>Dr. Wolfgang H. Schwarz</td>
<td>Novel enzyme complexes for the effective hydrolysis of plant biomass</td>
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<tr>
<td>15:30</td>
<td>Coffee break</td>
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<tr>
<td>15:50</td>
<td>START-UPS FROM CLIB2021</td>
<td>Moderator: CLIB2021 Dr. Thomas Schwarz</td>
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<tr>
<td>16:00</td>
<td>Syngulon</td>
<td>Guy Helin</td>
<td>Microbial fermentation technologies for bio-based products</td>
</tr>
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<td>16:20</td>
<td>Oméga Cat System</td>
<td>Frédéric Caijo</td>
<td>Olefin metathesis</td>
</tr>
<tr>
<td>16:40</td>
<td>Networking snack</td>
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POLICY & INDUSTRY
POLICY AND MARKETS

Kristy-Barbara Lange
European Bioplastics e.V.

Bioplastics in the EU – status and lobbying in Brussels, a field report

Bioplastics still only represent well under one per cent of the about 300 million tonnes of plastic produced annually. Yet, as demand is rising and with more sophisticated materials, applications, and products emerging, the market is currently growing by about 20 to 100 per cent. According to our latest market data, global production capacity of bioplastics is predicted to quadruple in the medium term – from around 1.6 million tonnes in 2013 to approximately 6.7 million tonnes by 2018.

While Asia is predicted to further expand its role as major production hub, producing about 75 per cent of bioplastics by 2018, Europe – at the forefront of research and development – will be left with a mere 8 per cent of the production capacities. Asia and the USA are already investing strongly in measures ‘closer to market introduction’ to promote faster market development. On EU-level, however, legislators just recently withdrew the long-awaited ‘Circular Economy Package’ including a proposal to review EU waste targets, which are urgently needed to tap into the immense potentials for resource efficiency, economic growth, and job creation and to allow for a full-scale market introduction of bioplastics in Europe.

European Bioplastics is the association representing the interests of the industry along the entire value chain vis-à-vis EU institutions making sure that the voice of our members and the bioplastics industry as a whole is being heard in the context of on-going EU initiatives. The recently amended ‘Packaging and Packaging Waste Directive’ confirmed the EU’s strong environmental commitment to resource efficiency by obliging Member States to reduce the consumption of conventional single use plastic carrier bags and paving the way for compostable shopping bags. Yet, to realise the full market potential of bioplastics additional legislative measures are needed and we are working towards an integrated policy and economical framework to support the material use of renewable raw materials.

www.european-bioplastics.org
Ing. Ton Runneboom  
Honorary member and former chairman of The Biorenewable Business Platform  

Opportunities for the fermentation-based chemical industry: an analysis of the market potential and competitiveness of North-West Europe

Short description of our presentation in bullets

- Sugar beet are very suitable as feedstock for the production of many functional molecules (alcohols, amino acids, organic acids, biogas, polymers, vitamins, antibiotics and industrial enzymes).
- Oil vs Sugar: A remarkable development that has almost escaped notice is the declining ratio between the prices for crude oil and sugar. Before the turn of the millennium, the ratio between Brent Crude and London’s No 5 contract for white sugar, both in US$/GJ, hovered around 7. However, soaring oil prices and low sugar prices in 2000 led to the ratio plummeting to about 3. Even with the currently decreasing oil prices, the ratio tends to increase moderately, however, with a moderately declining sugar price, the effect is expected to be limited.
- According to our study, North-West Europe is a highly competitive sugar beet producer (the Netherlands is even the global cost leader) because of improvement in seeds and world-class cultivation methods. Also the location is beneficial; in the proximity of a world-class, strongly connected and advanced chemical cluster.
- The current market for biobased chemicals is still relatively small, but expected to grow with 6.5% CAGR until 2020. Clear opportunities exist for – investments in – the fermentation based chemical industry in North-West Europe, opening to an attractive market with high economic value-add ($ 12 billion/annum) in 2013.

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ton@runneboom.eu
Dr. Christine Stiehl  
BASF SE  
The use of renewable feedstock in chemical production

For the use of renewable feedstock in production usually very specific production technologies are applied and developed, which transform a renewable raw material like e.g. sugar or plant oils into a bio-based chemical. There are many opportunities with dedicated solutions, especially if the products have special properties due to characteristics of a renewable feedstock.

But there is also a lot of benefit if interlinked production processes are applied. At the BASF site in Ludwigshafen, the biggest interlinked production site world-wide, there are about 160 production plants located, which are connected by a pipeline system of about 2800 km in length. Decades of engineering excellence optimized these processes to ensure that the energy use is optimized and that a side product or thermal energy in form of steam generated by one production facility is utilized in another one at the same site. Huge savings regarding energy and production waste can hereby be achieved.

How can we introduce renewables, without losing the benefits of interlinked production? If we consider global warming, it is important to save fossil resources and greenhouse gas emissions wherever possible. If we manage to replace the corresponding amount of fossil raw materials by renewables in the very beginning of our interlinked process, the effect for fossil savings will be comparable to a production in dedicated lines.

This is exactly what BASF’s mass balance approach is about: It is calculated how much raw material (naphtha and fossil gas) is needed to produce the required amount of a chemical. In order to utilize renewables in interlinked production the corresponding amount of naphtha is replaced by bio-naphtha and gas by biogas. Therefore fossil resources are saved.
European Biotechnology Magazine reports in English on the political, economic and technical development at the intersection of biotech, pharma, medtech and chemistry in the 28 countries of the European Union, plus Switzerland and Norway. Collaborating with national and multinational organisations, the team of highly experienced journalists compiles all the relevant developments into highly readable news reports, features and articles.

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Michael Carus  
nova-Institut GmbH

Worldwide production capacities for bio-based building blocks and polymers, today and 2020

In March 2013, Germany’s nova-Institute published the most comprehensive market study of bio-based polymers ever made. The market study was carried out in collaboration with renowned international experts in the field of bio-based polymers from Europe, America and Asia. The 2013 market study received high acclaim and set a new standard for market studies in this field. Now, two years later, a complete update is to be published in June 2015. The study investigates every kind of bio-based polymer and several major building blocks produced by more than 200 companies at over 350 locations around the world. In 2014, for the first time, nova-Institute’s market study was used as the main data source of the recently published market data of the association “European Bioplastics”.

The presentations shows the main results of the study:
- Production capacities of the main bio-based building blocks and all bio-based polymers in 2013 and forecasts until 2018 and 2020
- Locations of the producers in 2013 and forecast until 2018 and 2020
- Main application sectors of the bio-based polymers, from packaging to automotive
- Main results from eleven trend reports, which are part of the study (250 pages)
- In 2013, the total production capacity for bio-based polymers was more than 5 million tonnes (worldwide) – this means 2% of the total polymer capacity

Summary can be downloaded at: www.bio-based.eu/markets

www.nova-institut.de
COMMERCIAL BIOREFINERIES

Dr. Wolfgang Baltus
PRECISE Corporation
Biorefineries in Asia

The presentation will give an overview about the status of biorefineries in Asia with focus on the development in Southeast-Asia. Current concepts with the integration of bio-based chemicals and 2nd/3rd generation feedstock, which follow the current global development trend, will be discussed on the example of Thailand, where 1st generation feedstock biorefineries are established for many years. New approaches like the establishment of biogas biorefineries will be highlighted as these kind of smart integrated factories are expected to contribute significantly to the society by the introduction of smart community concepts in combining bio-based energy and material supply.

Dr. Rainer Busch
BioEconomy Clustermanagement GmbH
The LCF-Biorefinery in Leuna as the cornerstone for the cascading use of woody biomass

“Bioeconomy” is defined as “the knowledge based production and use of renewable resources to provide products, processes and services to all sectors of a future sustainable economy”.
A bioeconomy needs the close cooperation between economical areas which usually do not work together: agriculture and forestry, food industry, chemical industry, plastics and polymer processing industry, wood processing industry, construction industry, energy industry and machinery and plant engineering & construction. And it needs biomass as the base of bio-based value chains, including biomass conversion technologies.

The cluster BioEconomy in Central Germany, which is built around the OrganoSolv LCF biorefinery in the Fraunhofer CBP in Leuna, strives primarily for the material usage of wood with high value creation (wood as a material of construction on one hand and as a raw material for the chemical industry on the other hand), supplemented by the energetic usage of the residues of the whole process chain.

The presentation will shine a light on the importance of both the “hardware” biorefinery and the “software” conversion technology for the development of a future bioeconomy.
INNOVATION AWARD
“BIO-BASED MATERIAL OF THE YEAR 2015”

Peter von Hoffmann
Coperion GmbH

Coperion and compounding of bio-based materials

In Coperion you have a partner on hand to provide the optimum solution to every compounding task. This ranges from special applications on laboratory scale to industrial-scale production extruders. As pioneers in the development of the closely intermeshing, co-rotating twin screw extruder, we have unique expertise and experience in this field. Since the 1950s, Coperion has continued to set new standards in processing machinery and plant design for compounding technology. We plan and implement compounding systems for the plastics, chemicals and food industries which are designed precisely to our customers’ applications. Over 10,000 compounding systems delivered all over the world are proof of our unique system and process competence.

Processing of biobased and biodegradable products makes very high demands on the compounding process because of the variety of possible base polymers and the great differences in the formulation mixtures. Every process step in a processing plant must be adapted exactly to the desired mechanical properties of the end product. We have built up a comprehensive know-how for the processing of biobased and biodegradable products. Our specialists benefit from our years of experience in the fields of cooking extrusion and plastic compounding which we gathered under our former name Werner & Pfleiderer.

NOTES
The only magazine dedicated to bioplastics, i.e. plastics from renewable resources and biodegradable plastics.
Dr. Heleen De Wever  
Flemish Institute for Technological Research (VITO)  
**Highly functionalised lignin molecules: how to manage them and to turn them into innovative molecules and materials**

Price fluctuations, the changing feedstock (shale, light crude, coal, etc.) and sustainability questions are drivers to move into the production of biobased aromatics. Biorizon, the way to aromatics started as an initiative between Flanders and the Netherlands and is extended via BIG-C toward North Rhine-Westphalia. Among several approaches to make biobased aromatic molecules the most important seem to be the sugar- and lignin-based routes. The sugar-based route is based on a rather expensive feedstock and a rather easy conversion process. Whereas the lignin-based route is based on a cheaper feedstock, but as well on a difficult and complex processing. However the high amount and diversity of functional groups allows the lignin-based approach to develop many new molecules and materials. Sometimes it is based on a rather easy blending with some fractions, sometimes it will be based on a rather complex hydrolysis, separation and conversion process. The applications (by SMEs and large companies) are the main driver towards this innovations and go from tyres over textile, anti-oxidants, UV-resistance, flame retardance, coatings, emulsifiers, resins, inks, laminates, wood-plastics, wood hardening, etc. As resources soft wood is an interesting resource, but also waste wood, lignocellulose residues, flax shives, digestate residues, pulp & paper residues can be applied.

The presentation will give an overview of the initiatives, potential uses, potential feedstocks and will as well invite to join the BIG-C flagship.
Dr. Sangyong Kim
Korea Institute of Industrial Technology (KITECH)

Diacids and diols as sources of precursor materials for biobased aromatics

The development of bio-based materials has been extended from the synthesis of aliphatic molecules to aromatic molecules to balance the supply of renewable building blocks both in linear and ring structures to replace petroleum based drop-in compounds. While the bio-based platform chemicals are drawing more interests as potential monomer precursors for commodity bioplastics, a variety of synthesizing and processing pathways of sugar derived arene compounds has been investigated. As a corresponding research KITECH is aiming at sustainable production of C5–C6 cyclic and aromatic building blocks. The recent successful synthesis of diacids and diols such as itaconic acid, muconic acid, isosorbide and furanics from industrial sugar and crude polysaccharides may allow us to accept versatile non-food renewable feedstocks and replace oil based non-renewable drop-in aromatics such as terephthalate and bisphenol A preferentially. The noble catalysis and biocatalysis of bio-based small molecules along with inherent derivatization and copolymerization are in progress.

Jan Ravenstijn
Jan Ravenstijn Consulting

New (bio)polymers: lessons learnt

Historically it is well known that the introduction of new polymers to the market is a slow and tedious process that has demonstrated to always take much more time and resources than originally planned and it has a much more multi-disciplinary nature than originally considered. This is as true for bio-based polymers as it is and has been for fossil-based polymers. Examples from the past (polypropylene, polystyrene, PVC, etc.) turn out to be also true for the more recent market introductions of the new PLA, PHA and PBS polymer platforms. The Dos and Don’ts are often ignored and recognized late or even too late, which at least costs a lot of time and money, but sometimes even causes the demise of a company.

With this paper the author aims to identify ten of the lessons learnt and discusses options to avoid or at least to minimize the adverse effects when taking these lessons to heart. At least three main themes appear to be key in this respect: strategy (as opposed to tactics), multifunctional project approach from A to Z and value chain alliances for market pull creation.
Dr. Barbara M. Secchi  
Bridgestone Technical Center Europe

**Bridgestone actions towards use of sustainable materials**

The increase in population expected in coming years requires from global companies an effort to decouple population increase / economic growth from resource consumption / environmental impact. Bridgestone has taken the commitment to work towards 100% sustainable materials. Considering that more than 100 materials are used to produce a tyre, the path requires significant efforts / resources. The presentation shows the most significant actions taken / planned until now to be able to use more sustainable materials already by 2020. Being rubber one of the main constituents, activities are presented to increase natural rubber sustainability, as well as actions towards replacement of selected monomers. Other activities in progress are also briefly mentioned.

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Tayfun Buzkan & Motoki Maekawa  
Toyota Boshoku Europe N.V. Munich Branch

**Sustainable lightweight material in automotive industry: simultaneous back injection molding of natural fiber composites**

Toyota Boshoku Europe N.V. Munich Branch is an international automotive supplier of several worldwide acting customers. Especially the material division focuses on sustainable solutions. Several variations of natural fiber composites have been developed as sustainable and lightweight materials. The overall environmental emission impact caused by industry production has been reduced due to the absorption of CO₂ during the plants’ growth. Moreover low density and good mechanical properties of the plants’ fiber aroused the interests of the automotive industry. One type of our natural fiber composites is based on a thermoplastic matrix which is processed by a unique production process. Although another process was conventionally required to add functional components to the back of the natural fiber fleece, this new approach requires no extra process. It allows polymer injection, molding and adhesion to the natural fiber fleece to be performed at the same time so material and process costs are reduced. Furthermore, the replacement of further production steps increases the precision of manufacturing. During the simultaneous back injection molding of natural fiber composites semi-manufactured fleece based on natural and thermoplastic fiber are heated up and compressed until the thermoplastic matrix material encases the natural fibers. Afterwards the fleece is transferred into a form press.

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This pressing machine consists of an upper and lower tool which is shaped in the negative form of the final door panel. While pressing both together the fleece is shaped into its final form. At the same time melted thermoplastic is simultaneously back injected through tiny channels in the lower tool on to the back of the fleece to form thin ribs. With the help of this technology the weight of car door panels can be decreased by 22%.

BIO-BASED 3D PRINTING

Univ.-Prof. Dr.-Ing. Christian Bonten
Institut für Kunststofftechnik (IKT) – Universität Stuttgart

3D printing of bio-based plastics

In the last few years, 3D printing received increasing awareness. There are many methods that can “print” a 3D structure. All these technologies have in common that the 3D part is built up layer by layer. Originally, 3D printing stands for a specific prototyping process, but today it is often used for the so-called fused deposition modeling. Fused deposition modeling needs thermoplastics filaments and builds a 3D structure layerwise. Currently there are only a few materials available for the fused deposition modeling. New materials with different properties are required to widen the application of this 3D printing technology. The IKT developed new biobased filaments with a diameter of 1.75 mm or 3 mm, which are needed in the process. In order to produce filaments, which need to have a constant diameter as well as a perfectly round shape, a special die has to be designed. In addition, the new die has to consider die swelling and wall adhesion. The material itself has to fulfill specific requirements as well: On the one hand, the viscosity should not be too low, so that the strand would break during production, but on the other hand the viscosity should also not be too high to allow fast diffusion and thus high force transmission across the boundary layers. In this contribution the main tasks are described to get a new biobased filament which can be used in fused deposition modeling.
Carmen Michels
FKuR Kunststoff GmbH

Helian Polymers BV

Bio-based compounds for 3D printing: wood and bamboo with PLA

Bioplastics such as PLA are particularly suitable for the FDM process (Fused Deposition Modeling) or more common FFF (Fused Filament Fabrication), as they have a relatively narrow melt window at low temperatures. Furthermore, the low processing temperature results in easier control of the printer and simplifies the regulation of the printing process. When compared to conventional ABS, which is generally used currently, the printing accuracy is also improved. In addition, when ABS is processed, styrene vapours could be released with resulting, and as yet unknown, health consequences. Here, the bioplastic PLA offers an alternative which is not hazardous to health.

However, a significant disadvantage of unmodified PLA is its brittleness and low impact strength. As a consequence the quality of the finished product is adversely affected. With its new generation of PLA based filament formulations, the cooperation partners satisfy the requirement for an optimized material quality along with improved processing. With their unique and comprehensive product portfolio, both development partners steadily expanded the applications and markets for PLA in 3D printing. The new product range including the recently developed design materials reinforced with natural fibers namely 'woodFill Fine' and 'BambooFill' will be presented with concrete samples. These two wood fiber reinforced grades ('woodFill Fine' and the bamboo fiber reinforced grade 'BambooFill') enable the manufacture of components with a unique wood appearance and distinctive feel. Compared to conventional wood, there are virtually no limits to design freedom. This freedom of design enables designers and architects, as well as private users, to work with new creative options.
Microplastics in the environment: scientific background, sources and volumes

Waste in the oceans and inland waters is dominated by plastics. The United Nations Environment Programme (UNEP) assumes a coverage of up to 18,000 pieces of plastic for every square kilometre of ocean. It can take centuries for plastic to be broken down in the oceans by physical, chemical, and biological decomposition processes. Along with larger waste items such as plastic bottles or bags, steadily increasing amounts of microplastic particles – commonly known as microplastics – are being observed in ocean gyres, sediments, and on beaches, as well as being found in marine organisms.

The term microplastic, however, is not used consistently. In the cosmetics industry, it is used to describe plastic granulates that in many cases are much smaller than 1 mm in diameter. In marine protection, in contrast, plastic particles with a diameter of less than 5 mm are considered microplastics. Microplastic can therefore be considered an umbrella term for various plastic particles determined solely on the basis of size.

One often cited and in the public media discussed source of microplastic particles are cosmetic and body care products. The most commonly used polymers are polyethylene (PE), polypropylene (PP) and polyamide (PA). But a whole series of other polymers are also in use in cosmetics today. Along with their use in the cosmetics industry, there are other applications for microplastic particles. They are used as abrasive beads in detergents and cleaning fluids, and as a blasting abrasive in, for example, the surface cleaning of stainless steel. They are used as lubricants, separating agents, or as carriers for pigments, or to adjust the viscosity of hot melt adhesives.

The availability of precise numbers on the amount of microplastic particles used in cosmetics and other products is unsatisfactory until today. Due to the lack of data, it is difficult to establish the volumes in which these particles enter the environment. But fragments from plastic debris that have entered the sea are a far greater source of damage. This means that if we want to decrease the amount of microplastics in the environment, and above all in the world’s oceans, it is not enough to focus on microplastics in cosmetics. Instead, measures need to be taken to drastically reduce the amount of plastic waste entering the environment in general – not just in Germany or the EU, but worldwide.
Lisbeth Van Cauwenberghe  
Ghent University  🇧🇪  
**Microplastics in marine environment and impacts on human consumption**

Plastic debris is ubiquitously present in the world’s seas and oceans. Although the consequences of the plastic macrodebris are well known for (vertebrate) wildlife, there is increasing evidence that microplastics (plastic particles < 1mm) also exert an impact on marine biota. Ingestion has already been demonstrated for organisms at the base of the food chain (large variety of planktonic organisms), but also invertebrates occupying higher trophic levels (polychaetes, bivalves, echinoderms and decapods) are known to ingest microplastics, either directly or indirectly. The increasing scientific evidence that numerous marine (invertebrate) species ingest microplastics is an indication that these microscopic plastic particles are entering the marine food chain. Taking into consideration that the global food supply of seafood, both from capture and aquaculture production, was over $125 \times 10^6$ tonnes in 2009, consequences for human food safety need to be considered.

In this study, we investigate the presence of microplastics in seafood. To test the hypothesis that cultured bivalves contain microplastics, microplastic load of two widely farmed and commercially important species was determined: the mussel *Mytilus edulis* and the oyster *Crassostrea gigas*, with a global production of $2.1 \times 10^5$ tonnes and $6.6 \times 10^5$ tonnes in 2010, respectively. Any microplastic detected in these cultured animals is a particle that will end up in the human food chain. Therefore, results are discussed in the context of food safety.

Although it is now established that mussels and oysters contain microplastics, this is the first report so far on microplastics in foodstuffs. Currently, only a preliminary dietary exposure could be estimated. The hazard posed by microplastics needs to be established through in-depth toxicological studies. Due to a lack of dedicated studies, the complexity of estimating particle toxicity hinders a comprehensive assessment of the hazards associated with microplastics. Estimations of the potential risks for human health posed by microplastics in food stuffs is not possible.
Degradation of plastics: risks and chances

At the beginning, the talk distinguishes between polymers and plastics and introduces how long polymers are built from monomers during polymer synthesis.

After an overview on applications, in which plastics show a great benefit to the today’s society as long as they function, the loss of some of the functions due to aging of plastics is explained. Aging is a wide field and some of the aging mechanisms lead to chain degradation and depolymerisation, i.e. a fragmentation of the polymers to smaller chain lengths, which might get uncontrolled into the environment and might harm fauna and flora.

So called biodegradable plastics are designed in a way that their polymer chains can be attacked by specific bacteria and fungi. These settle on macroscopic parts, made of biodegradable plastics, and start a degradation of the polymer chains by means of specific enzymes. When the chains are short enough, they can be digested and the carbon and hydrogen atoms will be used by the microorganisms as energy source under production of CO₂, CH₄ and H₂O. In this contribution, an overview on these special plastics’ biodegradation in different environments (marine, fresh water, landfill, soil, compost) is given.
Mainly due to its bio-based and biodegradable character, PHA (polyhydroxyalkanoate) materials are gaining clear interests in the field of biopolymer materials. In this presentation a specific co-polymer of 3-hydroxybutyrate-co-3-hydroxyhexanoate, PHBH polymer, is described as produced by Kaneka Corporation (AONILEX®).

Kaneka’s Biopolymer AONILEX® is the first ever 100% plant-based and biodegradable polymer to offer flexibility in films, heat resistance in solid products, etc. While maintaining the key characteristics of polyolefin materials, the polymer can be converted to its compounds in a variable range from soft to hard. Moreover, the printability and heat-sealability are of high quality and suitable for biodegradable packaging.

AONILEX® holds OK Compost and OK Compost HOME certifications which guarantee degradation in an industrial and a home compost system. It also meets the ASTM D7081 which is the standard specification of marine degradation. These various biodegradabilities draw attention as low environmental load material. For example, AONILEX® is tested as microbeads for facial wash to decrease marine pollution.

The employed raw materials are biomasses such as plant oils, which are renewable resources. Through Kaneka’s fermentation technology, the polymers are accumulated in the bodies of microorganisms and further refined and extracted. PHBH based materials are generally converted by standard polymer moulding techniques such as injection moulding, blow moulding, etc. In addition, we would like to introduce several AONILEX® applications which contribute to create more environmental friendly society.
This is already the sixth edition of the world’s largest event on Wood-Plastic Composites (WPC), which attracts people from every sector of the industry. We expect more than 300 participants from over 20 countries. The range of topics that previously covered only WPC, will for the first time be expanded to also address natural fibre composites (NFC) and bio-based plastics as matrix for bio-composites.

**Market opportunities through intersectoral innovation in Wood and Natural Fibre Composites**

**We would like to welcome you to:**
- International two-day program, taking place in English
- World’s most comprehensive WPC exhibition
- Vote for The Wood and Natural Fibre Composite Award 2015
- Gala dinner and other excellent networking opportunities
When speaking of biotech start-ups, they are mostly associated by the public to dealing with biopharmaceuticals. This perception is supported by the fact that almost half of the German biotech companies are active in the field of pharmaceuticals, but only 10 percent are dealing with industrial biotech. However, global economic and ecological developments will increase the future importance of start-ups dealing with industrial biotech and (renewable) chemistry, especially when considering the finiteness of fossil resources and CO$_2$ reduction pressed forward by national and international regulations.

To catch up with this trend foreseen, big players and mid-sized organizations from the nutrition, chemistry, cosmetics and energy sectors are screening the markets for innovative start-ups in biotech and chemistry just in this moment. In times of a changing economic environment with bio-based, sustainable and resource-efficient processes gaining importance by the hour, these players are searching the markets for interdisciplinary innovations, mostly based on industrial biotech and renewable chemistry.

This talk gives an overview about the current situation of start-ups in biotech and chemistry. It will discuss the challenges of financing and the opportunities of HORIZION 2020 and other powerful tools to bring biotech and chemistry as well as SME and Big Player together.
START-UPS FROM THE NOVA INSTITUTE

Zuzana Cabejšková
ZAZA bottles

Refillable water bottles: combining sustainability and beauty

Fashion doesn’t have to be wasteful. Eco-friendly products shouldn’t be unfashionable. ZAZA is all about combining sustainable consumption with beauty and customization, so that customers find the eco-friendly alternative at least equally appealing as the regular offer. ZAZA Bottles are the world’s first biobased and customizable water bottles, which can be refilled over and over again. We believe that bottled water is unnecessary, wasteful and polluting. Tap water is much more sustainable, it’s cheaper, equally tasty and healthy. ZAZA Bottles underpin the benefits of tap water by packaging it into a heat-resistant and transparent biobased polymer. Our bottles are the only ones that customers can customize and change its design to match their taste and outfit.

www.zazabottles.com | www.zuzanacabejskova.com

Marcel van Berkel
GFBiochemicals Europe

Making levulinic acid happen

GFBiochemicals is the first company to produce levulinic acid at commercial scale directly from biomass. Its breakthrough process for market-competitive, biobased levulinic acid has significant potential to replace petroleum-based products in both chemicals and biofuels. Biobased levulinic acid is a platform chemical with value-added derivatives for existing processes at prices competitive with fossil-based alternatives. It is truly versatile. In chemicals, levulinic acid offers derivatives such as gamma-valerolactone (GVL), methyltetrahydrofuran, delta-amino levulinic acid and di-phenolic acid. This offers advantages for diverse markets including pharmaceuticals, agrochemicals, personal care, coatings & resins, plasticizers and more.

In biofuels, levulinic acid derivatives can be used to produce biodiesel and renewable jet fuel. Levulinic acid derivatives can also be used to produce fuel additives as well as gasoline components. A breakthrough process by GFBiochemicals allows for feedstock flexibility and is less impacted by weather and seasonal conditions. This allows for reliable supply at commercial scale to service new markets. GFBiochemicals’ process and application development commercializes levulinic acid derivatives for existing processes at competitive prices. With a commercial-scale plant that is the first of its kind and its own IP portfolio, GFBiochemicals is breaking new ground and enabling new market applications.
A new synthesis path towards highly pure long chain fatty acid esters of starch was developed. Derivatives obtained via this path are thermoplastic or even transparent-melting. They represent a completely biogenic and sustainable alternative to traditional synthetic hot melts. In the preparation process molten imidazole is acting not only as solvent, but also as a reagent and base. \(^1\) Thus the system is very simple, effective and leads to high conversion of the reagents up to 90\%. The derivatives are highly pure and well-defined. Starch esters with a broad variety of degree of substitution values from 0.9 to 3.0 can be prepared. This results in melting temperatures from 40 to 255°C. Besides the melting temperature other properties like viscosity, adhesive behavior, biodegradability and transparency can be tailored and therefore a custom-made hot melt can be synthesized.

Having proof of concept the challenge is, to take the technology further into products and to the market, be it as hot melt, as film or as coating\(^3\) for medical implants.


This presentation explains the development of protein extraction and hydrolysis processes with animal and plant materials, discusses different industrial applications and explores its potential markets. Protein-containing by-products from food processing industry provide the basis for production of high-quality supplements for chemical applications as well as biotechnological applications like the cultivation of microorganisms. The diverse functional properties of the materials have been tested as a base product or a component in chemical industries for the manufacturing of adhesives, surfactants, foams, polymers, coatings, films and packaging materials.

ANiMOX develops sustainable processes for the recovery of valuable natural materials from animal and vegetable protein-containing by-products and uses this technology for the production of customized protein materials, such as collagens, keratins and peptones, using our proprietary, innovative hydrothermal process.

Our patented process produces mixtures of peptides and amino acids with defined molecular size and a significant amount of reactive groups by extracting and hydrolysing renewable raw materials. We have already fully-developed application-specific process conditions for more than 100 different raw materials. This cost-effective process can be used industrially, and a pilot plant has been in operation since 2013.

www.animox.de
Dr.-Ing. Ralf Lach  
Polymer Service GmbH Merseburg  
Mechanical performance of biomaterial modified polymers

The field of business of the Polymer Service GmbH Merseburg (see www.psm-merseburg.de) established in 2001 involves industry-oriented research and development as well as engineering services on different business areas including “Polymer testing and diagnostics”.

Impact fracture behavior of polypropylene (PP)/wood fiber composites modified with maleated polypropylene as compatibilizer and poly(butadiene styrene) rubber as impact modifier has been studied by instrumented Charpy impact testing. Although the impact strength reflects toughening of the PP matrix of modified composites by using the impact modifier and the compatibilizer, analyses on the individual stages of the impact event, such as crack initiation and propagation, have been undertaken for deeper understanding of toughness behavior. While the crack initiation energy is mostly only little material-dependent and reflects the matrix behavior, the crack propagation energy is much more influenced by the morphology. From the plot of stiffness–toughness balance it can be summarized that the maleated PP/wood fiber composite combines pronounced enhancement in stiffness with sufficient toughness.

The mechanical behavior of composites resulting from melt-mixing of different amount of raw Ketuki fibers with thermoplastic polymers such as ethylene-1–octene copolymer (EOC) and PP were studied using tensile testing. For the EOC composites the rubbery nature of the matrix material remains still visible irrespective of the non-compatibility of the polymer matrix with filler.

Furthermore, the recording (depth-sensing) microindentation technique was applied to analyze the effect of filler (such as prawn shell chitosan, rice husk, microfibrillated cellulose or (carbonized) bamboo flour) on the multi-parametric mechanical performance of different biomaterial modified polymers based on epoxy resin or different thermoplastics such as polyvinyl alcohol, Ecoflex or copolyester.
START-UPS FROM CLIB2021

Steve Gotzen
Medical Adhesive Revolution GmbH
Revolutionizing wound care with biodegradable surgical adhesives

Today, many surgeons still suture or staple more than they would like to, as medical glues do not meet all their requirements. Based in Germany and the US, Medical Adhesive Revolution GmbH seeks to change the game, introducing a one-of-its-kind range of polyurethane based glues. The technology is unique, as it combines ease of use, strength, flexibility and biodegradability.

Two products are currently under development: As first, MAR-SKIN has been designed for dermal use, to close a board scope of topical wounds fast and reliable. Secondly, MAR-VIVO is envisaged for the use inside the body: either as an adhesive to seal areas of leakage or re-attach tissue or as a hemostat to stop (even arterial) bleeding.

Founded in 2013, the VC-backed start-up company acquired the patented technology, which has been developed since 2007. The Medical Adhesive Revolution GmbH pursues a strategy to bring this medical adhesive technology to market. Further, the company won the Rice Business Plan Competition in 2014, which is the world’s richest and largest graduate-level student startup competition.

It is the team’s vision to bring their wound sealants into every Emergency Room, to all cases of first aid applications to save lives, radically enhance surgical procedures, and improve patient comfort.

Dr. Wolfgang H. Schwarz
Technische Universität München
Novel enzyme complexes for the effective hydrolysis of plant biomass

The growing demand for a sustainable alternative to crude oil not competing with food supply has resulted in the obvious but so far elusive need for utilization of the abundantly available plant biomass. The hydrolysis of plant biomass delivers sugar, which then serves as a basis for bio-based fuels and chemicals. However, plant biomass consists of a stable and naturally resilient matrix of cellulose, hemicellulose and lignin. To date, no economically competitive technology to hydrolyze cellulose has been developed. Filling this gap, our product FasCiPlex is an engineered enzyme complex which converts cellulose to sugar. Currently
available cellulose degrading enzymes (cellulases) are mainly derived from the fungus Trichoderma, which has been intensively studied and developed for over 70 years. Major further improvements in Trichoderma-derived cellulases are not expected.

Our product FasCiPlex is based on the most effective cellulase in nature, the cellulase complex (cellulosome) of the anaerobic bacterium Clostridium thermocellum. The cellulosome connects all enzymes required for cellulose degradation in a complex, thereby enhancing enzymatic synergy. Tremendous research effort has already been spent on the characterization of the >70 native cellulosome components which are available as a toolbox for the in vitro assembly based on our proprietary HTS screening system. The prototype FasCiPlex already outperforms marketed fungal cellulases. Our future research will concentrate on FasCiPlex’s adaption to cellulose sources commonly used in the industry. By Q2 2015 we will have developed FasCiPlex 3.0, optimized to wheat straw.

START-UPS FROM IAR
IAR: Industries & Agro-Ressources

Guy Helin
Syngulon
Microbial fermentation technologies for bio-based products

As the field of synthetic biology develops, real-world applications are moving from ideas and laboratory-confined research towards industrial implementations. A pressing concern, with microbial systems, is that re-engineered microbes may escape and produce undesirable effects on the environment. To address this biosafety issue, multiple mechanisms for constraining microbial replication and horizontal gene transfer have been proposed. These include the use of host–construct dependencies such as selection using toxin–antitoxin pairs, conditional plasmid replication or the requirement for a specific metabolite to be present for bacterial function. A need for efficient genetic firewall design will be presented including new selection genetic circuit using bacteriocins gene platform.
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18 März 2015

Cotton Incorporated publiziert Markt- und aktuelle Preiseentwicklungen
USDA-Zahlen legen nahe, dass geringere Baumwollpreise im kommenden Jahr zu einer
größten Abnahme bei Anbau und Produktion führen werden

EPA pushes for cap on GMO corn plantings to defeat corn rootworm pesticide
resistance
Biotech seed manufacturers supposed to face substantial revenue losses

Biotech materials made simple – crystal structures altered by a single protein
Scientists in Haifa and Sarbrücken have been able to show that a single protein species is
each to produce specific effects on the formation of crystal structures.

Biotechnologische Produktion vereinfacht: Protein verändert Materialstrukturen
Forscher des INM und des Technion in Haifa konnten zeigen, dass ein einzelnes Protein genügt,
ur den Aufbau von Kristallen zu verändern

New products made from seaweed
Collaborative venture in the water sector to prepare a brief outline of the new form of
‘agriculture at sea’

Sappi to locate ground-breaking nanocellulose pilot plant at Brightlands Chemelot
Campus in the Netherlands
Company to proceed with a pilot-scale plant for low-cost Cellulose NanoFibrils production

Total investments in Renmatix – Takes equity and Board seat in Philadelphia based

» More than 15 years – more than
15,000 reports and news –
more than 5,000 companies

» Read bio-based news
every morning to start
your day with fresh ideas

» Send us your press release
in English or German – we
will disseminate for free
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» Advertise your company
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For the eighth year running the Innovation Award “Bio-based Material of the Year” will be awarded to the young, innovative bio-based material industry, finding suitable applications and markets for bio-based products. The competition focuses on new developments in these areas, which have had (or will have) a market launch in 2014 or 2015, coming from Europe and US this time round.

This year, six bio-based materials and products have been nominated for the Award by the advisory board – out of 24 submitted products. The nominated companies are from the United Kingdom, the United States and Germany.

In a short 10-minute presentation, each of the six companies will introduce its innovation. The three winners will be elected by the participants of the conference and awarded with the prize, sponsored by Coperion GmbH, at the dinner buffet.

Please find the winner after the conference here: www.biowerkstoff-kongress.de/award
Bayer MaterialScience AG

DESMODUR® eco N – First bio-based polyurethane crosslinker in the market for high performance automotive coatings: Polyisocyanate based on Pentamethylene Diisocyanate (PDI)

The limiting factor for bio-based polyurethanes has been the need for polyurethane crosslinkers based on renewable feedstock, since bio-based polyols solutions already exist. Bayer MaterialScience has taken up this challenge and developed DESMODUR® eco N: a new solvent-free aliphatic polyisocyanate and the first polyurethane crosslinker on the market with a significant renewable content that has not come at the expense of performance. This crosslinker is based on a new isocyanate, pentamethylene diisocyanate (PDI), 70 percent of whose carbon content comes from biomass. Furthermore it is produced using energy-efficient gas-phase technology, to assure minimum impact on the carbon footprint. This product enables the production of bio-based polyurethanes for high-performance automotive coatings.

EcoTechnilin Ltd

FibriRock 100% bio-sourced composite for aircraft applications comprising flax non-woven, basalt yarns and a sugar-based bioresin. Co-developed with TFC

FibriRock: a lightweight bio-sourced fast-curing composite with excellent FST performance. Certified for use in an airline galley cart, FibriRock combines a Nomex-type core with skins formed from flax, basalt and a sugar-based bioresin. There are three reasons why FibriRock is so special in the field of aerospace composites: the skins, which represent 87% of the material, are 100% biosourced; the fast processing times (150 seconds) are pretty exceptional in the field of aircraft composites where most sandwich-type materials take between 40 and 70 minutes to cure; and the low heat release rate figures (15 kWmin/m²) are three times lower than competitive materials enabling clients to use much cheaper films and decorative finishes. Hence FibriRock is taking EcoTechnilin to new heights!
Evonik Industries AG

100% bio-based high performance polyamide 12 based on palm kernel oil

Thanks to its specific properties, polyamide 12 is the material of choice for a wide range of high performance products in numerous applications. Examples are sophisticated liner systems for motor vehicles, large-volume pipes, e.g., in the oil and gas industry, medical catheters, or injection-molded parts.

The conventional production of polyamide 12 starts from petroleum based butadiene. This is transformed via multiple chemical process steps to the key monomer laurolactam. Now, the breakthrough alternative uses a one-step fermentation process starting from lauric acid methylester which is based on the renewable resource palm kernel oil. The resulting monomer 12-aminolauric acid is processed via established polymerization and compounding steps to polyamide 12 products with the same outstanding properties as the conventionally produced ones.

HIB Trim Part Solutions GmbH

Nature 50 – Natural fibre reinforced plastic (Hemp – PP) including a long fibre ratio > 50% for injection moulding

In the last years, many companies have developed natural fibre reinforced PP granulates – but the market success has been limited. Our new Nature 50 granulate is a completely new development with unique properties. Long hemp fibres (> 50%) are mixed with PP and additives in an innovative cold-press technology (no extruder). The granulate can then be extruded and injection moulded in serial moulding tools. The long hemp fibres give a unique design and a good Charpy impact property to the material – making it suitable for automotive parts. The weight reduction is between 18 and 20% in substitution of serial plastic PC ABS GF20. Also impact strength, shrinkage and heat expansion show attractive properties. As a pure injection moulding part, Nature 50 shows an extraordinary appearance due to the long fibres, which can be varied through colouring. Therefore the material offers a wide range of design options in- and outside of the automotive sector.
INVISTA S.a.r.l.
LYCRA® T 162R Fibre – Spandex yarn made using renewable butanediol as raw material with a lower CO₂ and fossil fuel emissions footprint

INVISTA, one of the world’s largest integrated producers of polymers and fibres, and owner of the LYCRA® brand, has introduced the only commercial offering of a bio-derived spandex available globally and for use in a wide variety of apparel fabrics and garments. Approximately 70% by weight of the new T 162R LYCRA® bio-derived spandex fibre comes from a renewable butanediol raw material source made from dextrose derived from corn. The use of a renewable feedstock in the making of this new LYCRA® bio-derived fibre results in a lower CO₂ and fossil fuel emissions footprint than spandex produced using traditional raw materials.

twoBEars GbR
bioFila – High performance PLA blends with outstanding optic and haptic properties for 3D printing

In 2009 the patent of Stratasys for 3D printing ended and opened the way for 3D printing for everybody. By now, printing files can be ordered on the internet from everywhere – therefore, the products do not travel around the world, but can be printed at home, offering a big potential for reducing global transport emissions. The market for 3D printing filaments is US$ 800 Mio. and is expected to grow tenfold in the next 10 years.

With the new developments, also new challenges appear: A lot of waste and prints with failures are produced by 3D printing with standard plastics such as ABS. The solution is PlaTec™, which is stronger than ABS, with its softening temperature of 120°C. PlaTec™ is biodegradable and is made out of renewable raw materials.
The BIO World Congress on Industrial Biotechnology is the largest international industrial biotech conference bringing together business executives, government officials, academic researchers and industry leaders.

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Booth No. 3
DIN CERTCO Gesellschaft für Konformitätsbewertung mbH

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Booth No. 4
GFBiochemicals Europe

GFBiochemicals produces biobased levulinic acid using a cutting-edge breakthrough process. With proprietary technology and a commercial-scale plant in Caserta, Italy, GFBiochemicals’ levulinic acid is the platform chemical with significant potential to replace petroleum-based products. Because market-competitive levulinic acid enables derivatives for existing processes in the chemical and biofuel sectors, versatile applications are now within reach. Samples are available now. GFBiochemicals offers in-house application development and is a global venture, funded and supported by private investors who are committed for the long-term.

Contact:
GFBiochemicals
Brightlands Chemelot Campus
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Marcel van Berkel
Chief Commercial Officer
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www.GFBiochemicals.com
Fraunhofer UMSICHT develops applied and custom-made solutions in the fields of environmental and process engineering, material and energy technology. Assuming a leading position Fraunhofer UMSICHT is committed to sustainable development, environmentally friendly technologies and innovative approaches designed to improve the standard of living and to promote the economies innovative capacity.

Fraunhofer UMSICHT is your competent partner in all phases of development and market introduction of bio-based materials. Based on our long-term scientific experience we create innovations: from the first project idea over the joint discussion of product requirements, the production of material samples to practical application tests.

**Services**
The department “Bio-based Plastics” is focused on polymer chemistry, material development, plastics processing, applications, and industrial scale-up of novel bioplastics. This topic comprises plastics derived from biomass as well as biodegradable plastics. Our equipment covers laboratory and testing facilities, kneaders and laboratory compounding extruders, and industrial plastics processing lines (e.g. compounding, extrusion, injection moulding). Additionally we assess products and value chains with respect to their sustainability.

**R+D Portfolio**
- Development of new bio-based monomers and plastics
- Material and product development
- Plastics processing development
- Small scale and pilot series manufacturing of plastics compounds and products
- Polymer analyses and material testing
- Certified testing of biodegradability of substances, materials and residues
- Market and feasibility studies, technological assessments
- Life Cycle Analysis (LCA), Carbon Footprint

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Exhibitors

Booth No. 6
Institut für Kunststofftechnik (IKT) – Universität Stuttgart

The Institut für Kunststofftechnik (IKT) at the University of Stuttgart is an R&D-institute, active on fields of material engineering, processing technology and product engineering. Besides the research on conventional plastics processing technologies and conventional applications, the development of improved bio-based compounds is a focus of the institute.

The IKT is a comprehensive R&D partner to develop new biobased compounds and to realize new biobased applications. A wide range of processing and characterization techniques under one umbrella enables the IKT to conduct fast and effective developments for the industry.

Service in the field of bioplastics
- Material development/Compounding (ZSK 18/25/26/40)
- Material characterization: Full range of chemical-, thermal-, rheological and mechanical characterization (accredited testing laboratory)
- Processing techniques: Extrusion (blown film and flat extrusion), injection moulding, injection moulding compounding, thermoforming, 3D printing

Current activities in the field of bioplastics
- Impact modification of different bioplastics by reactive extrusion
- Modification of PLA for foamextrusion
- Enzymatic modification of cellulose
- Development of biobased materials for the fused deposition modeling process (3D printing)
- Analysis of the degradation of bioplastics in marine habitat
- Welding of bioplastics blends and analysis of the weld line morphology

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KBBPPS and Open-Bio are both FP7 projects whose research revolves all around standardization of bio-based products.

KBBPPS started in 2012 and covers research on bio-based carbon content determination, biomass content methods not solely dependent on 14C-analysis as well as biodegradability and eco-toxicity test schemes. Also identification and resolution of functionality related bottlenecks for bio-based products are part of the research focus.

The goal in the end is developing, harmonising and validating test methodologies for a wide variety of bio-based products so that the results can be directly implemented into truly horizontal European standards.

Open-Bio started at the end of 2013 as a broader follow-up programme not only covering pre-standardization work. It comprises of a broader consortium consisting of the KBBPPS group and a number of new partners, bringing in expanded expertise. Open-Bio builds on the results of KBBPPS, refining them and developing further knowledge on implementation of the standardization result in relation to market development.

Open-Bio investigates how markets can be opened for bio-based products through standardization, labelling and procurement. Therefore, one focus is on the sustainability of the bio-based resources and potential testing methods for this criterion. The end-of-life research will be expanded to different biodegradation scenarios, composting and recyclability. Functionality testing will focus on the gaps identified by KBBPPS and on the special properties of bio-based products.

A new aspect is communication: Open-Bio will also investigate the needs and demands of consumer groups and develop a system that can provide the relevant information about bio-based products to make buying decisions easier for businesses, public procurement and private customers. Part of the project is also to conceptualize an Ecolabel that can be applied to bio-based products to strengthen consumer confidence and boost market demand.

More information can be found at [www.kbbpps.eu](http://www.kbbpps.eu) and at [www.open-bio.eu](http://www.open-bio.eu)

These projects are funded by the European Commission’s Seventh Framework Programme for Research and Technological Development under Grant Agreements n°KBBE/FP7EN/312060 & 613677

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Booth No. 9 & 19

Innovation Award “Bio-based Material of the Year 2015”

See page 41

Sponsor of the Innovation Award 2015 is:
Coperion GmbH

The Top 6 candidates have been nominated:

■ Bayer MaterialScience AG
  DESMODUR® eco N
■ EcoTechnilin Ltd
  FibriRock
■ Evonik Industries AG
  Polyamide 12
■ HIB Trim Part Solutions GmbH
  Nature 50
■ INVISTA S.a.r.l.
  LYCRA® T 162R Fibre
■ twoBEars GbR
  bioFila

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EIHA was originally founded as an association of the members of the European Hemp industry. Regular members include primary Hemp processors in the EU. Associate members may be associations, research organisations and companies and individuals working in the area of Hemp and other natural fibres. Founded in 2005, EIHA today has 9 regular and more than 72 associated members from 28 countries. EIHA was founded to give industry a voice at the European Commission in Brussels. It has rapidly become a respected industry association that provides effective lobbying and serves as an information bank.

The annual EIHA conference (www.eiha-conference.org/more than 150 participants from 30 countries) has become an attractive opportunity for members and visitors to meet, learn about developments and exchange views with their colleagues. The conference is the most important event on industrial Hemp – worldwide!

European Hemp Fibres are available for your bio-based products: Today, China, Canada and Europe are the main Hemp cultivation areas in the world. In 2010 the total cultivation area in the European Union was around 10,000 ha. These areas produce around 24,000 t Hemp fibres. All byproducts like shivs (woody part of the Hemp stem) and dust are used. Main countries for Hemp production are France, UK, Germany, The Netherlands and Poland. Hemp fibres, ready to use in your bio-based products are price competitive to other domestic and exotic fibres for technical applications. Different qualities are available.

European Hemp fibre is currently used mainly in technical applications like speciality paper (cigarette paper, technical filters), insulation material, natural fibre reinforced plastics (automotive, industrial and consumer goods), mulch and cultivation fleeces. Especially insulation and plastic reinforcement show promising market increases. Different options for feeding Hemp fibres in injection moulding processing are available today.

The EIHA Hemp processors produce on average each year between 10,000 and 15,000 tonnes of technical Hemp fibres. As Hemp is an annual crop this quantity can be easily increased according to demand.

Please find the Hemp processors for your demand on www.eiha.org

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Wood K plus is the research partner for companies in the fields of material research and process technology for wood and other renewable resources. More than 100 experts with various backgrounds develop solutions for the economy also in cooperation with further scientific partners. Wood K plus analyses in cooperation with the industrial partners the demand for innovation, organizes the demand in technological issues and identifies promising approaches to the problems that can be implemented in specific research projects. If necessary, Wood K plus also acts as project manager from project definition, preparation of applications for projects, integration of partners over processing to clearing and communication with sponsors. Within the framework of service agreement tests, feasibility studies, expert reports and business consultancy are provided.

Wood K plus has at its disposal a comprehensive laboratory and technical centre infrastructure. Each of the four locations (areas) developed its special fields of expertise. An additional research team deals with questions about Market Analyses & Innovation Research.

Area 1: Wood Chemistry & Biotechnology
Area 2: Wood Polymer Composites
Area 3: Wood and Paper Surface Technologies
Area 4: Wood Materials Technologies
Team Market Analyses & Innovation Research

Please have a look at our page in International Business Directory for Innovative Bio-based Materials (iBIB2014) too!

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Flemish Institute for Technological Research (VITO) & Flanders Investment & Trade

VITO, vision on technology
VITO (Flemish Institute for Technological Research) is a leading European independent research and consultancy centre in the areas of cleantech and sustainable development, elaborating solutions for the large societal challenges of today.

Sustainable chemistry, energy, health, materials management and land use: these are the five topics VITO focuses on. These topics have been set out in five research programmes. They offer an answer to the challenges that mankind and society are confronted with today and in the future. Each programme builds up a strong base of knowledge and skill, with added value for industry and society. The result is new and innovative research and a comprehensive range of scientific services.

In VITO’s five areas of expertise, a societal transition is taking place or is urgently needed. Smart grids, intensive re-use of resources, a bio-based economy, all these developments require new and better sustainable technologies, as well as a change in mindset. That’s why VITO is working hard on sustainability and transition thinking as binding factors between the five research programmes.

VITO supplies innovative and high-quality solutions, whereby large and small companies can gain a competitive advantage, and advises industry and governments on determining their policy for the future.

VITO has more than 700 highly-qualified employees from various specialisms and collaborates with sector federations and their research centres, universities and other European research institutes. In 2014 VITO has a total budget of about 135 million euros.

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Flanders Investment & Trade

What Flanders can do for your business …

Flanders Investment & Trade is the agency of the Government of Flanders, the northern region of Belgium, that provides expert confidential advice free of charge on all financial, technical and practical aspects involved in establishing or expanding operations in Flanders. In addition to personal assistance on major issues, we maintain a comprehensive database of up-to-date national, regional and local economic information.

We provide potential direct investors with both information on: Site selection in order to pinpoint the most favorable location for your operations; An overview of all benefits, grants and incentives; Decision-makers: Regional business networks and service suppliers as well as to academic, R&D and private sector consultants; Legal aspects of setting up locally; Business opportunities and Integration into local community life.

Follow us for hot news: www.twitter.com/InvestFlanders

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Booth No. 13
Roundtable on Sustainable Biomaterials

The Roundtable on Sustainable Biomaterials (RSB) is a globally acclaimed certification for bio-based products. RSB’s standard and certification system has been developed by farmers, companies, non-governmental organizations, experts, governments, and inter-governmental agencies. It is globally renowned as the most robust certification system for assuring the sustainability of bio-based products and is an EU approved voluntary sustainability scheme. Adapted to meet the needs of the emerging bio-economy, RSB certification applies to any bio-product derived from biomass including: bioplastics, cosmetics, biofuel, bioenergy, fibre and lubricants. For details of how to become certified and the tools to implement the RSB’s environmental, social and economic principles and criteria see [www.rsb.org](http://www.rsb.org).

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[www.rsb.org](http://www.rsb.org)

Booth No. 14
ANiMOX GmbH

ANiMOX is a biotechnology company, which develops new procedures for the processing of organic by-products for industrial supply. We extract mixtures of water-soluble peptides and amino acids from protein-containing animal and plant materials using our proprietary, innovative hydrothermal process and enzyme technologies. The produced protein hydrolysate has a defined molecular size and is produced and marketed under the proprietary name of ANiPeptTM. ANiMOX has already developed application-specific process conditions for more than 100 different raw materials. The process is fully developed and can be used industrially, and a pilot-scale plant went into operation in 2013.

The overall process has a positive ecological balance, as it leaves no non-recyclable waste. The technology is patented and licensable worldwide. This method obtains valuable products for use in different industrial sectors including chemical and biotechnological as well as the food and feed industries. For processors of protein-rich residues and by-products, we offer technical solutions for protein production.

The products generated from either animal or vegetable materials can be divided into three main product groups: protein derivatives, fats/oils and minerals (in some cases with high rates of phosphate).
ANiMOX focuses its product development on the preparation of protein derivatives and their user-friendly applications. Depending on the raw materials used for production, the products are applicable for either technical use or the food industry. The ANiMOX process is much more cost-effective and allows competitive pricing compared to commercially launched, imported products.

For technical applications, the protein hydrolysate ANiPept™ is usable as a water-soluble peptide and amino acid mixture with a significant amount of reactive groups. Its diverse functional properties have been tested as a base product or a component in chemical industries for the manufacturing of adhesives, surfactants, foams, polymers, coatings, films and packaging materials as well as biotechnological applications, especially the cultivation of microorganisms.

ANiMOX specializes in sustainable solutions for reprocessing animal and plant by-products and residual materials. ANiMOX uses state of the art technology to provide its customers with new opportunities for reutilization. Customer-provided raw materials are processed immediately in our technical center under specifically adapted hydrolysis conditions. We perform material flow analysis for all production batches and provide a detailed certificate of analysis with each product sample.

ANiMOX performs the following customizable services:

- Customer-specific development and contract research
- Processing of by-products and residual materials
- Evaporation and lyophilization of products
- Analysis of protein-containing by-products and residual materials by chemical analysis, FPLC, HPLC and GC
- Disintegration, homogenization, hydrolysis, extraction and separation of animal and plant by-products and residual materials from food and agriculture industry
- Evaporation of bio-organic samples under mild conditions
- Production of liquid and dry samples up to kilo scale

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The Federal Ministry of Education and Research – BMBF

The Federal Government pursues the aim of harnessing the power of research and innovation to facilitate a structural transition from an oil-based to a bio-based economy which will also offer great opportunities for growth and employment. The Government is providing funds of about 2.4 billion euros between 2011 and 2016 for the “National Research Strategy BioEconomy 2030”.

The research strategy sets five priorities:
- sustainable agricultural production
- industrial use of renewable resources
- global food security
- healthy and safe food
- biomass-based energy sources

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Ecotradex GmbH is a provider of efficient solutions to mechanical processing of biomass and biomaterials.

One of the bottlenecks in handling all kinds of biobased materials is to get the raw material in a processable form.

The ATREX device from company Megatrex has been on the market for over two decades. It offers a sustainable and reliable solution to mechanical processing. Crushing, disintegration, mixing, blending, dissolving, dispersing, grinding, refining, emulsifying, homogenizing and other mechanical treatment steps can be performed for all kinds of materials at a very low energy consumption.

Please, visit our stand No. 16 at the 8th International Conference on Bio-based Materials in Cologne on April 13–15, 2015 for more information on ATREX and other capital and energy efficient solutions that we offer for biomass and biomaterials processing:
www.ecotradex.com

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Exhibitors

Booth No. 17
Bio Base Europe Pilot Plant

Bio Base Europe Pilot Plant in Ghent (Belgium) is a flexible and diversified pilot plant for the development, scale-up and custom manufacturing of biobased processes and products. It operates at kilogram to multi ton scale and aims at closing the critical gap between scientific feasibility and industrial application of new biotechnological processes.

The Bio Base Europe Pilot Plant is a one-stop-shop that performs the entire value chain in a single plant, from the biomass green resource up to the final bioproduct. The pilot plant is equipped with state-of-the-art equipment to perform biomass pretreatment, biocatalysis, fermentation, green chemistry, product recovery and purification.

Bio Base Europe Pilot Plant focuses on conversion of biomass (a.o. agricultural crops and by-products, industrial side streams) into biochemicals, biomaterials, biofuels and other bioproducts.

The Pilot Plant is situated in the Port of Ghent in Belgium. It is an independent open innovation pilot plant and is accessible for companies and research institutions throughout the world.

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Booth No. 18
Sustainability Consult

Sustainability Consult is the leading bioeconomy communications and PR agency. Set up in 2008 by CEO Kathryn Sheridan, Sustainability Consult is based in Brussels, Belgium and operates internationally. We work with organisations to build their visibility through credible communications and stakeholder engagement.

Our biotech clients (past and present) include DSM, BASF, BioAmber, Reverdia, Solvay, Stora Enso, MetGen, AVA Biochem, GF Biochemicals, Capricorn Venture Partners, Roundtable on Sustainable Biomaterials (RSB), CelluComp, Biotech Campus Delft and Science Port Holland. We are present at the major bioeconomy international trade shows and conferences globally, including moderating, speaking and exhibiting, as well as representing our clients.

Sustainability Consult is a responsible business and a member of 1% for the Planet, donating 1% of sales to environmental non-profit Natuurpunt in Flanders, Belgium. CEO Kathryn Sheridan is the first European 1% for the Planet Ambassador.

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InfraServ GmbH & Co.
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See page 72

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NISCluster – Novel Ideas and Solutions
NISCluster is a unique concept that combines detailed knowledge of international forest biomass value chains with novel ideas on the bio-economy. The special asset of NISCluster is its global network of highly experienced international professionals, who have solid experience in assisting world-class companies, SMEs as well as public sector.

Keeping ideas fresh
Close collaboration with leading institutes keeps us up-to-date on the latest progress in the bio-refinery sector – even before any clear business development trends can be seen by investors.

Our way of working
NISCluster has hands-on experience of the major forest-based businesses. By continuously expanding our global forest biomass value chain network we always assure the highest quality of resources to serve our clients.

With evaluation services NISCluster can offer for the private and the public sector to evaluate business opportunities related to the forest sector including new and old product and service groups. It includes comprehensive value chain master plans to ensure sustainable management of the forest resources.

For investors and financiers NISCluster Ltd can provide second opinions about viability of proposed investments. With market and business strategy reviews NISCluster helps enterprises to focus on the most profitable businesses by applying the latest bio-refinery technology. The basis for the analysis and recommendations is laid on profound market and business knowledge and combined with latest product and manufacturing innovation know-how. The production is tailored up with the local circumstances.

NISCluster offers assistance to companies to strengthen their business planning from strategy creation and restructuring to actual implementation. Its services cover activities from acquisition target analysis up to integration process.

With development programs NISCluster is boosting novel applications of forest-based biomass to commercial use. NISCluster is engaged in development programs to enhance versatile use of wood. Development programs are based on the latest science and technology relevant to the forestry sector businesses.

We help our clients to built their forest-based businesses on a basis, which is technically, financially and socially sustainable and respects the nature, which in any case is the ultimate resource manager.

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Exhibitors

Booth No. 26
Invista S.a.r.l.  

About bio-sourced LYCRA® fibre
INVISTA, one of the world’s largest integrated producers of polymers and fibers, and owner of the LYCRA® brand, introduces the only commercial offering of a bio-derived spandex available globally and for use in a wide variety of apparel fabrics and garments. Approximately 70% by weight of the new LYCRA® bio-derived spandex fiber comes from a renewable source made from dextrose derived from corn. The use of a renewable feedstock in the making of this new LYCRA® bio-derived fiber results in a lower CO₂ emissions footprint than spandex produced using traditional raw materials.

With this new LYCRA® brand offering, INVISTA is providing retailers and manufacturers of stretch fabrics a spandex fiber option that can impact the overall lifecycle analysis of the fabric and garment. The new fiber is made to INVISTA’s high standards and specifications. Therefore, INVISTA does not anticipate a need to re-engineer fabrics and finishing processes, or garment patterns.

About INVISTA
With leading brands including LYCRA®, COOLMAX®, CORDURA®, STAINMASTER® and ANTRON®, INVISTA is one of the world’s largest integrated producers of chemical intermediates, polymers and fibers. The company’s advantaged technologies for nylon, spandex and polyester are used to produce clothing, carpet, car parts and countless other everyday products. Headquartered in the United States, INVISTA operates in more than 20 countries and has about 10,000 employees. For more information, visit INVISTA.com, Facebook.com/INVISTAglobal and Twitter.com/INVISTA.

Information about our Planet Agenda can be found at www.invista.com/en/commitments-and-goals/planet-agenda.html

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Exhibitors

Booth No. 27 & 28
Tabletop space for nova-Institute and media partners

Display of trade magazines and leaflets.

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There is very little fertile land that can be converted into agricultural areas. This clearly shows that a rapid expansion of biofuels cannot happen… However, biomaterials can become a sustainable and important resource, also in terms of replacing many fossil fuel derivatives such as plastics.

(Johan Rockström)
MICROPLASTIC IN THE ENVIRONMENT
Sources, Impacts & Solutions

23-24 November 2015
Maternushaus, Cologne, Germany

++ 150 international participants expected ++
++ 15% early bird discount till end of May ++

Organiser
www.microplastic-conference.eu
Scientific studies have shown that plastics greatly contribute to the littering of oceans. In marine protection, plastic particles with a diameter smaller than 5 mm are referred to as microplastics. These can be secondary fragments created by the breaking up of larger pieces of plastic such as packaging materials, or fibres that are washed out of textiles. They can also be primary plastic particles produced in microscopic sizes. These include granulates used in cosmetics, washing powders, cleaning agents or in other applications.

The microplastic conference will:
• Identify sources of microplastics and quantify the amount ending up in nature
• Reveal impacts on marine ecosystems and human beings
• Propose solutions for current problems, such as prevention, recycling and bio-polymers

The conference will provide plenty of scope for discussion between producers, consumers, scientists, environmental organisations, governmental agencies and other interested stakeholders.

If you want to contribute as a speaker or like to become a partner/media partner of this conference please get in contact with the nova team!

Further information at:
www.microplastic-conference.eu
Coperion GmbH

Integrated system solutions – unique process engineering know-how – global presence
In Coperion you have a partner on hand to provide the solution to every compounding task. This ranges from special applications on laboratory scale to industrial-scale production extruders. As pioneers in the development of the closely intermeshing, co-rotating twin screw extruder, we have unique expertise and experience in this field. Since the 1950s, Coperion has continued to set new standards in processing machinery and plant design for compounding technology. We plan and implement compounding systems for the plastics, chemicals and food industries which are designed precisely to our customers’ applications. Over 10,000 compounding systems delivered all over the world are proof of our unique system and process competence.

Processing of biobased and biodegradable products
Processing of biobased and biodegradable products makes very high demands on the compounding process because of the variety of possible base polymers and the great differences in the formulation mixtures. Every process step in a processing plant must be adapted exactly to the desired mechanical properties of the end product.
We have built up a comprehensive know-how for the processing of biobased and biodegradable products. Our specialists benefit from our years of experience in the fields of cooking extrusion and plastic compounding which we gathered under our former name Werner & Pfleiderer.
Our twin screw extruders are the heart of the processing plants. The modular structure of the process section enables individual configuration to every application so that optimal product

Twin screw extruder ZSK Mc18 with specific torque of 18 Nm/cm³
qualities are achieved. Apart from the extruder, we also provide the entire plant periphery from the raw material feeding to pelletizing and drying of the pellets. Alternatively, it is possible to produce biobased and biodegradable products by direct extrusion.

**Typical applications for the processing of biodegradable products**
- Starch-based loose fill
- Thermoplastic starch
- Polylactic acid (PLA), PVOH, synthetic copolyester, PBS, PHA, PCL, CA
- Compounds of immiscible polymers/biomaterials
- Pelletizing of PLA, polymerization of PLA

Compounding plant for the production of WPC wood plastic composites

Typical plant structure for the production of biobased and biodegradable products
Processing of WPC wood plastic composites

Our twin screw extruders have proven themselves successfully on the market for the production of WPC wood plastic composites for many years. As a long-standing partner to the wood fiber industry, Coperion is well-known for its extensive process and system know-how with every process step of the compounding plants adapted individually to the application: from filling and reinforcement to devolatilization. Coperion implements solutions for the production of WPC wood plastic composites which are custom designed for your individual application – from the laboratory twin screw extruder to the industrial production plant in modular design.

Typical applications for the processing of wood plastic composites

- Filling and reinforcement with wood
- Filling and reinforcement with natural fibers such as flax, hemp, cellulose
- Compounding for injection molding applications
- Profile extrusion with WPC profiles

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Industrial Biotechnology is the first and longest-running peer-reviewed publication to report the science, business, and policy developments of the emerging global bioeconomy.

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The idea of producing chemical building blocks with the help of biotechnology is becoming more and more appealing to a majority of players in the chemical industry in Europe. The dynamic European market is the ideal basis for the commercialization of your bio-based chemicals due to the large amount of available renewable feedstock as well as a fast growing number of potential bio-based applications.

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Your good product idea is a sound start. Yet to actually get this idea onto the market you need the appropriate production process. InfraServ Knapsack develops these processes for and with customers once the basic producibility of the product and its general specifications have been determined.

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Every product, every company and every site has its own requirements when it comes to processes and plants. Satisfying these requirements calls for customised planning and development processes at every stage. InfraServ Knapsack places particular emphasis on the engineering of individual plants – from process development and conceptual design to basic and detailed engineering, regardless of whether we just carry out sub-services or take over the general planning for every stage.

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We set a fundamental course early on in the planning process using process development and conceptual design. Thanks to a broad range of diverse engineering fields and an extensive selection of methods, we can guarantee the very highest degree of flexibility with regard to content.

Scale-up platform
The Chemiepark Knapsack near Cologne in Germany also offers companies a scale-up platform and access to know-how for bio-based production and integration into existing value-chains. The innovative capacity of the Chemiepark Knapsack, qualified skilled workers, solid infrastructure, plug & play services, as well as less bureaucracy and red tape all offer huge benefits for your company to commercialize your product.
Thinking in Terms of Solutions

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When planning a new chemical facility or optimizing an existing one a lot depends on the particular way of thinking: Only those who think in terms of real solutions can act in a target oriented process. This is our strength – thinking in terms of solutions! We advise and work side by side with you in our capacity as an established industrial partner from the outset – seeing things with your eyes and delivering suitable solutions. After the process development or plant planning phase, we see you through conceptual design and basic engineering right up to commissioning and gladly even more.

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BCNP Consultants GmbH

Technology and Markets
BCNP Consultants GmbH is an acknowledged consulting company specialized in the branches biotech, chemistry, nanotech and pharma (BCNP). Holger Bengs is its managing director. He founded the company in 2002 on the basis of nine years of professional experience in the chemical and pharmaceutical industry as well as in the capital market.

Multidisciplinarity
BCNP clients benefit from the very broad basis of natural scientific expertise of its consultants in the disciplines inorganic chemistry, biochemistry, biology, biotechnology, molecular biology, polymer chemistry and business chemistry. The team is completed by an experienced finance expert and a specialist for international marketing and branding.

Clients
BCNP consultants understand the technical, financial and market needs of their clients. The spectrum of clients ranges from university or research organisation based scientists, small and medium-sized corporations to big publicly traded companies as well as non-governmental organisations and foundations.

We advise and support foreign companies on their market entry in Germany, i.e. search for cooperation partners in industry and university, search for suitable sites, foundation of German subsidiaries, financing and funding, cultural coaching, and business development.

Networks
BCNP is very well connected to experts and decision makers in various industries. This is supported by manifold memberships, e.g. in BIO Deutschland, VBU (Association of German Biotechnology Companies), DECHEMA (German Society for Chemical Engineering and Biotechnology), EAPB (European Association of Pharma Biotechnology), European Federation of Biotechnology (EFB), DV Nano (German Nanotechnology Association), ACS (American Chemical Society), RSC (Royal Society of Chemistry), Gesellschaft Deutscher Chemiker (German Chemical Society, GDCh), Gesundheitswirtschaft Rhein-Main, biosaxony, CLIB2021 and the Swiss-German Business Club.

References
Since 2007, BCNP has been advising the capital market specialist GoingPublic Media AG on the scientific issues biotechnology, industrial biotechnology and personalised medicine published as special editions of Germany’s GoingPublic and Venture Capital Magazine.
Since 2010, BCNP has been authorized by the Federal Ministry of Economics and Technology (BMWi) in the program BMWi-Innovationsgutscheine (go-Inno) and can help German companies in implementing innovative technologies (funding rate of 50%).

Since 2013, BCNP has been contributing in the project “Bringing innovative industrial biotechnology research to the market” (IB2Market, 7th European Union’s Research Framework Programme). BCNP is part of a multinational team (Belgium, Germany, England and Italy) and responsible for business cases and business plans.

Locations
BCNP is headquartered in Frankfurt am Main. BCNP has additional offices in Berlin and Cologne.

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CLIB2021

CLIB2021 is an “Open Innovation Cluster” for bioeconomy with focus on industrial biotechnology. Our 90 cluster members recruit from academia, finance, industry, and SME, with an international share of about 35%. The CLIB Graduate Cluster ensures qualification of young scientists in key areas of industrial biotechnology. The same scientific areas are also addressed by our Technology Cluster.

We help our members and partners to network along bioeconomy value chains in the chemicals and energy markets. Identification of unusual value chains within the bioeconomy is a major task of our cluster. We reveal joint interests of stakeholders, moderate a targeted partnering, and create implementation plans including funding scenarios. However, the partners themselves are in charge of implementation and commercialization. In European Union as well as in its international network our cluster serves as initiator, coordinator, and multiplicator to push the bioeconomy.

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The Federal Government pursues the aim of harnessing the power of research and innovation to facilitate a structural transition from an oil-based to a bio-based economy which will also offer great opportunities for growth and employment. The Government is providing funds of about 2.4 billion euros between 2011 and 2016 for the “National Research Strategy BioEconomy 2030”.

The research strategy sets five priorities:
- sustainable agricultural production
- industrial use of renewable resources
- global food security
- healthy and safe food
- biomass-based energy sources

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IAR Cluster

IAR Cluster aims at valuing vegetal innovation for concrete industrial applications, based on agricultural production and the vegetal biomass. The purpose is to conceive different and sustainable bio-based products and materials. From the idea to the development, searching financing, IAR Cluster supports project leaders, whatever the size of their organization or company. Projects lean on the model of biorefinery. IAR gathers near 300 members from the whole field of biorefinery. IAR Cluster has developed Agrobiobase, the website showcase of bio-based products (www.agrobiobase.com). Covering all type of applications (construction, cosmetics, transport, chemistry, coating etc.), Agrobiobase provides detailed information about bio-based products, such as bio-based origin, environmental benefits, physical data, etc. The website enhances connection between potential customers and providers, by facilitating the search of bio-based products.

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3N Centre of Experts Lower Saxony Network for Renewable Resources e. V.

The centre of experts 3N has the objective of supporting and furthering the development and use of marketable products, production processes and services in the field of bio energy and renewable raw materials. The key activities are arranged along the value creation chain of the resulting products, from cultivation through processing up to marketing.

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ASSOBIOTEC

Set up in October 1986 within the Italian Federation of the Chemical Industry (Federchimica), Assobiotec is the Italian Association for the Development of Biotechnology, representing more than 140 companies and science & technology parks operating in Italy and involved in various biotech-related fields – pharmaceuticals, diagnostics, agro-food, fine chemicals, environment, processing industry and equipment.

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AVK – Industrievereinigung Verstärkte Kunststoffe e. V.

The AVK is the oldest interest group representing the plastics industry in Germany. The AVK currently has over 220 member companies and is therefore one of the largest associations in the European composites sector. It represents members along the entire value-added chain in the area of reinforced plastics.

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BIO.NRW – Busyness for Biotech

North Rhine-Westphalia’s biotechnology cluster BIO.NRW is a central catalyst for the sustainable development of the state’s biotech sector. It activates cooperation between business, research, investors and policy-makers. The cluster also promotes the strengths and achievements of biotechnology in the state: industrial biotechnology and pharmaceutical biotechnology.

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BIO – Biotechnology Industry Organization

The Biotechnology Industry Organization (BIO) is the world’s largest biotechnology trade association. We provide advocacy, business development, and communications services for more than 1,100 members worldwide. We promote the use of industrial enzymes, conversion of biomass to energy and chemicals, and innovative clean up technologies. BIO hosts the World Congress on Industrial Biotechnology, which will be held July 19–22, 2015 in Montréal Canada.

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C.A.R.M.E.N. e. V.
The institution for renewables and resource economics

C.A.R.M.E.N. e.V. (Central Agricultural Raw Materials Marketing- and Energy-Network), founded in July 1992, is a non-profit organisation working in the field of biomass, renewable energies and economics. Since 2001 it has been part of the Competence Centre for Renewable Raw Materials in Straubing.

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CLIB2021 is an “Open Innovation Cluster” for bioeconomy with focus on industrial biotechnology. Our 100 cluster members recruit from academia, finance, industry, and SME, with an international share of about 30%. The CLIB Graduate Cluster ensures qualification of young scientists in key areas of industrial biotechnology.

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Deutsche Industrievereinigung Biotechnologie (DIB)

The German Association of Biotechnology Industries (DIB) is the biotechnology arm of the Association of the German Chemical Industry Association (VCI), the VCI sector groups and the VCI sector associations. DIB represents the political-economic interests of companies using biotechnological methods. Goals of DIB are sustainable growth and the international competitiveness of biotechnology in Germany. DIB is a member of the European biotechnology association EuropaBio and on the EuropaBio board.

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European Bioplastics e.V.

Founded in Germany in 1993 as IBAW, European Bioplastics today represents the interests of around 70 member companies throughout the European Union. With members from the agricultural feedstock, chemical and plastics industries, as well as industrial users and recycling companies, European Bioplastics serves as both a contact platform and catalyst for advancing the objectives of the growing bioplastics industry.

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**Fachagentur Nachwachsende Rohstoffe (FNR)**

The Fachagentur Nachwachsende Rohstoffe e.V. (FNR) is promoting the use of agricultural and forest resources on behalf of the Federal Ministry of Food and Agriculture (BMEL). FNR is the central coordinating agency in Germany for the funding of research, development and demonstration projects.

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**IAR Cluster**

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Industrielle Biotechnologie Bayern Netzwerk GmbH (IBB Netzwerk GmbH) is an organization focusing on transforming valuable scientific knowledge to innovative marketable products and technological processes in the area of Industrial Biotechnology. One of the main tasks of IBB Netzwerk GmbH is the management and coordination of the network IBB. Within this network, the competences and the potentials of big industry, small and medium enterprises, academic institutions and associations are combined and mobilized to deploy as well as to expand Industrial Biotechnology.

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kunststoffland NRW e.V.
A Strong Partner in the Plastics Industry

The association kunststoffland NRW was established in 2006 and organizes the entire plastics value chain in North Rhine-Westphalia. kunststoffland NRW was founded to create a network for all players along the total value creation chain. It has more than 120 members from industry and science including companies producing plastics, companies in the plastics machinery field and medium sized companies in plastics processing.

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Materials Science and Engineering Expert Committee (MatSEEC)

MatSEEC is an independent temporary science-based committee of over 20 experts active in materials science and its applications, materials engineering and technologies and related fields of science and research management. The aim of MatSEEC is to enhance the visibility and value of materials science and engineering in Europe, to help define new strategic goals and evaluate options and perspectives covering all aspects of the field.

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Roundtable on Sustainable Biomaterials (RSB)

The Roundtable on Sustainable Biomaterials (RSB) is a globally acclaimed certification for bio-based products. RSB’s standard and certification system has been developed by farmers, companies, non-governmental organizations, experts, governments, and inter-governmental agencies.

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VHI – The Association
Association of the German Wood-Based Panel Industries

As an industrial association, VHI represents the professional, economic and technical interests of the manufacturers of particleboards, MDF, and OSB as well as plywood, WPC and internal doors.

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20–21 May 2015
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Conference language: English

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- Hemp Food and Feed Industry
- Cultivation Consultants
- Engineers
- Traders and Investors
- Research and Development

Bio-based polymers – Production capacity will triple from 5.2 million tonnes in 2013 to 17 million tonnes in 2020, representing a bio-based share of 2% of overall polymer production in 2013 and 4% in 2020.

Authors: Florence Aeschelmann and Michael Carus

Bio-based drop-in PET and the new polymers PLA and PHA show the fastest rates of market growth. The lion’s share of capital investment is expected to take place in Asia.

Two years after the first market study was released, Germany’s nova-Institute is publishing a complete update of the most comprehensive market study of bio-based polymers ever made. This update will expand the market study’s range, including bio-based building blocks as precursor of bio-based polymers.

The nova-Institute carried out this study in collaboration with renowned international experts from the field of bio-based building blocks and polymers. The study investigates every kind of bio-based polymer and, for the first time, several major building blocks produced around the world.
Share of bio-based polymers in the total polymer market

Rather than simply listing the usual structural polymers, Figure 1 gives an overview of all kinds of polymers, including rubber products, man-made fibres and functional polymers. This figure includes bio-based shares at different levels. The bio-based share for structural polymers, which are the focus of the study, is 2%. For polymers overall, however, the bio-based share is even higher (8.3%) because of the higher bio-based shares in rubber (natural rubber) and man-made fibres (mainly cellulosic fibres). In 2011, these shares were 1.5% and 8.2% respectively. The bio-based share is clearly growing at a faster rate than that of the global polymer market.

This study focuses exclusively on bio-based building block and polymer producers, and the market data therefore does not cover the bio-based plastics branch. We must clearly differentiate between these two terms. A polymer is a chemical compound consisting of repeating structural units (monomers) synthesized through a polymerization or fermentation process, whereas a plastic material constitutes a blend of one or more polymers and additives.

### Table 1: Bio-based polymers, short names, current bio-based carbon content, producing companies with locations and production capacities in 2013

<table>
<thead>
<tr>
<th>BIO-BASED POLYMERS</th>
<th>CURRENT BIO-BASED CARBON CONTENT</th>
<th>PRODUCING COMPANIES IN 2013 AND UNTIL 2020</th>
<th>LOCATIONS IN 2013 AND UNTIL 2020</th>
<th>PRODUCTION CAPACITIES IN 2013 (TONNES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose acetate</td>
<td>CA 50%</td>
<td>17</td>
<td>20</td>
<td>850,000</td>
</tr>
<tr>
<td>Epoxies</td>
<td>– 30%</td>
<td>–</td>
<td>–</td>
<td>1,210,000</td>
</tr>
<tr>
<td>Ethylene propylene diene monomer rubber</td>
<td>EPDM 50% to 70%</td>
<td>1</td>
<td>1</td>
<td>45,000</td>
</tr>
<tr>
<td>Polyamides</td>
<td>PA 40% to 100%</td>
<td>9</td>
<td>11</td>
<td>85,000</td>
</tr>
<tr>
<td>Poly(butylene adipate-co-terephthalate)</td>
<td>PBAT Up to 50%**</td>
<td>4</td>
<td>5</td>
<td>75,000</td>
</tr>
<tr>
<td>Polybutylene succinate</td>
<td>PBS Up to 100%**</td>
<td>10</td>
<td>11</td>
<td>100,000</td>
</tr>
<tr>
<td>Polyethylene</td>
<td>PE 100%</td>
<td>1</td>
<td>1</td>
<td>200,000</td>
</tr>
<tr>
<td>Polyethylene terephthalate</td>
<td>PET 20%</td>
<td>5</td>
<td>5</td>
<td>600,000</td>
</tr>
<tr>
<td>Polyhydroxyalkanoates</td>
<td>PHA 100%</td>
<td>14</td>
<td>16</td>
<td>32,000</td>
</tr>
<tr>
<td>Polylactic acid</td>
<td>PLA 100%</td>
<td>28</td>
<td>34</td>
<td>195,000</td>
</tr>
<tr>
<td>Polytrimethylene terephthalate</td>
<td>PTT 27%</td>
<td>1</td>
<td>2</td>
<td>110,000</td>
</tr>
<tr>
<td>Polyurethanes</td>
<td>PUR 10% to 100%</td>
<td>7</td>
<td>7</td>
<td>1,200,000</td>
</tr>
<tr>
<td>Starch Blends***</td>
<td>– 25% to 100%</td>
<td>15</td>
<td>16</td>
<td>430,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>112</td>
<td>129</td>
<td>5,132,000</td>
</tr>
</tbody>
</table>

* Bio-based carbon content: fraction of carbon derived from biomass in a product (EN 16575 Bio-based products – Vocabulary)
** Currently still mostly fossil-based with existing drop-in solutions and a steady upward trend
*** Starch in plastic compound

Table 1 gives an overview on the covered bio-based polymers and the producing companies with their locations and production capacities in 2013.

### Bio-based polymers

In 2014, for the first time, the association “European Bioplastics” used nova-Institute’s market study as its main data source for their recently published market data. For European Bioplastics’s selection of bio-based polymers, which differs from nova-Institute’s selection, bio-based polymers production capacities are projected to grow by more than 400% by 2018.¹

The graph in Figure 2 shows European Bioplastics’s growth projection of bio-based polymers production; by 2018, these could grow by over 400%, or from 1.6 million tonnes in 2013 to 6.7 million tonnes in 2018 in absolute terms. The market is clearly dominated by bio-based and non-biodegradable polymers. Drop-in bio-based polymers such as polyethylene terephthalate (PET) and polyethylene (PE) lead this category. European Bioplastics uses plastic as a synonym for polymer.

European Bioplastics’s selection of bio-based polymers and time span differ from nova-Institute’s. nova-Institute decided to cover further bio-based polymers by including bio-based thermosets (epoxies, polyurethanes (PUR) and ethylene propylene diene monomer rubber (EPDM)) and cellulose acetate until 2020. Figure 3 shows the main results of nova-Institute’s survey. Production capacity of bio-based polymers will triple from 5.2 million tonnes in 2013 to nearly 17 million tonnes by 2020. The production capacity for bio-based polymers boasts very impressive development and annual growth rates, with a compound annual growth rate (CAGR) of almost 20% in comparison to petrochemical polymers, which have a CAGR between 3–4%. Due to their broader scope, nova-Institute’s projected production capacities are much higher than those projected by European Bioplastics.

The 5.2 million tonnes represent a 2% share of overall structural polymer production at 256 million tonnes in 2013. This bio-based share of overall polymer production has been growing over the years: it was 1.5% in 2011 (3.5 million tonnes bio-based for a global production of 235 million tonnes). With an expected total polymer production of about 400 million tonnes in 2020, the bio-based share should increase from 2% in 2013 to more than 4% in 2020, meaning that bio-based production capacity will grow faster than overall production.

The most dynamic development is foreseen for drop-in bio-based polymers, but this is closely followed by new bio-based polymers. Drop-in bio-based polymers are chemically identical to their petrochemical counterparts but at least partially derived from biomass. This group is spearheaded by partly bio-based PET, whose production capacity was around 600,000 tonnes in 2013 and is projected to reach about 7 million

![Global production capacities of bioplastics](Image)
Bio-based Building Blocks and Polymers Market Study

Bio-based Building Blocks and Polymers Market Study

For the first time, the production capacities of some major building blocks have been reported in the market study. The total production capacity of the bio-based building blocks reviewed in this study was 2 million tonnes in 2013 and is expected to reach 4.4 million tonnes in 2020, which means a CAGR of almost 12%. Contrary to bio-based polymers, most of which are still partly bio-based, bio-based building blocks are 100% bio-based. This explains why the total production capacity of bio-based building blocks is considerably lower than the total production capacity of bio-based polymers. On the other hand, we are currently witnessing the development of integrated biorefinery facilities.

Detailed information on the development of bio-based PET and PLA and other polymers can be found in the full report.

Figure 3: Bio-based polymers: Evolution of worldwide production capacities from 2011 to 2020

Bio-based building blocks as a precursor of polymers

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that produce both bio-based building blocks and polymers. This makes tracking production capacities a little more complicated. The most dynamic developments are spearheaded by succinic acid and 1,4-butanediol (1,4-BDO), with monoethylene glycol (MEG) as a distant runner-up. Figure 4 shows the evolution of worldwide production capacities for some major building blocks.

Bio-based MEG, L-lactic acid (L-LA), ethylene and epichlorohydrin are relatively well established on the market. These bio-based building blocks cover most of the total production capacity. They are expected to keep on growing, especially bio-based MEG and ethylene, whereas L-LA and epichlorohydrin are projected to grow at lower rate. However, the most dynamic developments are spearheaded by succinic acid and 1,4-BDO. Both are brand new drop-in bio-based building blocks on the market. The first facilities are currently running and more will be built in the coming years.

Detailed information on the development of bio-based building blocks can be found in the full report.

**Investment by region**

Most investment in new bio-based polymer capacities will take place in Asia because of better access to feedstock and a favourable political framework. Figures 5 and 6 show the 2013 and 2018 global production capacities for bio-based building blocks.

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**Figure 4:** Selected bio-based building blocks: Evolution of worldwide production capacities from 2011 to 2020

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D-LA 2,5 FDCA 2,3-BDO Lactide 1,3-PDO 1,4-BDO Succinic acid Epichlorohydrin Ethylene L-LA MEG 1,4-BDO 1,3-PDO 2,3-BDO 2,5 FDCA D-LA

Full study available at www.bio-based.eu/markets
bio-based polymers repartitioned by region. European Bioplastics published these market data, which take into account fewer types of bio-based polymers than nova-Institute. Due to the complexity of the manufacturing value chain structure of epoxies, PUR and cellulose acetate, the repartitions by region cannot be reliably determined for all bio-based polymers. As a result, a graph representing the repartition by region with nova-Institute’s scope is not provided in the report, but only for the subgroup selected by European Bioplastics.

Europe’s share is projected to decrease from 17.3% to 7.6%, and North America’s share is set to fall from 18.4% to 4.3%, whereas Asia’s is predicted to increase from 51.4% to 75.8%. South America is likely to remain constant with a share at around 12%. In other words, world market shares are expected to shift dramatically. Asia is predicted to experience most of the developments in the field of bio-based building block and polymer production, while Europe and North America are slated to lose more than a half and just over three quarters of their shares, respectively.

Market segments

The packaging industry consumes most petro-based polymers. For bio-based polymers, the same trend can be observed: the major part of this as rigid packaging (bottles for example) and the rest as flexible packaging (films for example). These uses cannot come as a surprise, since bio-based PET is one of the biggest bio-based polymers in terms of capacity and is mostly used for the production of bottles. On the other hand, the packaging industry has a considerable interest in biodegradability since packaging is only needed for short times but in big quantities, which contributes to the accumulation of waste. It should be understood that not all bio-based polymers are biodegradable but some important ones are, e.g. PHA, PLA and starch blends. This feature is also interesting for agriculture and horticulture applications (mulch films for example). However, bio-based polymers are also used in many different other market segments. Figure 7 shows the worldwide shares of bio-based polymers production in different market segments in 2013 and 2020 for nova-Institute’s scope of bio-based polymers (with thermosets and cellulose acetate).
Content of the full report
This report presents the findings of nova-Institute’s market study, which is made up of three parts: “market data”, “trend reports” and “company profiles”.

The “market data” section presents market data about total production and capacities and the main application fields for selected bio-based polymers worldwide (status quo in 2013, trends and investments towards 2020). Due to the lack of 100% reliable market data about some polymers, which is mainly due to the complexity of their manufacturing value chain structure (namely thermosets and cellulose acetate) or their pre-commercial stage (CO₂-based polymers), this section contains three independent articles by experts in the field who present and discuss their views on current and potential market development. However, this part not only covers bio-based polymers, but also investigates the current bio-based building block platforms.

The “trend reports” section contains a total of eleven independent articles by leading experts in the field of bio-based polymers. These trend reports cover in detail every recent issue in the worldwide bio-based polymer market.

The final “company profiles” section includes company profiles with specific data including locations, bio-based polymers, feedstocks and production capacities (actual data for 2011 and 2013 and forecasts for 2020). The profiles also encompass basic information on the companies (joint ventures, partnerships, technology and bio-based products). A company index by polymers, with list of acronyms, follows.
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For the 4th year in a row, the nova-Institute will organize the conference „Carbon Dioxide as Feedstock for Chemistry and Polymers“ on 29 - 30 September 2015 in the “Haus der Technik” in Essen, Germany. CO$_2$ as chemical feedstock is a big challenge and chance for sustainable chemistry. Over the last few years, the rise of this topic has developed from several research projects and industrial applications to become more and more dynamic, especially in the fields of solar fuels (power-to-fuel, power-to-gas) – but also in CO$_2$-based chemicals and polymers.

Several players are very active and will showcase some enhanced and also new applications using carbon dioxide as feedstock. The conference will be the biggest event on Carbon Capture and Utilization (CCU) in 2015.

Attending this conference will be invaluable for businessmen and academics who wish to get a full picture of how this new and exciting scenario is unfolding, as well as providing an opportunity to meet the right business or academic partners for future alliances.

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