bioplastics MAGAZINE VOL 18

Bioplastics - CO_2-based Plastics - Advanced Recycling

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Cover Story
Circularity and the toy industry | 18

Highlights

Basics

Show Preview
Chinaplas 2023
interpack

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dear readers

At Spielwarenmesse (the International Toy Fair in Nuremberg, Germany) a guy approached our booth and said: "Go away with conferences. These events are just about moving around juice bottles and socializing in the evening." However, we know better. At least, when it comes to our conferences. The fish tank aquarium, we reported about in the last issue, which we saw for the first time in real life at the Spielwarenmesse, was developed by World Alive together with Biofibre, two companies that have found each other at the second bio!TOY in 2021. We don't know yet whether new cooperations were born or will be born out of bio!TOY 2023 or bio!PAC 2023, and how many such cooperations were initiated out of our many conferences since 2007. If you are part of such a success story, please let us know. We'd be happy to report about it.

Another example is the foundation of the global organisation *GO!PHA*, which was a spin-off of the first PHA platform World Congress in 2018. The organization has about 50 members today and does tremendous work for the PHA platform of materials.

Find out more about the recent bio!TOY and the upcoming bio!PAC in this issue. And the PHA platform World Congress is going to the USA this fall – save the date and send your proposals for a presentation. The call for papers is open.

Other highlights in this issue include show previews about the upcoming Chinaplas in April and interpack in May. For both events, we offer a Show-Guide with floorplan and all *bioplastics* companies listed with their booth number.

In addition to a number of articles on biobased plastics, as well as on the topics of CCU and Advanced Recycling – in line with our expanded objective on Renewable Carbon Plastics you'll find a book review, an opinion article, and, as usual, a whole bunch of articles about materials, applications, and news.

As many of you will have noticed, over the last couple of years we have included more and more topics that are not strictly *bioplastics* related but go broader towards the larger concept of Renewable Carbon. The team of bioplastics MAGAZINE has decided to change the name of the publication as, due to this broadening of topics, the name "bioplastics MAGAZINE" doesn't ring completely true anymore. The new name of this publication will be "Renewable Carbon Plastics", this change will be a gradual one, and we will still continue to focus on everything bioplastics related in the future next to the new topics of CCU and Advanced Recycling. We all know that bioplastics won't be able to solve the problems we are facing by themselves, but cooperation and a combination of technologies will lead to the change we all hope to see – the name change is supposed to represent that philosophy.

Looking forward to seeing you at one of the many events this year. Until then we hope you enjoy the springtime that is just around the corner (at least here, where we live) and of course, enjoy reading bioplastics MAGAZINE.

Sincerely yours,

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Sharon Keilthy and Sonia Sanchez at bio!TOY (Photo: Philipp Thielen)

Picks & clicks

Most frequently clicked news

Here's a look at our most popular online content of the past two months.
The story that got the most clicks from the visitors to *bioplasticsmagazine.com* was:

tinyurl.com/news-20230307

New biobased material for substituting plastics like ABS for cosmetics and beauty packaging

(07 March 2023

An award-winning material innovation startup, Sulapac (Helsinki, Finland), has launched Sulapac® Luxe, a new biobased material ideal for substituting hard plastics, including ABS, as part of its expanded portfolio for cosmetics and beauty packaging.

The new material comes in response to demands from the beauty industry's leading brands for more environmentally conscious packaging solutions that still offer high-end luxury feel, function, and aesthetics.

"Renewable Material of the Year" Nominees 2023

With the innovation award "Renewable Material of the Year 2023", nova-Institute, as organiser of the *Renewable Materials Conference* (23-25 May, Siegburg, Germany), and Covestro, as sponsor, want to recognise particularly exciting and promising solutions that contribute to replacing fossil carbon from the ground.

On the second day of the conference, the nominated companies will present their products and all 500+ conference participants will vote for the three winners on-site and online.

The six nominees are:

Carbon-light yeast oil – COLIPI (Germany)

COLIPI develops innovative bioprocesses to convert CO_2 into sustainable, carbon-light alternatives to vegetable oils such as palm oil. The core innovation and enabler is a patented gas fermentation bioreactor that safely unlocks the world's fastest CO_2 using microorganisms that convert off-gases containing CO_2, H2, and O2 into carbohydrate-rich biomass.

CovationBio™ Sorona® for faux fur – CovationBio (USA)

Sorona for faux fur is one of the first commercially available faux furs made from plant-based ingredients. It offers unlimited solutions for fashion apparel, such as jacket linings or collar trims, as well as footwear and accessories, including fur-lined shoes, earmuffs and more.

KUORI – biobased and biodegradable elastic materials – KUORI (Switzerland)

Kuori is developing and producing biobased and biodegradable elastic materials based on food waste such as banana peels and nut shells. They are sustainable alternatives for conventional elastic materials in various applications.

Monolayer PEF bottle: a high-quality and sustainable packaging material – Avantium Renewable Polymers (The Netherlands)

Avantium has developed a technology to convert plant sugars into FDCA, the building block of PEF: a plant-based, fully recyclable plastic with superior performance. The improved barrier properties result in a longer shelf life of the packaged products.

QIRA – the next generation of biobased 1,4-butanediol (BDO) – QIRA (USA)

QIRA is the next generation of 1,4-butanediol (BDO) – an easy-to-use, biobased BDO made from annually renewable feedstocks that can reduce CO_2 emissions compared to materials using fossil-based BDO.

traceless® – plastic-free natural polymer – traceless Materials (Germany)

Traceless is part of a new generation of plastic-free natural polymer materials that go beyond biobased or biodegradable plastics. The material is based on plant residues from the agricultural industry and contains 100 % biobased carbon content.

Find more details at tinyurl.com/rmc-nominees **MT**

Monolager PEF Bottle: a High-Quality and Sustainable Packaging Material
Avantium Renewable Polymers (NL)

Carbon-Light Yeast Oil
COLIPI (DE)

CovationBio™ Sorona® for faux fur
CovationBio (US)

(Source: nova-Institute)

KUORI — Biobased and Biodegradable Elastic Materials
KUORI (CH)

OIRA — the Next Generation of Bio-Based 1,4-butanediol (BBC)
Gore (US)

traceless® — Plastic-Free Natural Polymer
traceless materials (DE)

https://renewable-materials.eu

Bio-On is back, saved by the Maip group

The proposal for a bankruptcy arrangement for the acquisition of all Bio-On assets presented by GRUPPO MAIP (Turin, Italy) has been approved by the Court of Bologna, Italy, having received consent from the trustees and creditors.

The offer was submitted by HARUKI, controlled by MAIP Compounding and Plastotecnica (75 % and 25 % respectively). Both companies belong to MAIP Group.

Following the approval of the Court of Bologna, the full transfer of assets of the company based in Castel San Pietro will materialize within technical time frames.

The five-year plan proposed by MAIP Group will allow to quickly re-launch the innovative production technology of PHA (which derives from agricultural waste or agro-industrial by-products, such as sugar cane, beet, glycerol from biodiesel), which was developed by Bio-On from 2008 to 2019 and still stands at the forefront worldwide.

Thanks to its fifty years of know-how in the tech-polymers' market and its advanced experience in the compounding of all types of plastics, MAIP Group strongly believes in the relaunch of Bio-On.

The synergistic advantages of the operation at an industrial and strategic level are quite obvious, considering both Bio-On's leadership position in the production of PHA powder and the unique know-how of MAIP Group.

With this deal, Italy becomes a centre of excellence worldwide in the production of PHA, the most interesting biopolymer on the market today.

"Thanks to this deal and the important synergies it allows MAIP Group expands its value chain and accelerates the production of sustainable products with high technological value", Chairman Eligio Martini stated. "To ensure the success of the operation, we asked Marco Astorri to collaborate with us as we believe that his experience and skills are absolutely critical for the relaunch of Bio-On. Our goal is to offer the market an excellent portfolio of unique and innovative materials with few equals worldwide; it will rely on over 500 formulations based on polyhydroxyalkanoates (PHA), in powder and granules". **MT**

www.maipsrl.com

LyondellBasell and KIRKBI invest in APK

LyondellBasell (Rotterdam, the Netherlands), a global leader in the chemical industry and KIRKBI (Billund, Denmark), the family-owned holding and investment company of the LEGO® brand, recently announced they have signed an agreement to make an investment in APK (Merseburg, Germany), which specializes in a unique solvent-based recycling technology for low-density polyethylene (LDPE).

APK aims to increase the recycling of multi-layer flexible packaging materials – which today make up the majority of mixed plastic waste from the consumer sector. To this end, APK has developed the unique solvent-based Newcycling® process, which separates the different polymers of multi-layer packaging materials and produces recycled materials with a high degree of purity suitable for new packaging materials. **MT**

www.lyondellbasell.com
www.apk.group
www.kirkbi.com

Algae pilot facility in Spain

Neste (Espoo, Finland), the world's leading producer of sustainable aviation fuel, renewable diesel, and renewable feedstock solutions for various polymers and chemicals industry uses, is aiming to establish an algae pilot production facility in Spain to further strengthen the growth of its global raw material pool.

With this pilot, Neste strives to develop and demonstrate algae cultivation and processing. The project is currently in the planning phase with no final investment decision made yet.

"By harnessing algae as part of our future raw material pool, we continue to diversify Neste's renewable raw material portfolio with new types of scalable and sustainable raw materials. The pilot in Spain will lay the foundation for advanced research and commercialization of algae and related technologies. Furthermore, novel raw materials support our growth and transformation, enabling Neste to offer lower-emission solutions for the growing global demand", says Lars Peter Lindfors, Executive Vice President, Innovation at Neste.

Due to its local algae expertise, favourable environment, and central location accompanied by robust infrastructure in the surrounding regions, Spain was identified as a suitable location for piloting. **AT**

www.neste.com

New melt-spinning pilot plant

Senbis Polymer Innovations (Emmen, the Netherlands) has invested in a new flexible pilot plant for mono – and multifilament yarns via its subsidiary SPIC Facilities. This investment brings new unique opportunities for the development of sustainable plastics in the Chemport Europe Region, which is leading in Green Chemistry. Senbis has a high focus on developing fibres and filament yarns from bioplastics.

This melt-spinning pilot plant has been custom-made by Fibre Extrusion Technology (Leeds, UK) and KraussMaffei (Munich, Germany).

The pilot plant can be used for meaningful research trials as well as small productions for application field tests such as

- the compounding of polymers (with the option of adding additives such as plasticizers or natural fibres)
- the compounding and filtration of recycled polymers
- the production of drawn monofilaments
- the production of multifilament yarns including textile yarns
- the production of bicomponent yarns

The pilot plant is fed with two extrusion systems, namely a twin screw extruder and a bico extruder. The twin screw extruder from KraussMaffei has a capacity of 50 kg/h. It is equipped with:

- four dosing units
- liquid dosing option
- side feeder
- spinning pump and
- filtration

Senbis' own developments have a focus on developing biodegradable alternatives for products that have a high likelihood of ending up in nature, where they cause lasting harm to our environment.

Thanks to this new equipment, Senbis can now look into more challenging applications such as marine or in-soil biodegradable yarns and filaments such as dolly rope and muscle socks. In addition, they are able to produce our biodegradable trimmerline in-house. In the next years, we expect to bring many more sustainable products to the market and therewith support the Sustainable Development Goals 12, 14, and 15. **MT**

www.senbis.com

Avantium and Origin cooperate

Avantium (Amsterdam, the Netherlands), a leading technology company in renewable chemistry, and Origin Materials (West Sacramento, CA, USA), a leading sustainable materials company, announced in late February a partnership to accelerate the mass production of FDCA and PEF for use in advanced chemicals and plastics.

The partnership aims to bring the technology platforms of both companies together to produce FDCA from sustainable wood residues on an industrial scale. FDCA (furandicarboxylic acid) is the key building block for the biopolymer PEF (polyethylene furanoate) – a 100 % plant-based, fully recyclable plastic material, with superior functionality and a significantly reduced carbon footprint compared to conventional plastics. PEF can be used in a wide range of applications such as bottles, packaging, films, fibres, and textiles, which represent major end-markets.

This new partnership brings together Avantium's proprietary YXY® Technology that converts plant-based sugars into FDCA, with Origin's patented technology platform which turns carbon found in sustainable wood residues into useful building-block chemicals such as CMF (chloromethylfurfural). Bridging these two complementary technologies creates a route that can convert sustainable wood residues via CMF into FDCA. Avantium is currently constructing the world's first commercial-scale FDCA Flagship Plant in Delfzijl, the Netherlands. Avantium has signed offtake agreements for the supply of FDCA and PEF to major brand names and industry leaders for a range of applications, including Carlsberg, LVMH, and AmBev. Origin Materials has recently reported that it has mechanically completed its first commercial manufacturing plant *Origin 1* in Canada. This plant is anticipated to produce materials including CMF from sustainable wood residues, which can subsequently be converted into high-performance products used in packaging, textiles, apparel, automotive, and other applications. For Origin 1 and future plants, Origin has signed numerous capacity reservations and offtake agreements with well-known brand owners. **MT**

www.avantium.com | www.originmaterials.com

RCI carbon flows report

Supply and demand of fossil and renewable carbon on a global and European level

In the last five years, the mindset around carbon has changed fundamentally. Of course, there is no way around the fact that the rising concentration of carbon dioxide in the atmosphere poses an existential threat to life on Earth. But at the same time, carbon is the main component of our food, the basis of all organic chemicals and plastics, and the backbone of life on Earth.

When it comes to carbon, the focus has long been on achieving a zero-carbon, decarbonised energy system wherever possible to avoid CO_2 emissions. This is crucial and more urgent than ever to achieve net zero emissions by 2050. However, it is now becoming clear that other large-volume sectors such as food and feed, but also all organic chemistry, plastics, and significant parts of the materials sector are fundamentally and increasingly dependent on carbon. In the chemicals and plastics sectors, in particular, almost 90 % of the carbon used as feedstock is fossil carbon. This fossil carbon must be replaced by renewable carbon from recycling, biomass, and CO_2 by 2050 to avoid a further influx of fossil carbon into our technosphere and atmosphere.

Policymakers today are talking about *sustainable carbon cycles, defossilisation* and above all *carbon management*: which sectors should be supplied by which carbon sources in the future? To answer such complex questions and develop realistic targets and strategies, a resilient and comprehensive data basis on the carbon flows of all sectors, both globally and in Europe, has been missing until now.

The Renewable Carbon Initiative (RCI) has commissioned a study from the nova-Institute to fill this gap as best as possible. It builds on the nova-Institute's long-standing work on biomass and carbon flows over the past ten years and takes it to the next level. The result is a comprehensive, detailed, and updated carbon flow data basis that significantly surpasses previous publications. All data have been corroborated as best as currently possible by scientific publications, feedback from experts and additional research. Remaining gaps and differences are transparently depicted and explained as well as possible.

The nova experts assessed data from a multitude of sources. A wide range of data on material flow is used to compile a comprehensive inventory of carbon stocks and flows. The sectors covered include all applications of organic carbon from fossil resources and biomass production, from raw materials through utilisation to final end-of-life. This includes the use of carbon for feed and food, materials, energy, and fuels. A special focus is put on the carbon demand in the chemical and plastic industry today and tomorrow, with several figures specifically zooming into this sector and including scenarios for a full defossilisation by 2050.

If you have read previous reports on carbon flows and shares, you will find a number of data in this new report that differ from previous publications – of the nova-Institute or those of other authors. For example, the share of biomass in chemical feedstocks is lower than in previous publications. The figures have changed mainly because nova experts were able to gain particularly deep insights into the data and because they consulted many experts and associations for their input and feedback – thankfully possible due to the financial budget of the Renewable Carbon Initiative (RCI). One central aim was to generate a data basis as uniform and transparent as possible so that it can then be used and shared by industry, associations, and politicians alike.

The RCI commissioned a study from nova-Institute to compile a comprehensive inventory of carbon stocks and

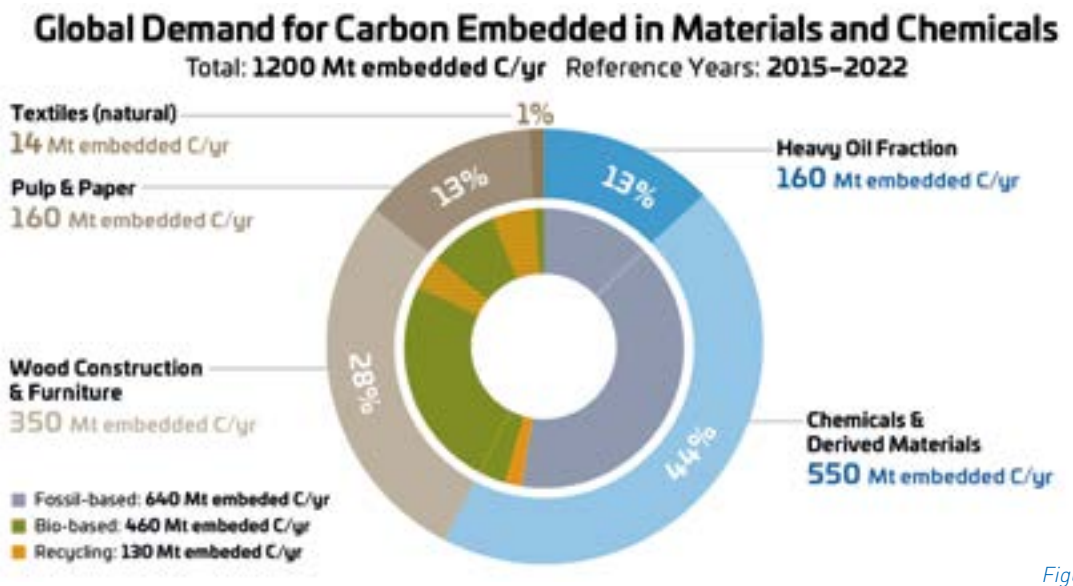


Figure 1

flows. All sources of organic carbon used in economic activities and all sectors where resources containing organic carbon are used are covered. The sources of carbon include the fossil resources, oil, gas and coal, as well as renewable carbon sources, namely biomass, recycling and CO_2, where already in use. The report determines the share of fossil carbon at 63 %, while biomass contributes 35 % and recycling 2 % to the entire global supply of organic carbon. In Europe, the fossil share is even higher at 67 %. Sectors that rely on organic carbon include food and feed, the material and chemical sector and energy and transport. The report presents material flow data for all these manifold sectors and determines the corresponding flows of carbon.

Carbon can be used in fundamentally different ways. On the one hand, it is used as an energy carrier where the energy stored in the molecules of hydrocarbons is released in combustion processes for power generation or for transport. On the other hand, there are applications where carbon is embedded in the final product as a fundamental part. These include food and feed as well as the material and chemical sectors, where hydrocarbons are used or converted to form often complex chemical molecules. The material sector includes wood for construction and furniture, paper, cotton for textiles, and fossil and renewable carbon for a wide range of chemicals and plastics.

While the energy and transport sector can and should be decarbonised using renewable energy, electrification and hydrogen, carbon cannot be replaced in food and material applications. The material sector can only be defossilised, meaning a shift from fossil to renewable carbon sources. In the report, the renewable carbon share of carbon embedded in materials and chemicals is calculated to a remarkably high figure of 48 % (37 % from primary biomass, 11 % from recycling) at the global level and 44 % at the European level (see Figure 1 & 2). The material use of renewable carbon is dominated by wood for construction and furniture as well as pulp and paper. These two sectors are large and consume significant amounts of carbon in form of primary biomass but also non-negligible shares of recycled biobased products. On the other hand, the chemical industry uses only small shares of biogenic carbon and carbon from recycling (6 % and 3 % globally and 4 % and 3 % in the EU).

Zooming in on the chemical industry, it still strongly depends on fossil carbon as raw material feedstock with more than 90 % fossil carbon share, both globally and in the EU. When compared to other statistics, this figure is surprisingly high, but in the RCI's report, the heavy oil fraction (mainly bitumen) is included for the first time – an application sector exclusively consuming fossil carbon so far.

In the report, comprehensive depictions of the current supply of carbon are drawn. An in-depth analysis is carried out for the chemical sector. Next to the carbon contained in energy carriers that is used in the chemical industry, an additional annual demand of 710 megatonnes of carbon (Mt C) is embedded in feedstock used for material purposes. The sub-sector of chemicals and derived materials currently uses 88 % fossil feedstock.

From this point, the authors outline an explorative scenario for 2050 that considers a growing demand due to rising consumption of chemicals and plastics and rising demand for road infrastructure on the one hand. On the other hand, the scenario is based on a complete phase-out of fossil feedstock and a shift to renewable sources of carbon. For chemicals and derived materials, a share of 55 % is assumed based on ambitious exploitation of both mechanical and advanced

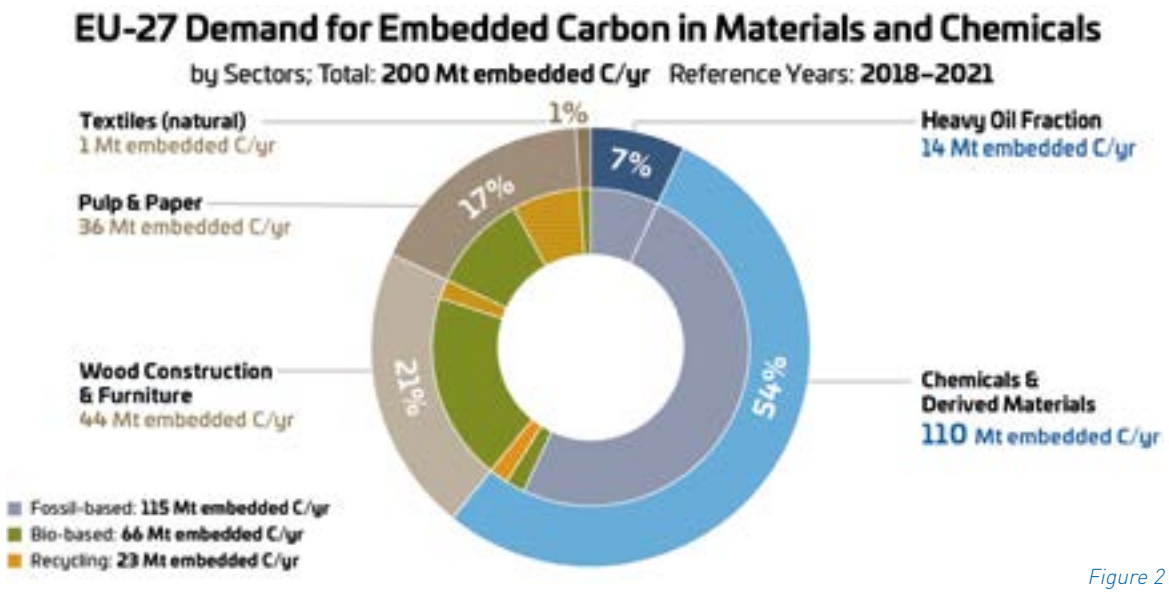
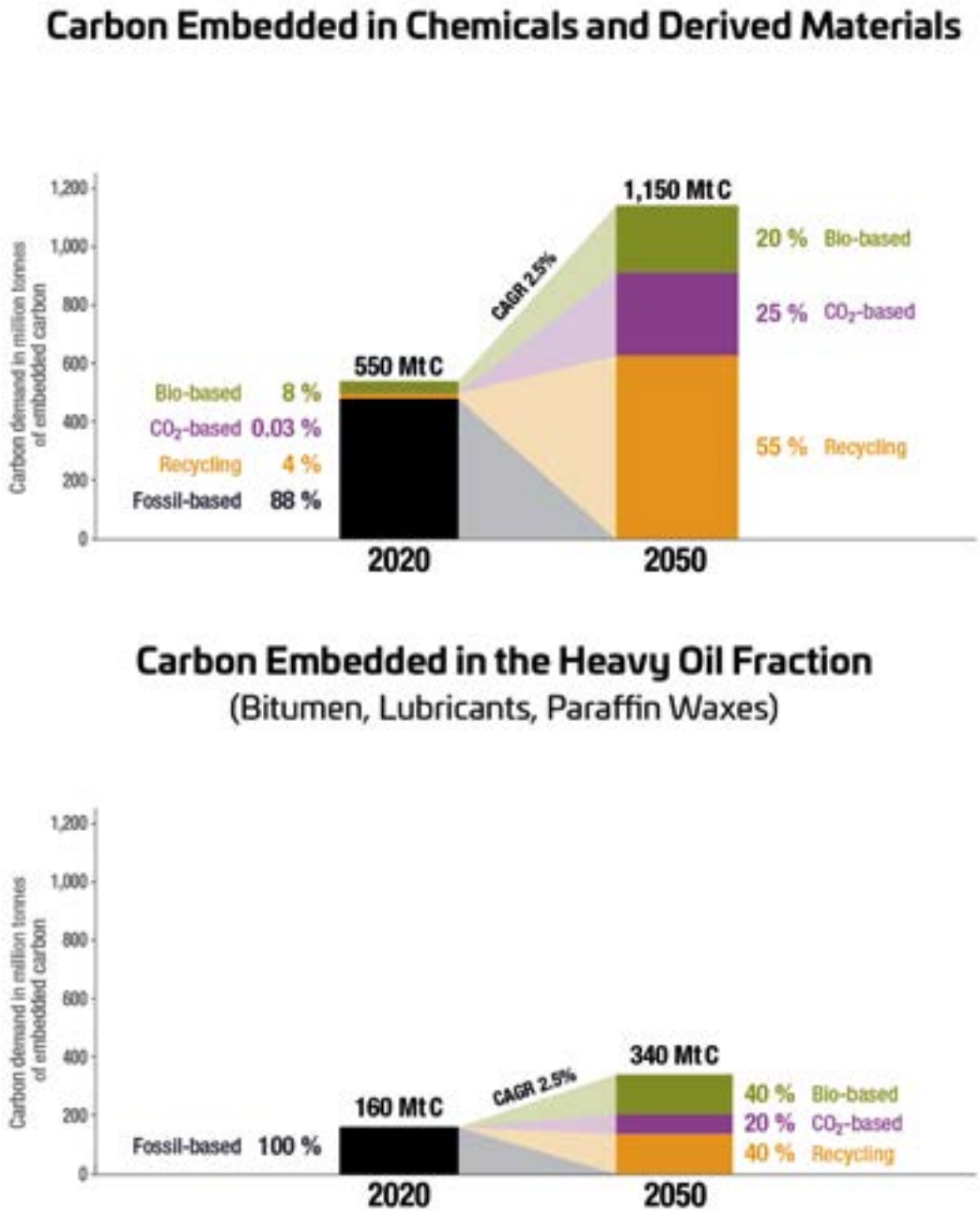


Figure 2



recycling. But recycling alone cannot completely close the carbon cycle, additional carbon must be fed into the circular carbon flow. In the explorative scenario, biomass is required to meet the demand for chemicals and derived materials, but the share is limited to 20 % due to constrained limited availability of agricultural and forestry areas as well as biodiversity loss. The remaining share of 25 % is provided by Carbon Capture and Utilisation (CCU) technologies, using CO_2 emissions from fossil and biogenic point sources and direct air capture.

The collected data emphasise the dependence of the energy and transport sector on fossil sources of carbon. Furthermore, the data can be used as a basis for the material sector to phase out fossil carbon, a process referred to as defossilisation. The information can set the basis to shape the future distribution of renewable carbon sources for the feed and food, material and chemical, and energy and transport sectors: a comprehensive carbon management across all sectors.

The Carbon Flows report is designed to be a living document that we would like to update every one to two years if possible. This also means that the RCI looks forward to your feedback, additional input, new data, and suggestions from any interested party.

The report contains in total of 80 pages with more than 35 graphics and tables plus corresponding descriptions of methodology, source material and data as well as five pages of literature sources. The format of the report allows to easily present the graphics to any audience. The full report including all visuals is available for free online. AT

www.renewable-carbon-initiative.com

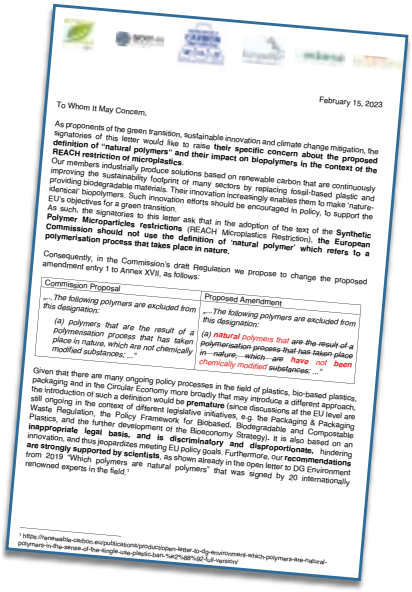
https://renewable-carbon.eu/publications/product/the-renewable-carbon-initiatives-carbon-flows-report-pdf

What are natural polymers?

Six leading associations and stakeholders from the chemicals, polymers and plastics sectors – namely BioChem Europe (a sector group of Cefic), EDANA, the voice of nonwovens, EuropaBio – the European Association for Bioindustries, European Bioplastics, GO!PHA, and the Renewable Carbon Initiative (RCI) expressed their specific concerns about the proposed definition of *natural polymers* and its impact on biopolymers in the context of the REACH restriction on microplastics.

Under the coordination of the RCI, the associations ask the Commission in a letter "that in the adoption of the text of the Synthetic Polymer Microparticles restrictions (REACH Microplastics Restriction), the European Commission should not use the definition of *natural polymer* which refers to a polymerisation process that takes place in nature".

The letter proposes an amendment to the current wording of entry 1 to Annex XVII of the Commission's Regulation draft.



February 15, 2023

To Whom it May Concern,

As proponents of the green transition, sustainable innovation and climate change mitigation, the signatories of this letter would like to raise **their specific concern about the proposed definition of "natural polymers" and their impact on biopolymers in the context of the REACH restriction of microplastics.**

Our members industrially produce solutions based on renewable carbon that are continuously improving the sustainability footprint of many sectors by replacing fossil-based plastic and providing biodegradable materials. Their innovation increasingly enables them to make 'nature-identical' biopolymers. Such innovation efforts should be encouraged in policy, to support the EU's objectives for a green transition.

As such, the signatories to this letter ask that in the adoption of the text of the **Synthetic Polymer Microparticles restrictions** (REACH Microplastics Restriction), **the European Commission should not use the definition of 'natural polymer' which refers to a polymerisation process that takes place in nature.**

Consequently, in the Commission's draft Regulation we propose to change the proposed amendment entry 1 to Annex XVII, as follows:

Commission Proposal	Proposed Amendment
... The following polymers are excluded from this designation:	*... The following polymers are excluded from this designation:*
(a) polymers that are the result of a polymerisation process that has taken place in nature, which are not chemically modified substances; ...	*(a) natural polymers that are the result of a polymerisation process that has taken place in nature, which are have not been chemically modified substances; ...*

Given that there are many ongoing policy processes in the field of plastics, bio-based plastics, packaging and in the Circular Economy more broadly that may introduce a different approach, the introduction of such a definition would be **premature** (since discussions at the EU level are still ongoing in the context of different legislative initiatives, e.g. the Packaging & Packaging Waste Regulation, the Policy Framework for Biobased, Biodegradable and Compostable Plastics, and the further development of the Bioeconomy Strategy). It is also based on an **inappropriate legal basis, and is discriminatory and disproportionate**, hindering innovation, and thus jeopardizes meeting EU policy goals. Furthermore, our **recommendations are strongly supported by scientists**, as shown already in the open letter to DG Environment from 2019 "Which polymers are natural polymers" that was signed by 20 internationally renowned experts in the field.[1]

[1] https://renewable-carbon.eu/publications/product/open-letter-to-dg-environment-which-polymers-are-natural-polymers-in-the-sense-of-the-single-use-plastic-ban-%e2%88%92-full-version

Commission Proposal	Proposed Amendment
„... The following polymers are excluded from this designation: *(a) polymers that are the result of a polymerisation process that has taken place in nature, which are not chemically modified substances; ..."*	*„... The following polymers are excluded from this designation:* *(a) natural **polymers** that ~~are the result of a polymerisation process that has taken place in nature, which are~~ **have** not **been** chemically modified ~~substances~~; ..."*

"Given that there are many ongoing policy processes in the field of plastics, biobased plastics, packaging and in the Circular Economy more broadly that may introduce a different approach, the introduction of such a definition would be premature (since discussions at the EU level are still ongoing in the context of different legislative initiatives, e.g. the Packaging & Packaging Waste Regulation, the Policy Framework for Biobased, Biodegradable and Compostable Plastics, and the further development of the Bioeconomy Strategy). It is also based on an inappropriate legal basis, and is discriminatory and disproportionate, hindering innovation, and thus jeopardizes meeting EU policy goals. Furthermore, our recommendations are strongly supported by scientists, as shown already in the open letter to DG Environment from 2019 *Which polymers are natural polymers* that was signed by 20 internationally renowned experts in the field [1]", the letter states before giving a list of 12 detailed justifications for this proposed change.

"Considering the significant fast pace of innovation in the field of biobased and biodegradable materials, the notion of natural polymers should be clearly defined in future policy, since industry will continue to innovate through cutting edge technologies to deliver polymers which are identical to those found in nature. A new and scientifically accurate definition of natural polymers is hence of great importance to establish the future regulatory frameworks correctly – whether in future EU policies or in the context of the global treaty negotiation on plastic pollution – and to drive forward innovation", the letter concludes.

The full letter with comprehensive science-based arguments is available for download. AT

https://renewable-carbon.eu/publications/product/letter-to-the-commission-on-the-definition-of-natural-polymers-in-the-reach-microplastics-restriction

[1] https://renewable-carbon.eu/publications/product/open-letter-to-dg-environment-which-polymers-are-natural-polymers-in-the-sense-of-the-single-use-plastic-ban-%e2%88%92-full-version

bioplastics MAGAZINE presents:

The 5th bio!PAC conference on bioplastics and packaging in Düsseldorf, Germany, organised by bioplastics MAGAZINE together with Green Serendipity, is the must-attend conference for anyone interested in sustainable packaging made from circular renewably-sourced materials.

The hybrid (on-site and online) conference offers expert presentations from major players in the packaging value chain, from raw material suppliers and packaging manufacturers to brand owners experienced in using biobased packaging. Experts from all areas of bioplastics & packaging will present their latest developments or research. The conference will also cover discussions like end-of-life options, consumer behaviour issues, availability of agricultural land for material use versus food and feed etc.

bio!PAC offers excellent opportunities for attendees to connect and network with other professionals in the field.

The conference will be held as a Breakfast Conference. After presentations and excellent networking opportunities from 8:00 to 13:00, attendees can visit the interpack show in the afternoons. Free tickets for the interpack are included.

bio!PAC

conference on
bioplastics & packaging
08 – 09 May 2023
at interpack, Düsseldorf

www.bio-pac.info

	Monday, May 08, 2023	
08:00 – 08:05	Michael Thielen	Welcome remarks
08:05 – 08:25	Patrick Zimmermann, FKuR	Bioplastics in the context of a circular economy
08:25 – 08:45	Erik Pras, Biotec	Bioplastics, established technologies but ready for new challenges ?!
08:45 – 09:05	Frédéric Gansberghe, Futerro	PLA the best candidate to be used in Bio-Renewable packaging
09:05 – 09:25	Martin Bussmann, Neste	CO_2 reduction by the use of renewable-based polymers for packaging
09:25 – 09:35	Q & A	
09:35 – 09:55	Mark Shaw, Parkside Flexibles	Biobased flexible packaging
09:55 – 10:15	Andy Sweetman, Futamura	Functional performance for compostable packaging
10:15 – 10:35	Allegra Muscatello, Taghleef Industries	New developments in biobased and biodegradable packaging solutions
10:35 – 10:55	Stanley Mitchell, Xampla	Proteine based film for packaging
10:55 – 11:05	Q & A	
11:05 – 11:25	Coffee / Networking break	
11:25 – 11:45	Bram Bamps, Materials and Packaging Research & Services	Bioplastics in food packaging applications: seal, gas barrier and mechanical performance
11:45 – 12:05	Michael Zhang, Bluepha	Bluepha™ PHA with processing solutions for performance quality and productivity
12:05 – 12:25	Albertro Castellanza, Novamont	Compostable Coffee Capsules: an effective tool to enable a close loop system
12:25 – 12:45	Bruno de Wilde, Normec OWS	Compostable packaging: Why? Why not?
12:45 – 12:55	Q & A	
	Tuesday, May 09, 2023	
08:00 – 08:05	Michael Thielen	Welcome remarks
08:05 – 08:25	Taco Kingma, FNLI	Future of packaging materials
08:25 – 08:45	Patrick Gerritsen, Bio4pack	What is Sustainable (packaging)?
08:45 – 09:05	Francois de Bie, Total Energies Corbion	Recent developments in Luminy® PLA bioplastics for more sustainable packaging
09:05 – 09:25	Todd Fayne, Pepsico	Designing Flexible Packaging based on Biopolymers
09:25 – 09:35	Q & A	
09:35 – 09:55	Bineke Posthumus, Avantium	Avantium's PEF for a fossil-free future in packaging
09:55 – 10:15	Hugo Vuurens, CJ Biomaterials	Using PHA to improve biodegradability and create end-of-life solutions of biopolymers in packaging
10:15 – 10:35	Brendan Hill, Braskem	Braskem, Helping customers de-couple from fossil feedstocks.
10:35 – 10:55	Lorena Rodríguez Garrido, AIMPLAS	Biobased and biodegradable Coatings
10:55 – 11:05	Q&A	
11:05 – 11:25	Coffee / Networking break	
11:25 – 11:45	Alberto Zanon & Alberto Marcolongo, Sirmax	Biocomp®: the Sirmax Group answer to EU policy regulation
11:45 – 12:05	Ruud Rouleaux, Helian Polymers	Understanding new PHA building blocks; from compounding to application development
12:05 – 12:25	Marcea van Doorn, Bunzl	Bioplastics: packaging & legislation
12:25 – 12:45	Srivatssan Mohan, Unilever	Sustainable biobased packaging: enablers & challenges
12:45 – 12:55	Q & A	

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Bioplastics packaging:

- can be recyclable, biodegradable and/or compostable
- can be made from biobased, biowaste, or renewable resources
- can offer innovative features and beneficial new barrier properties
- can help to prevent accumulation of microplastics in our environment
- helps to reduce the depletion of finite fossil resources and CO_2 emissions

Challenges:

Most plastic packaging is made of fossil-based resources, is hardly recycled, and not biodegradable. In addition, these plastics can contribute to long-term accumulation of microplastics.

Innovative bioplastics can be a sustainable alternative. They present new features and can have multiple end-of-life options: recycling and/or biodegradation.

At the bio!PAC the focus will be on circular packaging based on bio-based feedstock that leads to genuine environmental benefits. Specific attention will also be paid to the criteria for these applications.

That's why bioplastics MAGAZINE (in cooperation with Green Serendipity) is now organizing this 5th edition of the bio!PAC – conference on bioplastics & packaging.

The conference will be held as a breakfast conference during interpack at the Düsseldorf fairgrounds. A ticket for interpack is included.

Experts from all areas of bioplastics & packaging will present their latest developments or research. The conference will also cover discussions like end-of-life options, consumer behaviour issues, availability of agricultural land for material use versus food and feed etc.

The conference will be a hybrid event that will be recorded and made available for convenient watching (video-on-demand) for at least a month after the event. All presentations will be made available (pdf) as well.

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Let's talk about SusTOYnability

Looking back at the 3rd bio!TOY conference

By Alex Thielen

The unique bio!TOY conference, which brings together players from all parts of both the toy as well as the plastics industry, celebrated its 3rd edition on the 21st and 22nd of March in *Toycity* Nuremberg. This year the team of bioplastics MAGAZINE had the distinguished pleasure to not only work with sustainability expert for plastics, toys, and life in general, Harald Kaeb (narocon), but also with Sonia Sánchez (Impact & Sustainability consultant) and Sharon Keilthy (jiminy eco toys). The toy expert trio has recently founded STAC (Sustainable Toys Action Consulting) and presented their vision of the future for toys next powerhouses like LEGO and Hasbro on the toy side, and Braskem and FKuR on the plastics side – to name just a few.

The overall vibe of the conference was very positive and open, participants seemed eager to learn from each other and exchange information and experiences in their pursuit of sustainability. The goal of the conference was to bring together all stakeholders of the industry, but mainly to foster communication between toymakers and material producers of the plastics industry. 80 of the 111 participants were from exactly those two industries in an even 50/50 (or rather 40/40) split. The remaining 31 participants were retailers, research institutions, the press, accreditation bodies, independent toy designers, government bodies, and consultants.

The conference venue in Nuremberg was packed with 71 participants in the room (and 40 online). Presentations ranged from success stories of what has already been achieved, the cutting edge of toy design to material properties and origins. Exchange was lively and plentiful, with over 60 questions via the slido platform alone next to many questions in the room. After the first block of speakers, there was also an *open mic* session, inviting anybody in the room to quickly come on stage and introduce themselves and what they are hoping to achieve during the two-day event. This opportunity was accepted with open arms and led, among other things, to the announcement of Pauliina Sariomaa saying that Fortum Waste Solutions is planning to introduce CCU technology in its waste incineration plants to decarbonise its processes while providing a CO_2-based feedstock for plastic production. But let's start, as is tradition, at the beginning.

Co-organizer Harald Kaeb opened the conference with a presentation introducing the participants to the general topic of sustainable materials in the context of toys but went broader in the scope of *why are we doing this* referring to the recent IPCC report *Urgent climate action can secure a liveable future for all* (released one day before the conference). "If we act now, but really now, we can still keep it (the fall out of the climate crisis) in a dimension that is not too painful and not too chaotic", he said. This call to action already has the undertone of that, no matter what – it will be painful and chaotic to a certain degree, we are already in the area of damage control. Another article Harald referred to talked about the human *fight-or-flight* response that is good for immediate threats but that we are reacting to the climate crisis like the metaphorical frog in boiling water – too little, too late.

The other three speakers of this block encapsulated the whole range of players, with Søren Kristiansen representing the Lego Group (Billund, Denmark) that is looking for more sustainable solutions, Niklas Voß from FKUR that can provide more sustainable solutions, and Ana Ibáñez-García from AIJU who test these solutions. One of Sørens' answers during the Q&A session perfectly summarized the struggle of sustainability in probably every industry. "I think communication is much more complicated than finding a new polymer", he said when discussing what to print on packaging and how to convey sustainability to the end consumer. "The basic rule is: Say what you do. Without using too fancy words, while being as concrete as possible", he added.

And even topics of AI made it into the conference as Sharon closed the open mic session by talking about the app *Brickit* that can analyse your personal hoard of Lego bricks through picture analysis and then give out ideas on how to combine your collection in new and creative ways.

The second block on day one touched on many different aspects of sustainable toy making and was opened by Elise Hounslow (Elise Toy Design) who talked about Biomimicry. The idea of emulating how nature solves problems is not new as such. One of the most infamous examples is swimsuits that imitated shark skin, which are by now banned from

competitions. That was already 15 years ago – but innovation is not about new ideas, it is about introducing ideas and concepts from one area into another, which is exactly why the concept of biomimicry belongs in the toy industry.

Elise was followed by Hartmut Knecht (fischertechnik) who talked about the difficulties of trying out new materials and unexpected struggles such as unforeseen chemical reactions in the tools that can lead to rust.

Christian Ruthard (INEOS) echoed Harald's opening remarks about acting now. "There are some solutions available now, and there are some solutions available in maybe five years – but we don't have time to wait five years. We see climate change is increasing more and more, we need to be able to offer solutions now".

Another topic was about the ambitions to become more sustainable – Philipp Hummel talked about how Schleich wants to have all their figurines Crade-to-Crade® certified by the end of 2027. During the Q&A session, he confirmed that this means that Schleich will phase out PVC as it cannot be Crade-to-Crade certified.

Again, the Q&A session was very lively and touched on issues such as the question of whether or not mass balance is *good enough* to which Christian said that "in my point of view it (mass balance and bio-attribution) is the quickest solution to save CO_2 emissions. As a scientist, I believe it should be the solution we use right now because it is implementable quickly". The question of price was also raised and Hartmut commented that with some products the materials are more expensive and with others they are not, which also means that some products are now more expensive. How well they will be received in the market remains to be seen. "Give me one year and I will have answers", he told the audience.

The third session started off with two presentations going in a somewhat different direction. First Jasmin Brinkmann talked about the ISCC licencing schemes, certification requirements, and chain of custody of renewable materials. Everyone agrees that one of the biggest issues in the field of sustainability is trust and transparency to work against the threat of greenwashing. ISCC also tried to make it easier for brand owners to communicate their sustainability achievements to the end consumer with new and more comprehensible logos.

The second presentation, given by Mesbah Sabur from Circularise, seamlessly fit into that topic. The problem with sustainability claims and especially mass balance is about traceability. People often talk about the *black box*, X % of biomass goes in somewhere and is accredited to another product(s) someplace else. The bigger a company, a value chain, or an industry the more complicated keeping track of all these sustainability claims becomes. Greenwashing is of course a concern here, but so are simple mistakes and human error as the current bookkeeping systems are often done manually, e.g. in excel sheets and pdfs that are sent from one company to the next via email – which is very hard to scale. The solution proposed by Circularise is digital product passports that work with blockchains. Mesbah compared it to bitcoin, "I have one bitcoin and I can give that to one person, I can't give it to two people – that's essentially how blockchain works for our digital passports".

One question that Alexander Kronimus (Plastics Europe) asked Mesbah during the Q&A session was whether or not the high energy demand of blockchain technologies may compromise the sustainability of the traced product.

Photo: TOYS, Alfred Kirst

Photo: TOYS, Alfred Kirst

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Photo: TOYS, Alfred Kirst

"It is a very important point. Luckily, a lot of these issues around energy consumption have been solved to a large extent last year. We use the Ethereum blockchain, they moved away from the mechanism that uses a lot of energy – the emissions dropped by over 99.9 %, they are basically non-existing compared to what they used to be". Mesbah also admitted that the weakest point of this system is at data entry at the very beginning, saying that this is exactly why licencing schemes such as ISCC are necessary to ensure that the data entered is actually accurate.

Another interesting point was raised by Ulrich Betzold (Betzold) who took it among themselves to use biopolymers for their products by starting their own production. "We also need a (market) pull instead of (just) a push. The market needs to go to them (plastic producers) and say *I don't want your oil-based plastic*. I don't see that yet, but I see it within the next years – then we will have that pull and with that a tipping point".

He also explained (among others) how he brought production back to Europe and how to market products successfully today.

The last session of the first day was somewhat different – after an opening statement by Maarit Nyman from DG GROW of the European Commission and three short statements, a panel discussion about policy was held. Next to Maarit, Lidia Galus (Toy Industry Europe), Alexander Kronimus, and Rafaela Hartenstein (Hasbro) talked about legislation and policies that might help the Toy industry in their sustainability efforts. Sharon commented that, in her perhaps ignorant opinion, the role of legislation is not to reflect the status quo but to pave the way to where we want to be. In this context things like plastic taxes, subsidies for sustainable plastics, or tax cuts for sustainable technologies were discussed as potential solutions. "A global CO_2 tax is the vision of my sleepless nights, it's the perfect instrument. It would create a perfectly even playing field worldwide. It's still a dream, but we can make steps towards that dream", Alexander said.

Another topic touched on was the question of sustainability and safety. Rafaela commented on the current state of legislation saying, "sector-specific legislation and horizontal legislation are not really aligned. Substances in many recycled materials are in direct conflict with toy safety regulations. If an orange was a toy, it would be banned. That is how strict the regulations are".

Sonia pushed the discussion in a slightly different direction saying that the perspective on the issue needs to change. "It is in the toy industry's DNA that we can't compromise on safety – a part of this is due to regulations that say, *this is the way it needs to be.* Many seem to say, *sustainability is important but don't push me too much because we cannot compromise on safety.* I think we need to reframe this mindset – sustainability is safety in the long term. Sustainability and climate change are a matter of safety. The truth is that for some children in countries affected by climate change, it is not even a long-term consideration of safety – it is a matter that affects them today".

The discussion touched on many different aspects which lead to an invitation by Alexander for joint talks welcoming representatives of the two industries, associations, academics, and policymakers to work together to formulate the most pressing needs of the industry as well as potential approaches on how to satisfy them.

Maarit closed the session by saying that many of her initial questions have already been answered and that, "we know that there is a need for a level playing field, we know that the fossil-based industries have an advantage over biobased industries and biobased materials. There is a question of what kind of tools, what kind of policies, and what kind of mix is optimal – that is a tricky question".

The second day was also packed with facts and figures, success stories and demands to do better now.

Eleonora Foschi (University of Bologna) opened the first session and showed us once again what issues we are trying to solve, 90 % of toys are made from conventional plastics and 80 % end up in landfill, incineration, or the environment. Filippo Gallizia followed her and talked about how GEOMAG faced this challenge. They changed their main line from ABS to recycled polyolefins, a difficult but necessary step. Toys also have the task to be educational, but "we cannot be educational without being sustainable". He went further and was very clear that "sustainability means the reduction of emissions – all the rest is bla-bla, it's nothing".

Floris Buijzen talked about the Borealis ABC version of the renewable carbon approach, which are atmospheric, biobased, and circular tech (recycling), showing that a mix of different solutions is necessary. In the Q&A session, he also pointed out that, "Borealis produces exclusively in Europe".

Photo: TOYS, Alfred Kirst

Photo: TOYS, Alfred Kirst

The first session was closed by the STAC trio – Harald, Sonia, and Sharon. The three co-moderators of the conference talked about how their individual passions have led them to where they are today but also gave some statistics, e.g. that only 13 % of companies have a comprehensive sustainability strategy. While there is a lot of willingness of companies to do good the issue is, that there is a lack of coherence and consistency which can make communication with customers and consumers difficult. "Companies want to do something but without a proper strategy – they are trying to do it blindfolded. They have amazing initiatives for sustainable practices, but at the same time they have really bad practices", Sonia said and pointed out that this is on the one hand a missed opportunity to connect with consumers and that companies also risk failing to comply with environmental and social regulation. "It is not something that can be improvised".

Gabriele Peterek from FNR, supporter of bio!Toy since its first installation, opened the second session and talked about their PR efforts to educate children and parents about biobased toys. The importance of communication was a topic that resurfaced repeatedly during the conference.

Hao Ding (Covation Biomaterials) talked about the use of their textile materials in the toy sector followed by Brendan Hill who talked about Braskem's production of sugar cane based bioplastics and common misconception about land use and sugar cane agriculture in Brazil. Many people wrongly think that rain forest is cut down to make room for agricultural land for sugar cane. However, sugar cane doesn't only grow in a completely different area of Brazil 2,500 km away from the rain forest (about the distance from London to Istanbul), it is actually used to recover land previously used for cattle farming. The soil is so compacted by the weight of the cows that almost nothing grows there – except for, for example, sugar cane. It, therefore, even has an additional positive effect on the environment.

The question of land use came up in the Q&A session again and both Hao and Brendan explained how out of proportion such accusations are. The corn used for Covation's Sorona material is industrial corn, in the US 99 % of corn is used for industrial applications and only a tiny fraction of that goes into the production of biopolymers. Similarly low is the percentage of land used for Braskem's bioplastics in Brazil which is, according to Brendan, only about 0.02 %.

Harald closed the session and land-use debate by saying that "this discussion has been annoying me for over 20 years. We have a really small bioplastics market which brings down CO_2 emissions really significantly – what do you think is the biggest threat to our food consumption patterns in the future? The few hectares of biobased PE? Or climate change itself? What will kill people in the future in catastrophic environments where no food can be grown? It's climate change! You can ask these questions a hundred times and you would always be wrong when you post such questions".

Everybody who has ever been on a multiple-day-long conference knows that the last block on the last day is the toughest – people are tired, their brains filled to the brim with new information, and their thoughts are already on *how to get home*. To battle the drag of the last session the conference team decided to mix things up a little. The moderation of Sonia was frequently interrupted by the shenanigans of puppets like Kasper (a well-known figure in Germany), a *3D-printed clone*, a colour-stealing witch, or a 50-year-old Ernie in dire need of repairs. But the presentations were anything but boring, there was Steven van Bommel (biobuddi) who talked about his journey to use bio-PE for toys that was kicked off by an 8th-grade presentation of his daughter 15 years ago. Elizabeth Eaves talked about Mattel's take-back schemes that got back toys that are, like the Ernie puppet, over 50 years old. And Onno Treur from the masterbatch and additive experts Sukano talked together with Jeremy Margheriti from Tide Ocean about joint efforts to battle ocean plastic pollution. Last but not least Daniel Römhild from Bioplastics & Recycling showed that it is not an either-or question between recycling or biobased plastics, but that both solutions are valuable and can even be combined.

Overall, it was an eventful two days that can be summarized in a couple of statements. We cannot wait for the holy grail of technologies – we have working solutions now that we should use while continuously seeking and improving new solutions. The biggest threat to food safety is not biomaterials but climate change. We cannot do it alone, we have to collaborate, share knowledge, and work together for that common goal. And lastly, legislation will be a necessary step to accelerate these developments, but they need to be based on broad cooperation of all stakeholders from companies to public authorities and even EU member states. Or as Filippo said in his presentation, "we cannot take care of the healthy growth of kids without taking care of the planet – it's a simple idea, but difficult to be achieved".

If you are now struck with an acute case of retrospective FOMO (fear of missing out) don't worry – the whole event was recorded, and we offer access to the video recordings of the presentations (including a PDF download of all PPTs). The video recordings will be available at least until the end of June 2023. Just write an email to mt@bioplasticsMAGAZINE.com.

www.sustainabletoys.eu | www.bio-toy.info

Circularity and the toy industry

Two of the biggest global issues have shaped conversations, discussions, and innovations within the plastics industry like no other, global warming and the plastic waste crisis. Neither of them is new to you and unfortunately, neither is likely to go away anytime soon. The *golden solution* to both issues is the goal of a Circular Economy, where we don't create waste and produce sustainably without relying on fossil resources. But the Circular Economy is a grand concept – a big-picture idea. And it is good that we try to look at the big picture, the global fallout of decisions good and bad. The problem is that while Circular Economy sounds relatively simple in the big picture, battling any issue at a global scale means finding many local solutions. Solution X might work for country X but might not work for country Y – maybe because the legislative framework is different, or the infrastructure for solution X is lacking or non-existent – or maybe just because country Y has a different climate than country X. Similarly, these big issues need horizontal legislation to affect a vast range of industries, but there is often already sector-specific legislation in place and the two might have conflicting demands (e.g. a certain percentage of recycled material and safety regulations).

The toy industry is a relatively small sector if you compare it to, e.g. the automotive industry or construction. It is also an industry with the highest safety requirements for materials. Now, what are the demands of the Circular Economy? We have all heard them multiple times, Reduce, Reuse, Recycle and for toys we can also add Repair and Redesign. Let's look at them one by one – although as we will see, they are not strictly separate. The considerations that follow are largely based on discussions with industry experts during the 2021 and 2023 bio!TOY conferences.

Reduce

Reducing in the toy industry can be interpreted in multiple ways. We can reduce unnecessary parts of the packaging – this also already touches on Redesign. Changing the packaging is a quick and easy solution that many toy brands are already implementing – that often means on the one hand better and smarter designs but also often a switch from plastics to paper. While that helps to solve the plastic waste problem, we need to be mindful of such changes. Paper is also a finite resource, and its production is not without its own drawbacks such as water consumption.

Next to packaging, we can look at the materials of the toys themselves. Here an option is to move away from fossil-based plastics to recycled and/or biobased plastics – this is also already done by many companies. However, here we are facing two problems: biobased plastics are still more expensive than fossil-based plastics. Some customers are willing and able to pay a *green premium* for more sustainable toys, but that has its limits (up to about 10 %). And we should not forget that there is a need for affordable toys as well, as some parents simply cannot afford expensive toys – yet every child should be able to play and learn through toys. Recycled plastics are another matter. For toys these materials need to follow certain regulatory safety standards – that means we are talking about high-quality recycled materials – food contact grades. Such grades are high in demand and low in supply. Looking again at the big picture, even a *toy giant* like Hasbro is a small fish on the global plastics scale if they have to compete with the likes of, e.g. Audi. Hasbro needs many different very specific materials of high quality, but the volumes are much lower than that of any large automotive company, while simultaneously needing these materials on a global scale in production facilities all over the globe – that is unattractive for material suppliers as it is easier to sell to someone who wants one specific material in large volumes for fewer production locations. Availability is also often an issue for biobased plastics.

Another aspect of Reduce is to eliminate unnecessary toys, often called by the derogatory term "China Toys" – which is ironic as many "high-value toys" are also produced in China. Toys have a general use life of between 36 hours and five years. There are exceptions of course and these numbers don't include the reuse factor of handing down toys to the next generation – that can lead to toys being in use for well over 50 years. The point is that children can lose interest in a toy fast. Cheap and badly designed toys that are often free giveaways might not even be able to catch the attention of a child at all – they are essentially promotional garbage that should be avoided as they don't hold any real value. Here, one of the greatest attributes of plastics, that it is cheap and suitable for mass production, is detrimental. Many of these toys should, by all accounts, not exist.

Reuse

We have already touched on this, valuable toys are often handed down to younger siblings, cousins, neighbours, or your own children. It is a practice that has been around for decades if not centuries. The only way to tweak the reusability of toys is by trying to increase the intrinsic value of a toy – this again is often a question of design. Better toys that have higher replayability and are less prone to breaking are more likely to be handed down or resold. Companies that focus on *pre-loved toys* can also help in facilitating more reuse.

Repair

In case a toy does break it makes sense to consider repairing it – many toy companies have spare parts for their products (if they are still currently sold). However, as with many things, it also comes down to a question of price. Toys are intrinsically a low-cost mass-produced application and are meant to be affordable. What are those repairs allowed to cost to remain economical? And who will take on the liability? That doesn't mean it should not be done but as is often the case, the devil is in the detail.

By Alex Thielen

Redesign and Recycle

Looking at both beginning-of-life and end-of-life together seems to make sense as these topics are intrinsically related from a circular economy perspective. On the one hand, design for recycling is one of the current ideas within the general plastics industry – so design with end-of-life in mind. On the other hand is the use of recycled material (if you can get your hands on it). However, recycled materials might have different mechanical properties than the conventional virgin plastics previously used – which means that the design process itself might have to change. Instead of starting with a design and then looking for a material that can fulfil the requirements designer might have to get used to starting with certain materials and then look at what is possible with the given material properties. This also completely ignores the difficulty of sourcing such materials, to begin with.

At the other end of the equation is end-of-life, which is in and by itself a very difficult puzzle to solve. One might argue that recycling is the obvious way to go, but with such a variety of lifetimes, toys might not readily respond to a *one-size-fits-all* approach. Ideally, toys will have a lifetime of over five years, and we know that the lifetime can go up to 50 years. Does it even make sense to try to design toys such as Lego bricks that are known to be handed down from one generation to the next to be recyclable? In the case of "design for recycling" we are usually talking about "design for mechanical recycling" because it is the most energy-efficient and most common way to recycle – but that landscape is likely to change in the next 5–10 years. Design for recycling makes sense for short-lived applications such as packaging and some toys are also rather short-lived. Finding the right solution becomes increasingly difficult when considering the whole range of best-case to worst-case scenarios – the actual lifetime of any given toy is often hard to predict.

This might be an unpopular opinion but perhaps, among the "5 Circular Economy R's" discussed here, recycling should take a back seat. After all, recyclability is a completely useless attribute if the application is not actually recycled at the end-of-life. We should not completely ignore it but rather focus on reducing fossil plastics and unnecessary toys, promoting the reuse of toys and consider whether repairing is an economically viable solution. The (re)design of toys (and packaging) will certainly play an important role in all of these considerations. It might be worthwhile to refocus on *design for reuse and repair,* rather than focusing on *design for recycling*. And at the end of the day, if we want to have more sustainable toys, we will not get around using more biobased and recycled plastics – both are necessary and both will need to become more affordable and increase in volume.

The STAC (Sustainable Toys Action Consultancy) trio that moderated the bio!Toy 2023 talk about their views on circularity and motivation to bring change to the toy industry. (Photo: TOYS, Alfred Kirst)

The reason why sustainability matters – children should be able to play and learn, but they also have a right for a sustainable future (toy in picture: Mobby-Dig, page 21).

Examples of toys from sustainable materials – some are new designs some are classics redesigned. (Photo: FNR)

New toys line made from biobased material

At the latest edition of Spielwarenmesse (International Toy Fair – Nuremberg) Androni Giocattoli (Varallo Pombia, Italy) presented a preview of toys made of a polymeric matrix of biological origin (from renewable feedstock), selected for the Special fair area *Toys Go Green* ("Inspired by Nature" category), dedicated to sustainable products. The renewable feedstocks (replacing those of fossil origin) from which the biopolymer is obtained are waste and residues from vegetable oil refining and cooking oil.

The fair was an opportunity to present these biobased products, capable of enhancing the circular economy.

The production process involves lower CO_2 emissions and has thus a lower carbon footprint compared to many conventional plastics. It is estimated that by using these bioplastics the carbon footprint is reduced by around 127 %. By replacing one tonne of conventional PP with one of the biobased plastics, up to 2,700 kg of CO_2 is saved. This emission is, for example, comparable to that produced by a Paris-Beijing flight.

On this occasion, Androni Giocattoli presented some items from the Green Garden line in this sustainable material variant, to make it an available option for an entire toy range.

The company has been paying attention to sustainability and environmental impacts for years by investing in more sustainable choices, e.g. with the introduction of some product lines in recycled material, made with post-consumer recycled plastic (PCR). PCR plastics have a low environmental impact while maintaining almost the same mechanical properties and processability characteristics as virgin ones.

Strengthened by this experience in *green* production, entirely made within their factories and with raw material controlled through chemical safety tests (according to the EU Safety Directives) the company is able to offer these certified, innovative, and more circular products allowing the achievement of sustainability objectives while maintaining the same quality standards. **MT**

www.androni giocattoli.it

Mobby-Dig finally available in bioplastic

Eight out of ten kindergarten children in Germany know and love the all-time classic digger – the Mobby-Dig from the 4EverSpiel brand by BLS (Forchtenberg, Germany). Produced by BLS in southern Germany, it guarantees long-lasting fun for children from the age of three thanks to its robust construction and high-quality workmanship.

Due to the increasing demand of BLS customers, the Mobby-Dig is now available in a version made from bioplastic based on sugar cane. Sebastian Reiche, Head of Product & Marketing at BLS says, "Fast-growing sugar cane is the optimal starting material for our sustainable bioplastic and is in no way inferior to the classic Mobby-Dig in terms of durability and sturdiness. In cooperation with FKuR from Willich, Germany, we decided on Green PE from Braskem, which is perfect as a drop-in solution with our tools, for both injection moulding and the digger's blow-moulded parts. We've also tested other bioplastics since 2015 – but ultimately decided on Braskem".

Thanks to the ingenious geometry and high-quality workmanship of the digger, there are no sharp edges or corners and the so-called *scissor points* on the digger arm were designed in such a way that parents don't have to worry about pinched children's fingers. "Because we had no previous experience with biobased plastics on our tools, the subject of toy safety was especially important to us", says Reiche. "The chemical safety was clarified quickly, but the fracture behaviour had to be tested in detail. This is where Green PE has proven to be unbeatable".

True to the motto "Crafts, Learning, Playing", BLS has been selling and producing high-quality toys for 25 years. The manufacturer, importer, and wholesaler wants to motivate, inspire, and activate children. The close contact with customers and partners enables the company to always orientate itself towards current developments and the needs of children, parents, and educators. BLS sells mainly items of its own design and brands. MT

www.bls.net

Sustainable products for young families

A diaper bag that was not only fashionable but multifunctional and sustainable was the starting signal for LÄSSIG in 2006. Founded in Babenhausen (Germany), as a family business, the company pursues the goal of combining profitability, humanity, and sustainability, in the best possible way.

What started with a simple idea has now become a colourful world step by step as a team. With high-quality, sustainable, stylish, and functional fashion and lifestyle products for babies, children, and parents, Lässig meets the demands of modern families in over 50 countries.

The focus

An unprotected baby deer needing protection is the company's image. The deer stands for the base values of the company: Catering to families with products that merge lifestyle and creativity with sustain – and responsibility. But more than just products, the company is set to change the living conditions of people in poorer regions they work with – contributing to the protection of our planet and life on it.

Material history

Consequently, natural materials like natural rubber, wood, organic cotton, and others are some of the materials of Lässig's choice. However, with a focus on the functionality of their products, from the very first day of business, they have built on synthetic materials like polyester, polypropylene, co-polyesters, polyethylene, etc. due to their physical properties as well as functionality.

Constant R&D towards the highest sustainability goals have marked the company's product history: About ten years ago, they started working with dope dying methods to save water during the textile dying process of materials used for the earliest products, mummy bags. At this stage, the expression *dope dye* was not even defined as such.

Lässig's first collection of tableware in 2015 was the starting point in the company's journey of working with *solid* plastics. Step by step, more and more sustainable alternatives have replaced petrol-based polymers.

Expressing the non-textile part of the company's product range in materials, they talk about bamboo, wood, silicone, stainless steel, porcelain, glass, etc. With all esteem as a *sustainable brand*, a major part of the products are based on polymers.

The material journey took them from pure petrol-based to polymer compounds with natural fillers in 2017, where they were able to replace up to 70 % of petrol-based materials in some product ranges. This option continues to be an important material for Lässig due to its price-performance ratio.

Since then, different material options have been tested and further developed, such as Lässig's PLA/PBS compound with more than 85 % biobased content, which they started to use in 2020.

With additional big potential other biobased materials, such as biobased PE/PP options are currently considered.

In their strive for circular products, Lässig is currently also actively working on recycled polymers, such as PET and carrying out performance tests to define potential (re-)usage options within the product range of toys and tableware.

By:
Claudia Stöhr
Head of Quality, Innovation & Sustainability Management

LÄSSIG GmbH
Babenhausen, Germany

The biggest challenges in research and development towards more sustainable materials were found to be issues such as:

- Processing properties: durability and flexibility to allow, for example, long-term usage of hinges being part of some of the food storage items as well as toys.
- Usage properties and extended life cycle: microwave resistance and dishwasher compatibility are requests and needs of clients which are taken seriously.
- CO_2 and environmental compatibility: materials with potentially positive CO_2 contribution or otherwise smallest possible negative CO_2 footprint during the full product life cycle. The biggest focus is not only production and transportation but also potential long-term effects of farming/mining/production processes of raw materials on soil, water, and air. There is still little data available on such long-term effects, not even thinking of reliable comparative data/-bases.
- The best possible ethical compatibility, such as materials not being in conflict with food ethics – possibly materials from production residues or recycled materials.
- With humanity in mind, Lässig aims to make a positive contribution to social development, so humanitarian aid and protection as well as positive development of societies and living conditions is their goal not only in their daily work but also through product and material development. Similarly, in a regenerative farming project for their cotton products, the dream is to make a positive impact on living conditions with all products and materials used.

- Gene manipulation is also an issue. So, Lässig strives for sustainable materials that would not be in conflict with this conviction.
- Circularity: Even at this stage where only about 10 % of their products would even be considered for recycling due to the development of recycling streams as well as political decisions: With product life cycles of approximately 35 years and more of Lässig's quality products, the company feels responsible already now for their *afterlife*. This led to a preference for *solid* mixtures such as, e.g. PE with recycled/biobased content if for defined reasons a mixture is not avoidable.
- With design and creativity being part of the company's DNA and providing goods to a highly design-relevant target group, durable embellishment, such as printability is an important feature of the products.
- Consumer´s *right to repair* is currently a project for electronic and technical consumer goods. Lässig is determined to extend this right towards all of their products, wherever possible. The ideas are not limited to spare parts, repair shops, and tutorials, but go further than that. In this context, *repairability* does not start in product design, but earlier than that in the choice of raw materials and cooperation partners.
- Transparency and traceability: as a company, Lässig is committed to allowing not only their customers a glimpse behind the scenes. They want to be open towards the clients about all information needed to make not only smart but also responsible and individually correct choices. In these times of regulations such as supply chain due diligence, anti-greenwashing legislations, and digital product passports, certifications and external proofs seem to be the officially defined *means of choice.* However, and additionally, to the necessity of proofs and certifications, The company still maintains their approach of *mutual trust first*, which they consider as being the only potential base of relationships with clients as well as cooperation partners.

"The more we research and gather information, the more we consider it our duty to pass on this information", concludes Claudia Lässig, Founder and Managing Partner of Lässig. "In order to do so, we need suitable cooperation partners, which would not be afraid to open up in regard to sharing information".

"And yes", she adds, "we consider constant R&D in terms of sustainability not only our duty but a great opportunity and joy, which we love to continue together with our customers, peers as well as cooperation partners".

www.laessig-fashion.de

200-year-old company focuses on alternative raw materials

"Keep up with the times and time won't pass you by". This well-known quote describes the situation of the Austrian toy manufacturer GOWI (Mariazell) very well. Though GOWI is almost 200 years old, the traditional company remains up-to-date and strives for alternative plastic materials for its toy production.

For this reason, GOWI launched a second product line more than three years ago, that continues to be successful. The "BIO BY GOWI" line made of sugarcane-based polyethylene pleases young and old alike. With a watering can, bucket, sand moulds, and water mill, the most popular GOWI toys are included and convincing with their high quality.

The biggest hurdle in all these attempts with alternative materials is that the GOWI quality promise is kept. That means it is necessary for the toy to be as robust and durable as the classic GOWI toy.

In addition to the sugar cane product line, the company is also taking its first steps with recycled materials. GOWI is a partner of the NUK Soothermonster recycling initiative, which was launched in 2022. In cooperation with HolyPoly (Dresden, Germany), used soothers, cups and bottles are collected, sorted and recycled by NUK to make new sand moulds.

However, since GOWI also wants to work with recycling materials itself in the future, the company continued to search and finally found a competent partner who can supply the company with material. At the moment, GOWI is still testing itself in this field in order to be able to comply with the necessary quality and safety regulations. GOWI expects to launch a new product line in the course of this year and anticipates great demand for the innovative products. MT

www.gowi.at

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Biobased and chemically recyclable foam

OrthoLite® (Ho Chi Minh City, Vietnam), the global leader of sustainable, performance and comfort insoles and footwear materials solutions, and Novamont (Novara, Italy), the international leader in the development, production and eco-design of biodegradable and compostable bioplastics and biochemicals, announce an exclusive partnership in the creation of OrthoLite Cirql™, the world's first circular foam material solution for footwear.

OrthoLite Cirql foam is a patented footwear materials solution combining OrthoLite's 26 years of expertise and innovation in foaming polymers and Novamont's world-leading biobased, compostable, and recyclable polymer to provide the first technology capable of greatly reducing the high impact of the manufacturing process with multiple end-of-life disposal options.

According to a new Life Cycle Assessment carried out by the Massachusetts Institute of Technology (MIT – Cambridge, MA, USA), a typical pair of running shoes generates 14 kg/30 pounds of carbon dioxide emissions, equivalent to running a 100-watt light bulb for a week. Every year, in the United States alone, people throw away more than 300 million pairs of shoes, 95 % of which end up in landfills.

OrthoLite Cirql will offer a conventional-plastic-free, scalable, and truly circular material to OrthoLite's 500+ footwear brand partners and factory stakeholders in 2023.

"At OrthoLite, operating sustainably has been central to our DNA since our inception 25 years ago, and Cirql represents our continued commitment to this effort and a natural extension of our brand", said Glenn Barrett, OrthoLite founder and CEO. "Worldwide footwear production has increased by over 20 % since 2010 with no signs of slowing down. As an industry, the onus is on us all to help mitigate our environmental impact on the planet. It's going to take commitment and a concerted team effort, but Cirql is a major step in that positive direction".

OrthoLite sought out the high-tech bio-polymer company because of Novamont's pioneering activities in the field of the circular bioeconomy and for its 30 years of experience in the development of chemical and biotechnological processes to create low-impact certified biodegradable and compostable solutions with multiple end-of-life options for everyday life, including: packaging, separating organic waste collection, retail purchasing, disposable tableware, farming, lubricants, cosmetics, pharmaceuticals, and more.

"Proving by facts that it is possible to *do more with less*, Novamont has always based its model on the development of products conceived as true catalysts for change, which are capable of activating much greater systemic effects than the product itself, and not as mere substitutes for traditional ones", explained Catia Bastioli, CEO and Founder of Novamont. "Our philosophy has always been to avoid the problems of pollutant accumulation in the environment, and the fruitful collaboration with OrthoLite, a company that is also committed to finding solutions and not just products, allows us to bring our approach to the footwear industry for the first time".

OrthoLite Cirql is free from *forever chemicals* and responsibly sourced from non-GMO traditional vegetable raw materials derived from plants plus synthetic biodegradable materials. The material is a co-polyester based on Novamont's Origo-Bi technology, it includes their Bio-BDO monomer plus other biobased and synthetic monomers. A big advantage of the material is that it can be both returned to the production cycle via a low-energy advanced chemical recycling process, keeping materials in use or, alternatively, it can be brought back to nature through selected industrial composting methods and processors. Using existing and new, closed loop, take back, recycling streams for footwear, scalable end-of-life management will involve collaboration with footwear brands and the waste management sector. OrthoLite Cirql will also help avoid the accumulation of persistent microplastics as particles will biodegrade similar to natural polymers such as cellulose.

Novamont Research developed a tailor-made biopolymer material for OrthoLite Cirql's chemical-free foaming process which uses nitrogen combined with renewable energy. Unlike the conventional foaming methods currently used, no dangerous or toxic chemical additives are used in the production of Cirql. The biopolymer pellets are melted and mixed with liquid nitrogen under extreme pressure, in a unique injection moulding process that results in incredibly efficient cycle times that reduce energy consumption and create a finished part with no downtime, polymerization, or waste as it doesn't require the additional steps and typical finishes that conventional midsoles require when they are produced

Certified as a B Corp in 2020 with a top-tier ranking, Novamont is a member of the United Nations Global Compact network, a leadership platform for the development and implementation of responsible corporate policies and practices. OrthoLite Cirql marks the company's debut in the footwear industry. Together, the partners are bringing a global solution for environmental improvement across the global footwear industry, a market currently valued at around USD 400 billion.

Operating sustainably has also been central to OrthoLite's DNA since its founding more than 25 years ago, beginning with footwear insoles containing recycled rubber. As the insole supplier of choice for more than 470 leading footwear

brands worldwide, across all categories – outdoor, athletic, running, comfort, golf, lifestyle, and fashion – OrthoLite insoles are utilized in more than 500+ million pairs of shoes every year. With trust-based relationships through its wholly-owned and vertically integrated global supply chain and production facilities located in countries around the world, OrthoLite's commitment to sustainable, circular solutions has an immense and measurable global impact. The brand's current goal is to achieve zero waste, which is a significant step toward pollution reduction and the regeneration of natural systems–central tenets of circular, sustainable solutions.

OrthoLite Cirql is committed to full transparency and third-party validation and has undergone extensive third-party testing and analysis including a complete Life Cycle IVL Assessment. OrthoLite Cirql is Certified Industrial Compostable – (Din Certco), REACH-certified (EU), USDA Certified BioPreferred®, RSL compliant (Intertek), certified GMO-free, certified vegan, and hypoallergenic. **AT**

www.OrtholiteCirql.com | www.novamont.com

First CO_2-based running shoes

A milestone in the quest to become carbon circular

Creating a circular future for the plastics industry is a bold ambition, and achieving it is non-negotiable. Significant progress has been made: an increased focus on design for reuse and recycling, the development of pioneering digital watermark technology, and advancements in mechanical and chemical recycling are all providing evidence that we're on a path to a more circular future – but recycling alone isn't a silver bullet for plastic's sustainability challenges.

In order to truly call the plastics industry 'circular', we need to consider the plastics lifecycle as a whole – crucially, we also need to become circular in carbon. Borealis' (Vienna, Austria) Circular Cascade Model sets out a holistic approach to achieving true circularity, including a gradual shift from fossil-based feedstocks to *A-B-C* alternatives – Atmospheric carbon, Biobased carbon, and Circular Carbon from recycled feedstocks.

Many of the technologies needed to realise the vision of the Circular Cascade are already at the mid-stage of development – the exception is atmospheric carbon capture, which is still at an early stage of commercialization, however, these so-called CCU (Carbon Capture & Utilisation) technologies are part of a Renewable Carbon future. Despite it still being in an early stage, exciting developments around the world show that the technology is moving beyond the demonstration into more and more commercial-scale investment projects.

A landmark moment in the use of atmospheric-carbon-based feedstock

One such breakthrough was announced last summer by Swiss sports brand On (Zurich). Their launch of Cloudprime made from CleanCloud™ – the first running shoe sole made from carbon emissions – represents a landmark moment in the use of atmospheric-carbon-based feedstock in the footwear and polymer industry.

An inspirational example of the Everminds™ spirit in action, the shoe is the result of intensive work over three years involving On and Borealis, as well as partners LanzaTech (Skokie, Il, USA), a market leader in carbon recycling technology, and Technip Energies (Nanterre, France), an engineering and technology company specialising in the green energy transition.

How it works

The state-of-the-art process used to make CleanCloud proof of concept begins with LanzaTech, who capture carbon emissions, which would otherwise be released to the atmosphere, and then use a process of bacterial fermentation to convert it to ethanol. The ethanol was dehydrated by Technip technology to become ethylene. At Borealis, the ethylene is polymerized to create EVA (ethylene vinyl acetate) – a virgin-quality material that is perfectly suited to be used as the raw material for the foam cushioning in On's high-performance running shoes.

Borealis concluded the proof-of-concept stage for CleanCloud producing the first shoes with EVA midsoles made out of 51 % carbon emissions, but On's ambition is to roll it out across its footwear collection. To make this a reality, Borealis will be continuing to work with partners on implementing CO2-based polyolefins technology on a commercial scale.

Inspiring future progress

The shoe serves as a proof-point of our power to decouple plastic from fossil fuels. Only a few years ago, such a product would have seemed far beyond reach. In demonstrating what is possible through collaboration, it provides inspiration for future development. **AT**

www.borealisgroup.com | www.on-running.com
www.technipenergies.com | https://lanzatech.com

Bioplastics: labels, regulations, and the path to sustainability

In September 2020, California's Governor signed the Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54) into law to reduce plastic pollution and promote sustainable packaging. The act requires packaging producers to ensure that their products are recyclable, compostable, or reusable by 2025, and establishes a framework for a state-wide extended producer responsibility program for packaging.

Bioplastics have been touted as a more sustainable alternative to traditional plastics, but their end-of-life management is challenging, and additional regulatory work is necessary for them to be effective. One challenge with bioplastics is that they require specific conditions to break down and compost, such as high temperatures and specific humidity. Without proper disposal, bioplastics can end up in landfills, where they degrade in the absence of oxygen and create methane, or worse, discarded in the environment and continue to add harmful microplastics through erosion and exposure.

Therefore, it is crucial for California and other governments to develop regulations to ensure that bioplastics are properly labelled and disposed of, avoiding unintended consequences and ensuring they are a more sustainable alternative to traditional plastics.

One key issue is the labelling of bioplastics. Currently, there is no clear definition or labelling requirement for bioplastics in California. Products labelled as "Biodegradable" or "Compostable" may not meet the necessary criteria to break down properly in composting facilities. This can lead to the contamination of compost streams, making it difficult for facilities to produce high-quality compost.

To address this, California's Department of Resources Recycling and Recovery (CalRecycle) is developing regulations to standardize the labelling of bioplastics. The regulations will require manufacturers to provide evidence that their products meet specific biodegradability and compostability standards, ensuring that they are suitable for composting and will not harm the environment.

Another challenge is ensuring that bioplastics are disposed of properly. With composting, now a mandated service across the state of California, this can facilitate the end-of-life option for biodegradable materials that are compostable in traditional municipal composting facilities and not generating harmful microplastics.

Polyhydroxyalkanoates (PHAs), such as PHB, are a family of biodegradable polymers produced by numerous microorganisms, through bacterial fermentation of sugars, vegetable oils, and other biomass or biogas. These products can biodegrade in nature if discarded inadvertently, causing no harm and generating no microplastics that can build up in our food chain. All the while, retaining their ability to be recycled and composted.

However, without proper regulation and requirements from suppliers and manufacturers to provide third-party results with clear evidence of biodegradability and compostability, the industry risks being subject to "greenwashing". Random icons with the words "Compostable" or "Biodegradable" without proper certification are meaningless and erode public confidence when exposed to scrutiny. This underscores the need for all parties involved to work with the various governmental agencies on establishing the necessary certifications required.

Beyond Plastic (Irvine, CA, USA), tackles these issues by engaging policymakers, advocating for proper support for the bioplastic industry, and collaborating with others to stay informed and factual on our material choices, their applications, and end-of-life options. They provide transparency through their published testing and certifications of their materials and compounds by reputable third-party labs and true experts in the field.

Labelling a product as biodegradable is easy but ensuring that the claim is factual and scientifically proven is the hard part. Together, we can ensure that bioplastics become a more sustainable solution for the future. **MT**

https://beyondplastic.com

The jungle of corporate sustainability

An introduction to requirements, regulation, and legislation

The topic of sustainability is on everyone's lips. From all directions, entrepreneurs are increasingly confronted with the most diverse aspects. This is the first of a loose series of articles scheduled for upcoming issues.

Getting started with holistic sustainable business transformation

The requirements will increase even more, as legislation worldwide foresees a tightening of existing guidelines or new laws. The first big question is: What are the actual requirements and to what extent are you affected?

First of all, the good news is that many companies are already taking various actions related to sustainability but are actually often not aware of it. Even the sustainability-related standards listed below have already been partially implemented by many companies. And no, you do not have to establish all of them in your company to be sustainable. Relax. But now let's talk about how it all began:

The beginnings of sustainability started with the founding of the "Club of Rome" network in 1986 with a paradigm shift: interconnected challenges that cannot be solved independently. The goal was and is to establish holistic and long-term thinking for a better future.

Since then:

- 1980s: first environmental reports
- 1995: Introduction of EMAS (Environmental Management and Audit Scheme)
- 1999: GRI (Global Reporting Initiative) the most widely used standard worldwide
- CDP (Carbon Disclosure Project (2000)
- UNGC (United Global Compact 2000)
- B-Corp (Public Benefit Corporation 2006)
- GWÖ (Common Good Economy 2011)
- DNK (German Sustainability Code 2011)
- IIRC (International Integrated Reporting Framework 2013)
- SRI (Sustainable Responsible Investments 2014)
- SBTi (Sustainable based Targets initiative: collaboration of CDP, UNGC and WWF 2015)
- 17 SDGs (Sustainable Development Goals 2015)
- TCFD (Task Force on Climate-related Financial Disclosures 2017)
- SASB (Sustainability Accounting Standard Board 2018)
- CSDD (Corporate Sustainability Due Diligence Directive 2023)
- EU Taxonomy: ESG (2023)
- ESRS and CSRD (European Sustainability Reporting Standards and Corporate Social Responsibility Directive 2025)

This was followed by a large number of standards related to sustainability:

- ISO 9001 Quality Management
- ISO 14001, 04,05,06,07,08,31,50,63 (environmental management)
- ISO 14020, 21, 24-26 (environmental labelling and declaration)
- ISO 14033, 34 Quantification of environmental information
- ISO 14040 Life cycle assessment and life cycle
- ISO 14044 LCA requirements and guidelines
- ISO 14064-67 Greenhouse gas emissions
- ISO 14091 Climate change risks
- ISO 20400 Sustainable product management
- ISO 26000 Social responsibility
- ISO 45001 Occupational Health and Safety
- ISO 50001 Energy Management Systems
- ISO/TC 323 Circular Economy
- DIN/SPEC 91436 Waste and Value Stream Management
- DIN/SPEC 91446 Plastic Recyclates

It is not surprising that virtually all market participants are completely overwhelmed by these requirements.

A global driver are the 17 SDGs as the basis of the 2030 Agenda, which was adopted by 193 member states of the United Nations on 25 September 2015. At the heart of the Agenda are the 17 Sustainable Development Goals, the SDGs, with their 169 targets. They touch on all policy areas, from economic, social, environmental, and financial policy to agricultural and consumer policy, as well as areas such as transport, urban development, education, and health.

By:
Christina Granacher,
Managing Director
BeGaMo GmbH
Hohenfels, Germany

Another very important global driver is ESG: Environment, Social, Governance. Environment stands for resource-conserving and sustainable measures that protect the environment. Social refers to what the company does for the communities in which it operates. Governance stands for transparent and ethical business practices as well as control measures to ensure the integrity of the company in all areas.

The world's leading reporting standard is GRI, which is closely linked to ESG and the emerging ESRS. The GRI guidelines are intended to support sustainable development worldwide and provide comparable decision-making and orientation aids, which are published in voluntary reporting.

Climate change is currently on everyone's lips and is being looked at from different angles: Carbon credit funds, insured emissions, net zero targets to decarbonisation of industrial real estate. Regulation is now at the forefront globally, not only in the EU but increasingly in the US and Asia-Pacific markets.

The next part is about the topic: Getting started – analyses and sustainability strategy

BeGaMo is an engineering company and management consultancy focusing on sustainability, new materials/ bioplastics, and circular economy. They are able to help you navigate the jungle of sustainability, among others with their own software, *D4S: Designed for Sustainability*, a holistic sustainability accelerator based on over 10 of the world's sustainability standards, suitable for companies of all sizes – 80 % time saving for data collection and automated seven analyses incl. reports: ESG, SDG, GRI, D4S, stakeholder & double materiality analysis, GHG protocol.

www.begamo.com

SAFE THE DATE:

Sustainability and Plastics (in German only!)

21. September 2023

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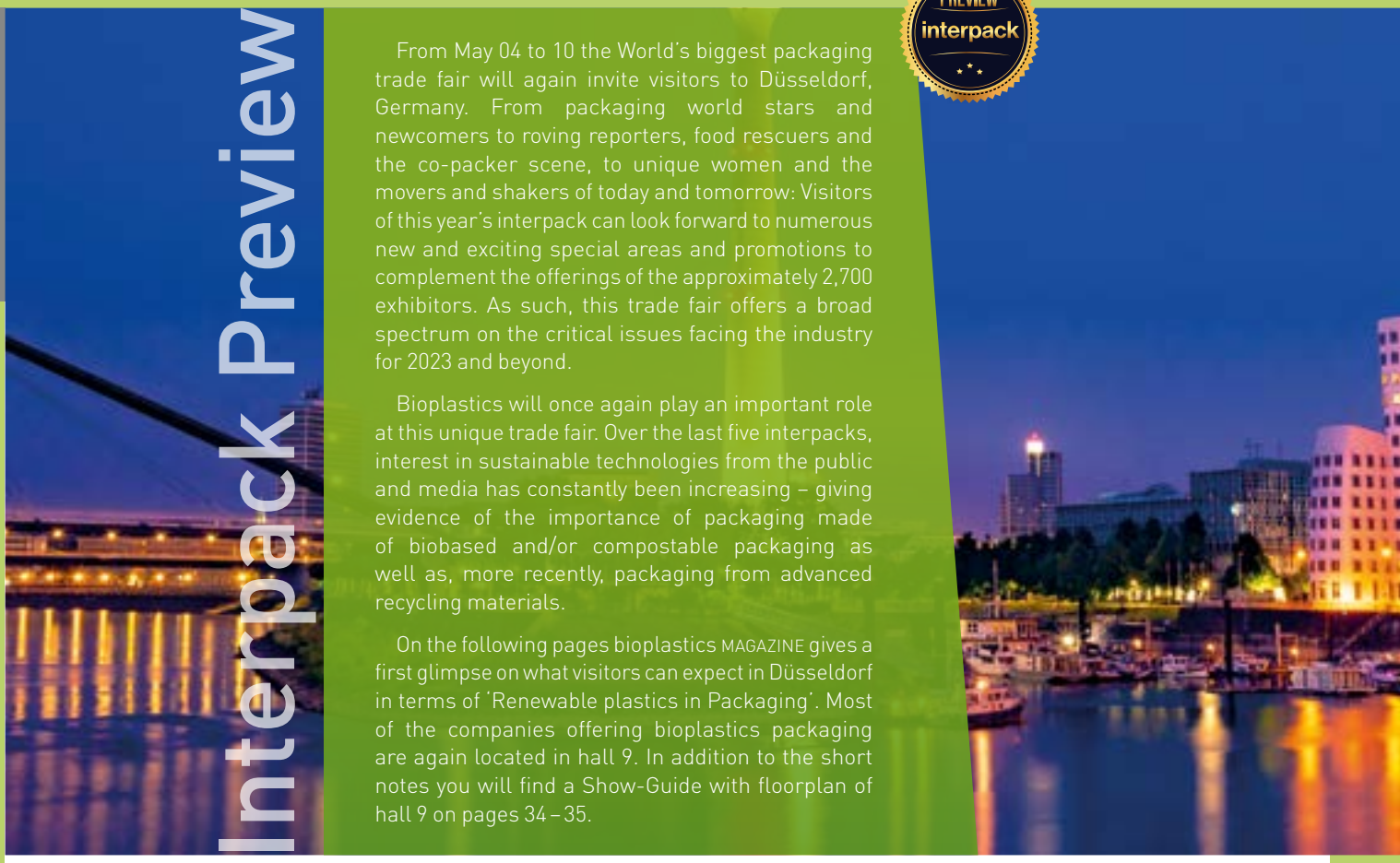
Three main topics:
sustainability, biopolymers, and circular economy



Interpack Preview

From May 04 to 10 the World's biggest packaging trade fair will again invite visitors to Düsseldorf, Germany. From packaging world stars and newcomers to roving reporters, food rescuers and the co-packer scene, to unique women and the movers and shakers of today and tomorrow: Visitors of this year's interpack can look forward to numerous new and exciting special areas and promotions to complement the offerings of the approximately 2,700 exhibitors. As such, this trade fair offers a broad spectrum on the critical issues facing the industry for 2023 and beyond.

Bioplastics will once again play an important role at this unique trade fair. Over the last five interpacks, interest in sustainable technologies from the public and media has constantly been increasing – giving evidence of the importance of packaging made of biobased and/or compostable packaging as well as, more recently, packaging from advanced recycling materials.

On the following pages bioplastics MAGAZINE gives a first glimpse on what visitors can expect in Düsseldorf in terms of 'Renewable plastics in Packaging'. Most of the companies offering bioplastics packaging are again located in hall 9. In addition to the short notes you will find a Show-Guide with floorplan of hall 9 on pages 34 – 35.

Safepack

BioSafe Sustainable Packaging Solutions

"The earth, the air, the land, and the water are not an inheritance received from our fore fathers but are on loan from our children. Our responsibility is to at least hand over to them as it was handed over to us". – Mahatma Gandhi

Safepack Super PLA coated paper and boards are the NextGen solutions which greatly improve the mechanical properties of PLA films, enabling the expansion of the application areas with industrial compostability as ideal end-of-life option and also available in metalized variant. Other Safepack Bio-safe options available are Eco Aqueous coating / PLA coated range with features like:

- EN 13432 compliant/Repulpability/RoHS certified
- Food grade
- Grease/water proof
- Heat sealable
- Flawless running on existing FFS machines
- Optimum barrier protection

This sustainable, biodegradable, compostable, recyclable unique range is manufactured by biobased renewable/natural resources for applications like:

- Disposable paper cups
- Paper cartons/trays/lids
- Portion packs / tea packaging
- Food & pharma packaging
- Industrial packaging

Safepack's sustainable journey started a decade ago with World Star 2013 award winning, "bio-polymer coated cupstock", and reached its new pinnacle being the first Indian company to receive the prestigious WPO President's Award 2022 for the innovative sustainable product development.

https://safepack.com 7.1 E37

ADBioplastics

ADBioplastics is a Spanish company specialising in the development and manufacture of additives and improved bioplastics. With its products, the company aims at showing industry and society that more environmentally friendly plastic polymers are possible.

ADBioplastics manufactures the additive ADBio PLA+, an impact modifier specially designed to improve the mechanical properties of PLA. Through a compounding process, the additive is blended with this biopolymer to create a PLA-Premium bioplastic.

The products are biobased and compostable, and produced from raw materials from renewable sources such as corn, sugar cane and/or sugar beet which, under industrial conditions, disintegrate in just three months. This will enable companies to comply with the European Union's plastic reduction directive by 2030, promoting the circular economy.

www.adbioplastics.com 9 F03

DIN Certco

DIN CERTCO – TÜV Rheinland – Precisely, right

Certification for sustainable packaging solutions

Compostable Products

Materials, packaging, and products that can be recycled in industrial composting play a major role in the circular economy. Due to their great potential for meeting stricter disposal requirements, the demand for industrially compostable products made from biodegradable materials is continuously increasing.

DIN Certco certifies your biodegradable products in accordance with DIN EN 13432 and, if applicable, other national and international standards, and awards the two internationally recognized certification marks: The "DIN-Geprüft industrially compostable" test mark and the "Keimling" compostability mark of European Bioplastics.

Sustainable biomass

DIN Certco certifies your biomass, bioenergy, and biomass-based products according to the International Sustainability & Carbon Certification (ISCC) system and REDcert. The certification system can be applied to the entire value chain, from farming to the sale of biofuels and biobased products, so products can be tracked along the entire value chain.

And many more topics – just come and ask!

www.dincertco.de | www.tuv.com 12 D82

SHOW-GUIDE

Booth	Company	Location in hall 9
9-F03	ADBIOplastics	2
N C01	AIMPLAS	
10-B43	BASF	
9-E09	bioplastics MAGAZINE	1
9-F16.3	Biotec	3
9-D22	Bisio Progetti	4
9-B10	B-PACK S.P.A.	5
9-A32	Braskem	6
9-F05	Changzhou Biolegeen Ecotech Material	7
9-G02	Chiripal Poly Films	8
9-C22	CHOCAL Packaging Solutions	9
9-G03	CJ Biomaterials	22
10-E44	Coexpan	
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12 D82	DIN Certco	
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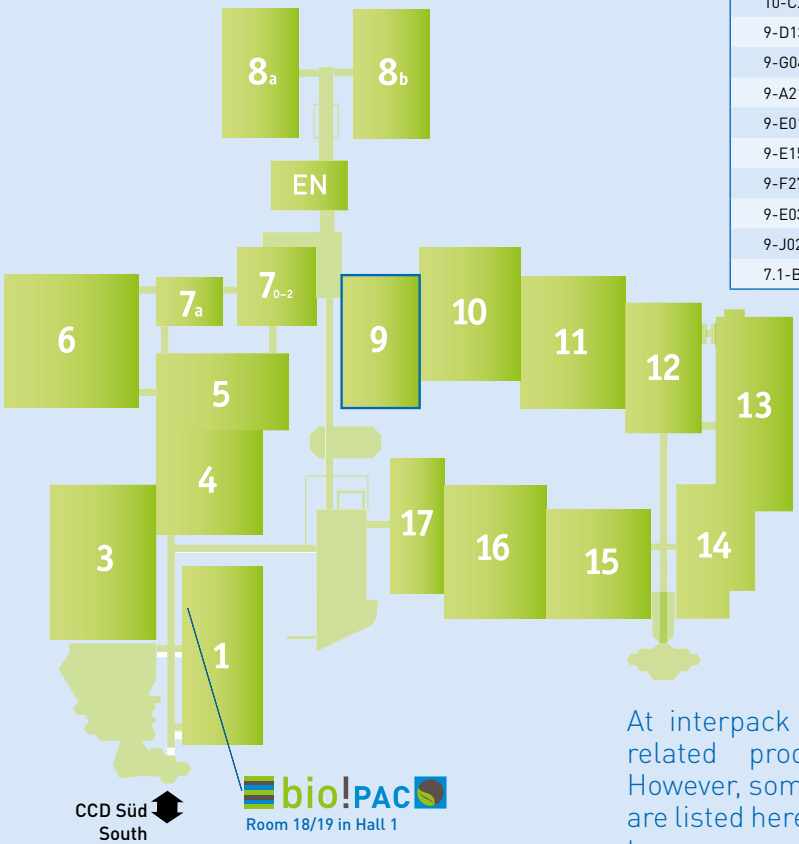
9-E09	European Bioplastics	1
9-F14	FKuR Kunststoff	11
7.1-E27	Flöter Verpackungs-Service	
9G22/4	Fortis Plastik	12
9-F13	Futamura	13
10-B20	Futerro	
7.2 A16-10	Green Packaging Material (Jiangyin)	
8b-H77	Hangzhou Bing Jia Technology - Locked Air	
8b-G14-4	Henan Longdu Torise Biomaterials	

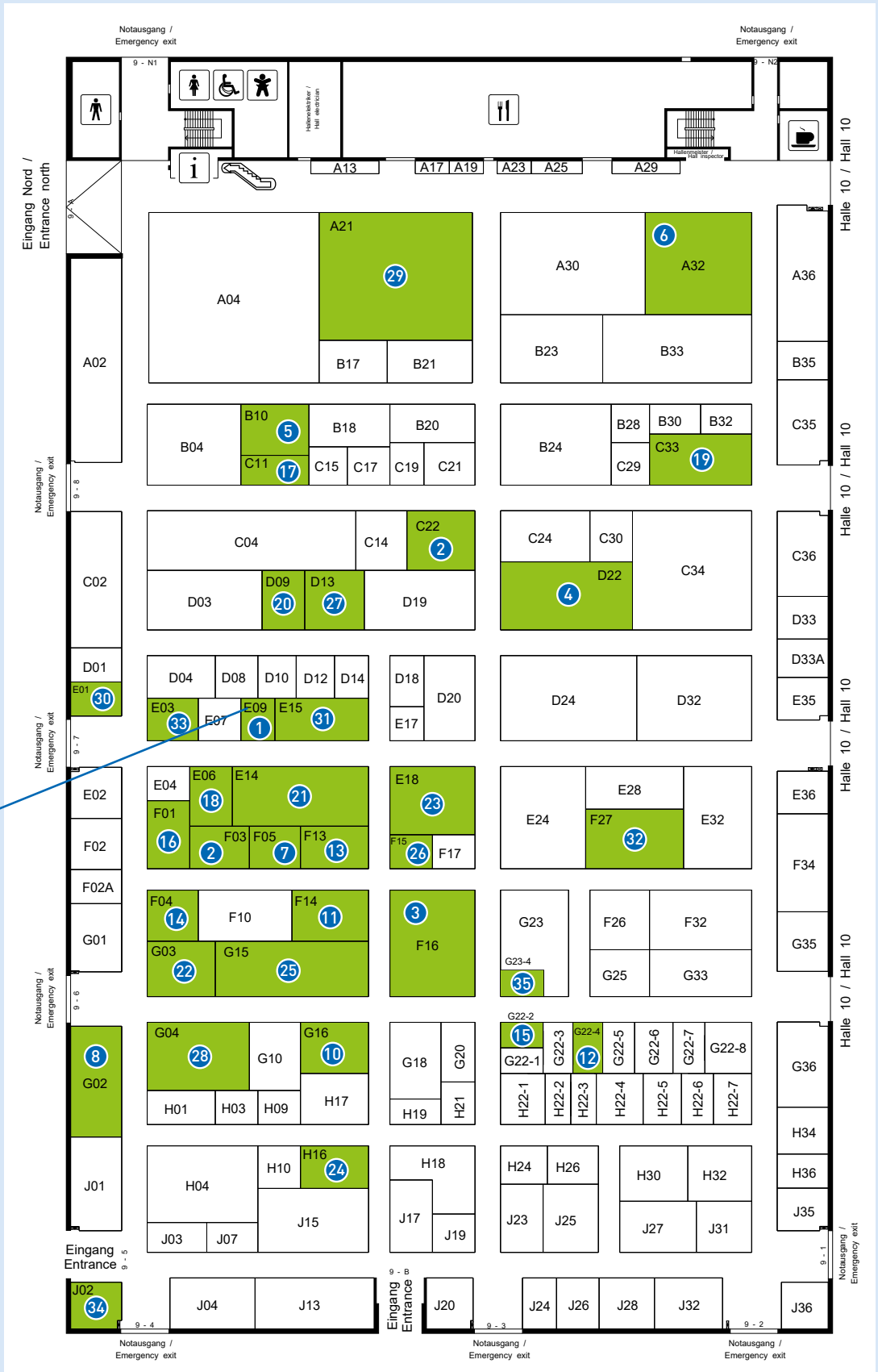
Booth	Company	Location in hall 9
10-B68	I.T.P.	
10-C60	ICEE Containers	
9-F04	Innovia Films	14
8a-D66	In.Pack Machinery	
9-G22.2	Isik Plastik	15
9-F01	ITENE Packaging, Transport & Logistics Research Center	16
7a-C13	James Pels	
9-C11	Jiangmen Proudly	17
9-E06	Jinhui Zhaolong	18
9-C33	Joma Kunststofftechnik	19
7-A07	jonatura	
10-D63	Kuraray (Plantic)	
7.1-E40.2	Larplast Plastik	
7a-C17	Marubeni International (Europe) Chemical Group	
8a-F32	Matrix Pack	
9-D09	Minima Technology	20
9-E14	Mitsubishi Chemical	21
9-G03	NatureWorks	22
9-G23-4	Natureplast	35
10-C26A	NOW Plastics,	
9-E18	Nurel	23
9-H16	Oerlemans Packaging	24
8a-C12	Omya	
9-G15	Pacovis	25
8a-D80	Ricoh International	
7.1-E37	Safepack Industries	
9-F15	Serim B&G	26
8b-G08-6	Shandong Henglian New Materials	
7.2-B43-8	Shenzhen Esun Industrial	
10-C29	Sidaplax	
9-D13	Sirmax	27
9-G04	SoBiCo	28
9-A21	Taghleef Industries	29
9-E01	TotalEnergies Corbion	30
9-E15	United Biopolymers	31
9-F27	Walki Group	32
9-E03	Wipf	33
9-J02	Xiamen Changsu Industrial	34
7.1-B41-2	Yi Shen Plastic	

Members of European Bioplastics are marked in orange



At interpack 2023 most of the exhibitors offering bioplastics-related products and services are located in hall 9. However, some more exhibitors can be found in other halls. These are listed here as well. For your convenience, you can detach these two pages and use them as your personal Show-Guide.

Hall 9



Meet us at booth E09

european bioplastics

bioplastics MAGAZINE.COM

Natureplast

NaturePlast is specialized in bioplastics materials with more than 15 years of experience.

The company is supporting manufacturers and contractors who wish to develop products from bioplastic materials (biobased and/or biodegradable).

Three areas of expertise:

- Distribution of bioplastics, production of compound and biocomposite
- Service (training/technico-economical study/ project engineering)
- R&D (customized formulation/characterization)

NaturePlast has the largest range of bioplastics in Europe, with almost all references available (PLA/PHA/TPS/ PBS/BioPET/Bio PA...).

In addition to conventional composites based on plant fibres such as wood, miscanthus, and hemp, NaturePlast also develops a whole range of new biocomposites made from co-products (food and industrial).

Therefore, for a few years, the company has been developing new bioplastics based on fruit and vegetable pulp, kernel powder (olive), leather waste, algae from French coasts, seashell powder...

This interest came, on the one hand, from a wish of industrials to find new ways of valorization of their co-products, and on the other hand, by their choice of non-noble raw materials instead of agricultural resources competing with human food.

www.natureplast.eu | www.biopolynov.com

9 F22-1

Biotec

BIOTEC, a leading bioplastics manufacturer, is pleased to announce the introduction of three new bioplastics that promise to revolutionize the packaging industry. The new materials, Bioplast 700, Bioplast 800, and Bioplast 900AD, will be showcased at the upcoming Interpack trade fair in Dusseldorf, Germany.

Bioplast 700 is a home compostable transparent bioplastic designed for film-blown applications, providing a sustainable alternative to traditional polyethylene film. Bioplast 800 is specifically formulated for heat-stable thermoforming applications, providing a sustainable solution for a wide range of packaging products. Bioplast 900AD is a new injection-mouldable bioplastic that offers excellent mechanical properties and short cycle times.

"We are excited to introduce these new bioplastics to the market", said Stefan Barot, CEO of Biotec. "Sustainability is at the core of our mission, and these new materials are a significant step forward in our efforts to create a more sustainable future".

The new bioplastics are based on renewable resources such as potatoes, sugarcane, and cassava, and are fully biodegradable. They offer a significantly lower carbon footprint than traditional petroleum-based plastics, helping to reduce the environmental impact of packaging products.

www.biotec.de

9 F16-3

TotalEnergies Corbion

TotalEnergies Corbion Luminy® PLA portfolio includes products in four categories that can be used in various conversion technologies:

- High-heat PLA for demanding applications
- Standard PLA for general-purpose applications
- Low-heat PLA typically used as seal layer
- PDLA used either as a nucleating agent or to create full stereocomplex compounds.

Luminy PLA neat resins from TotalEnergies Corbion are compliant with the relevant regulations and standards related to bioplastics:

- Approved for use in food contact applications in EU (EC No. 10/2011), USA (FDA 21 CFR), and China (GB 9685 – 016)
- Compliant with EN13432 and ASTM D6400 standards for industrial composting
- Biobased content of 100 % according to EN16785-1 and ASTM D6866
- REACH compliant

Luminy PLA resins are made from sustainably sourced raw materials, meeting the *sugar cane code of conduct* developed together with Corbion and the Thai sugar mills.

Luminy PLA resins have a reduced carbon footprint versus traditional polymers. Read the verification of this claim in the peer-reviewed LCA study.

www.totalenergies-corbion.com | tinyurl.com/Luminy-LCA

9 E01

10-11 Oct 2023

Atlanta, GA, USA

3rd PHA platform World Congress

organized by bioplastics MAGAZINE.COM

Call for papers now open!

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PHA (Poly-Hydroxy-Alkanoates) is a family of biobased polyesters. Examples of such polyhydroxyalkanoates are PHB, PHV, PHBV, PHBH, and many more. That's why we speak about the PHA *platform*.

Depending on the type of PHA, they can be used for applications in films and rigid packaging, biomedical applications, automotive, consumer electronics, appliances, toys, glues, adhesives, paints, coatings, fibres for woven and non-woven, and inks. So PHAs cover a broad range of properties and applications.

Also depending on the type, most PHAs are biodegradable in a wide range of environments, such as industrial and home composting, anaerobic digestion (AD), in soil, fresh- and even seawater.

After the successful first two PHA platform World Congresses in Germany, this unique event is now coming to the USA.

10-11 October 2023 in Atlanta, GA / USA

(subject to changes)

www.pha-world-congress.com

New dishwasher-safe bioplastics

and natural-coloured recyclates from FKuR

At Interpack 2023, FKuR (Willich, Germany) will be showcasing sustainable raw material solutions for the packaging industry. The focus will be on innovative, resource-conserving packaging plastics such as high-quality, natural-coloured recyclates as well as biobased, dishwasher-safe bioplastic compounds that are particularly suitable for the multi-use sector.

High-quality PCR recyclates with versatile colouring options

"Grey is the new White" is often the phrase used when talking about recycled materials. But not at FKuR: All compounds of the Terralene® rPP product range are characterized by a natural to white appearance. This means they can be coloured in a variety of ways and offer packaging manufacturers new possibilities in terms of design freedom.

Terralene rPP is a family of hybrid compounds based on polypropylene (PP) that combines the ecological advantages of recycled and biobased raw materials with 100 % recyclability. Depending on the product grade, the recycled content ranges from 30 % to 60 % and comes from post-consumer waste streams. The biobased share is up to 33 %.

The Terralene rPP drop-in product range can be used in a variety of applications due to the good flowability and natural colour of the granules but is currently still limited to the non-food sector.

A new addition to the portfolio is Terralene rPP 3508. This injection moulding grade is characterized by optimum process stability on standard machines. Due to the compounding process specially adapted to the raw material, an MFI of 20 g/10 min [acc. to ISO 1133] can be achieved despite the high recyclate content of 60 %.

Distribution of EuCertPlast-certified PE and PP recyclates from Kaskada

In addition to its own recyclate and hybrid compounds, FKuR will be presenting a broad distribution portfolio of EuCertPlast-certified PE and PP recyclates for injection moulding, blow moulding, and extrusion at Interpack.

"It already became clear at K2022 how great the interest is in sustainable, high-quality recyclates", states Patrick Zimmermann. "For food packaging in particular, however, there are still some hurdles in terms of recyclate use. If packaging manufacturers already want to make their packaging more sustainable, our biobased, highly recyclable drop-in bioplastics are the right choice, in addition to our high-quality recyclates", Zimmermann continues.

New: Dishwasher resistance proven for Terralene® HD 4527 and Bio-Flex® S 5514

Since January 1, 2023, all final distributors in Germany who sell takeaway food and beverages have been obliged to offer their products in reusable packaging. If these reusable items are also made from renewable raw materials, fossil raw materials can be conserved even more effectively and CO_2 emissions reduced.

"The earth cannot produce raw materials as fast as humans consume them. Our resources are not infinite", emphasizes Niklas Voß, Associate Sales Director at FKuR. " Thanks to the successful dishwasher testing of our grades Terralene HD 4527 and Bio-Flex S 5514, we give our customers additional security in the development of sustainable reusable concepts", Voß continues.

Both grades meet the high requirements for temperature or chemical resistance and can be used for dishwasher-safe multi-use plastic articles.

Visitors to interpack who want to make their products fit for the circular economy, visit FKuR in hall 9 at booth F14. **MT**

www.fkur.com 9 F14

New formulations for sustainable packaging

Sirmax (Cittadella, Italy), a leading manufacturer of polypropylene compounds, engineering plastics, elastomers, circular polymers from post-consumer recyclates (PCR), and bio-compounds, opens 2023 with some important news. The news concerns BioComp® compostable bioplastics – a family of fully biodegradable and certified compostable materials whose physical and mechanical characteristics make them usable in multiple fields as a replacement for fossil-based plastics such as polyethylene (LD-PE, HD-PE), polypropylene (PP), and polystyrene (PS). Its composition, which is partially derived from plant-based biomass, has the added advantage of being biobased by nature, with high percentages of biobased materials for some types of formulations. BioComp is a compound that can be both starch-based (TPS) or biodegradable polyesters (PBAT – PLA – PBS) based, depending on the technical properties required by the final items that have to be manufactured.

Sirmax's R&D engineers have fine-tuned and optimized BioComp formulations, which are specifically made for the extrusion of both ready-made products and sheets for thermoforming. The granules, which are compostable, are intended for the production of plates, cutlery, glasses, food take-out trays, and, more generally, for anything involving rigid food packaging, which can then be disposed of along with organic waste, where it is allowed. The granules are also available in an injection moulding (IM) grade that can be used, for example, for coffee capsules.

"Recent field tests, carried out both through in-house laboratories and thanks to the foresight of some of our main clients, have shown how the new range for extrusion and thermoforming is perfectly in line with the final characteristics that the manufactured product must have", commented Alberto Zanon, BioComp Sales Manager. "The option to use the same moulds and equipment as traditional raw materials means the company can offer its target clients a *green* product at no additional cost. Moreover, our engineers are accustomed to supporting clients across all machine set-up phases, helping them identify the best solutions to meet their production needs".

In general, historical products in the BioComp range, denoted by *BF* codes, cover a wide variety of applications in the flexible packaging sector and therefore lend themselves to being processed through blown film extrusion to make bags for fruit and vegetables, various types of carrier bags, and organic waste collection bags.

All BioComp products comply with the EN 13432 standard and the entire range is *OK Compost Industrial* certified. This means that, once the manufactured product has been disposed of and sent to the appropriate composting centre, it will be turned into fertilizer along with other organic waste so that it can be used to grow new crops and have a positive effect on soil composition.

Specific grades, which are currently mainly used for packaging film, are *OK Compost HOME* certified, meaning they can be disposed of with domestic food waste. This is a very old, simple technique to generate fertilizer independently through home composters.

Sirmax has 13 production plants across Italy, Poland, Brazil, USA, and India. It has gained significant market share in Europe, the Americas, and Asia, making it a global reference on the international market. In 2021, the Group generated a turnover of EUR 480 million, and employing more than 800 people worldwide. To date, it has leading global clients in the automotive, household appliance, electrical-electronic, and various other sectors. In addition to its range of bio-compounds, the company is also investing in recycled plastics from post-consumer sources, particularly for the production of durable goods such as automotive panels, components for large and small household appliances, and parts for domestic and industrial applications in the electrical sector.

"For Sirmax, innovation means continuous action", stated Massimo Pavin, Sirmax Group president and CEO. "Our goal is to be closer to our clients by offering them up-to-date solutions, and to be mindful of the environment with a view to true *proximity compounding*".

New additions to the BioComp range will be on display at the Sirmax Group booth at Interpack, (Messe Dusseldorf, May 4–10), Hall 9 Stand D13, and presented as part of the bio!PAC event, organized by bioplastic MAGAZINE during Interpack on the fairgrounds, on May 8 and 9. **MT**

www.sirmax.com 9 D13

High-barrier biopolymer made from starch

PLANTIC™ is a high-barrier biopolymer made from starch and is designed to meet the growing world demand for a sustainable approach to plastics technology. PLANTIC TECHNOLOGIES (Altona, VIC, Australia) has released the new PLANTIC EP resin and new PLANTIC FX semi-rigid materials.

Derived from starch, Plantic is the world's most advanced biobased material, it can be used in both recycle-ready and compostable formats while providing renewable, plant-based content, with excellent gas-barrier performance to extend shelf life and create odour barrier. Plantic products dramatically reduce the environmental impacts produced by traditional packaging materials while providing the opportunity for materials once considered not recyclable to be recycle-ready.

The new plant-based resin is designed specifically for converters who perform extrusion coating, Plantic EP can be used to develop sustainable gas and aroma-barrier solutions with paper, paperboard, or traditional film substrates. The new resin grade when applied on paper recently passed repulping and recyclability certification from Western Michigan University (WMU), laying the groundwork for sustainable barrier pouch and carton formats for brand owners and converters.

Plantic EP is currently available for trial and commercially in use with several brands around the world. Targeted applications include pouches and cartons for coffee, pet food, dry mixes, and more.

Plantic FX is a new range of semi-rigid materials that are made from new Plantic resins and polyolefins.

This new composition has high-barrier, deep draw thermoformability, and good Impact resistance at low relative humidity all done without the need to use nylon. Current testing shows that Plantic FX when drawn to a ratio of over three has over six times better barrier performance on the measured OTR when compared to conventional barrier materials.

Plantic FX material is suitable for packaging fresh produce including meat, chicken, fish and seafood, smallgoods, fresh pasta, and cheese.

Plantic continues to have success with its rigid materials and thrives to have circularity in the economy with the continued use of rPET in its structures. As a recent award winner in the Oceania region, Plantic designed a new range of materials to suit Coles Finest Carbon Neutral Beef Range, the packaging is made from over 90 % of renewable and recyclable materials it was created to pack the beef which is certified carbon neutral from paddock to shelf to the Australian Government's Climate Active Carbon Neutral Standard. What is believed to be a world first where both the product and the pack are better for the environment when compared to incumbent products.

Innovation is the key to the company's success, and they continue to invest and innovate in new structures to suit the high-performance and sustainable needs of consumers. The company has numerous accolades which are believed to be global first releases.

- Renewable plant-based material
- High-barrier recyclable material
- High barrier structures made from recycled and renewable material
- Coloured recyclable material

Numerous awards around the world have been received as recognition to these outstanding products. MT

www.plantic.com.au

10 D63

More sustainable solutions for thermoformed plastic packaging

Neste (Espoo, Finland) and ILLIG (Heilbronn, Germany) have entered into a strategic partnership to advance the use of more sustainable solutions in the production of thermoformed plastic packaging through demonstration cases. Such cases aim to verify the drop-in nature of renewable and recycled materials for demanding applications – by recreating value chains on a small scale for demonstration purposes.

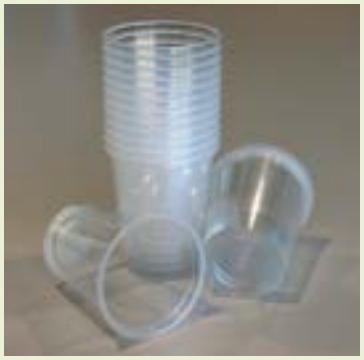
The partners combine Neste's expertise in providing renewable and recycled materials for polymer production and ILLIG's expertise in manufacturing thermoforming systems to create practical showcases. Inviting additional partners for individual cases, the showcases are to demonstrate that plastics made from more sustainable raw materials can be further processed within the already existing infrastructure similar to those produced purely from fossil resources, resulting in products of equal quality and with properties meeting regulatory requirements.

In spring 2022 and together with companies LyondellBasell (Rotterdam, the Netherlands) and Fernholz (Meinerzhagen, Germany), the project participants already successfully ran a feasibility study along the value chain turning renewable Neste RE™ feedstock into polypropylene with measurable C^{12}/C^{14} biobased content. The study showed that further processing steps along the value chain – including cracking, polymerisation, sheet extrusion, and thermoforming – could be performed without any deviations from processing fossil raw materials. The four companies presented their joint project at 2022's K fair in Düsseldorf with a live thermoforming demonstration.

As part of the new cooperation agreement, Illig and Neste now intend to conduct similar demonstration case studies to promote the usage of renewable feedstock like Neste RE, especially in demanding applications such as packaging suited for food contact or technical applications such as consumer electronics. Such studies could explore the manufacturing of packaging with varying measurable C^{12}/C^{14} biobased content but also include packaging produced with recycled raw materials leveraging Neste's capabilities in chemical recycling to create circular plastics value chains. To recreate entire value chains, additional partners will be invited to join individual cases. Over the course of the studies, processes, facilities, and machinery used will be closely monitored and analysed to provide new insight into the quality and property of products and the performance of value chain infrastructure.

"Renewable and recycled raw materials for polymers such as Neste RE are already being used today to reduce the sector's reliance on fossil resources. It's now a question of scaling up their share to make a bigger positive sustainability impact", says Jeroen Verhoeven, Vice President Value Chain Development at Neste's Renewable Polymers and Chemicals business unit. "Together with Illig, we can verify the drop-in nature of our solutions and the shift to more sustainable raw materials in the production processes in very practical demonstration cases, which can serve as blueprints for large-scale and real value chains. Our goal is to demonstrate what's possible already today to promote these solutions in the industry. By demonstrating the feasibility of renewable and recycled materials along value chains in demonstration cases, we can foster their acceptance on a larger scale". **AT**

www.illig.de | www.neste.com

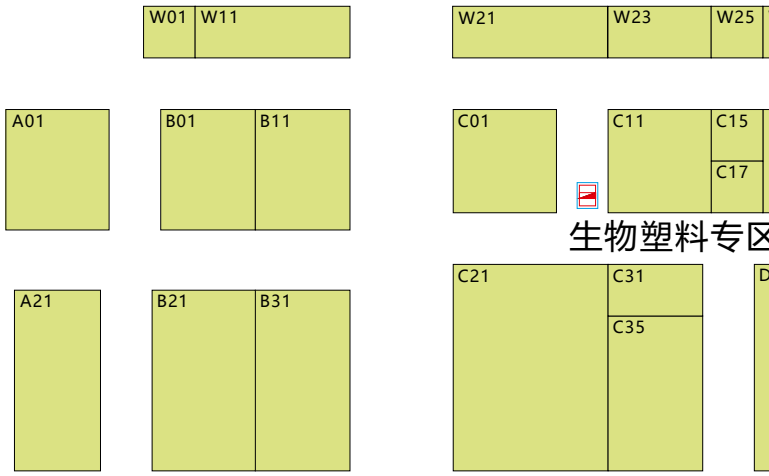


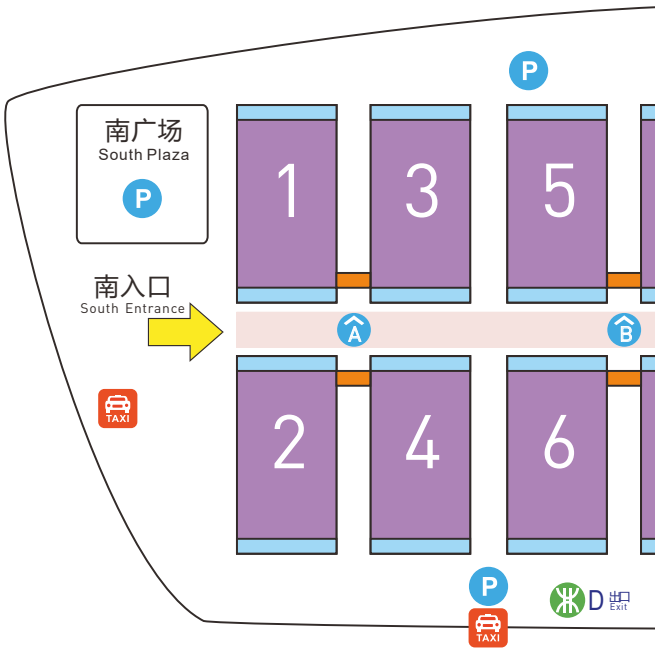
Fossil-based cups

Cups based on renewable raw materials from the above-mentioned project

Booth	Company
20G25	An Hui BBCA Biochemical
20W45	Anhui Jinganrun Bio-Technology
20D01	Anhui Jumei Biological Technology
20W11	Anhui Sealong Biotechnology
20W43	Anhui Tongli Advanced Material
20W57	Anhui Yihua Technology
20M15	Beijing Lvcheng Biomaterial Technology
20W71	Biofiber Tech Sweden
20B11	Biologiq Elite (Hk)
20W73	bioplastics MAGAZINE
20G01	Bluepha
20W31	Dong Guan Global Eco Tech
20L01	Dongguan Hongyan Plastic Material
20B31	Dongguan Xinhai Environment-Friendly Materials
20W55	Enerplastics
20W47	Gansu Mogao Juhe Environm.-Friendly New Material Technology
20W63	Guang Dong Remay New Material Technology
20W27	Guangdong Huayang Zhongsheng New Material Technology
20M03	Guangdong Jujing New Materials
20L09	Guangdong Moe Biotechnology
20L07	Hegen Polymer (Guangdong)
20W21	Henan Longdu Torise Biomaterials
20C35	Henan Techuang Biotechnology
20D21	Hong Kong Productivity Council
20M25	HSM Technologies
20W23	Hunan Juren Chemical Hitechnology
20C15	Jiangsu Beson New Biological Materials
20B21	Jiangsu Jinghong New Material Technology
20C21	Jiangsu Ruian Applied Biotechnology
20F05	Jiangsu Suiyamai Biotechnology
20M35	Jiangxi Heersi Eco-Technologies
20F11	Jiangxi Pingxiang Xuan Pin Plastic Cement Products
20C11	Jilin Cofco Biomaterial
20H01	Jilin Kaishun New Material
20H05	Jindan New Biomaterials
20H25	Jinfuliang Plastic Materials
20G05	Jinguan (Longhai) Plastic Packaging
20A21	Jinhui Zhaolong High Technology
20W53	Kushan Yi Jin Hang Plastic Technology
20F21	Liaoning Jinke Plastic Technology
20G21	Medpha Bioscience
20M31	Multiplex Screen Supplies
20M01	Nantong Aloe Green New Material Technology
20A01	Natureworks
20W01	Ningbo Baojiahua Biomaterials
20D35	Ningbo Homelink Eco-Itech
20L35	Oerlikon Barmag Huitong (Yangzhou) Engineering (Obhe)
20F01	Ping Ding Shan Bei An De Plasticizing
20D31	Pujing Chemical Industry (SHA)
20G35	Reberet (China)
20W67	Shandong Myhond New Materials
20G07	Shandong Orizon Biomaterials
20H21	Shandong Shenghe Film New Materials
20W29	Shandong Stark Biodegradable Technology
20G11	Shandong Tianrenhaihua Bio-Technology
20B01	Shandong Xinxiuli Biotechnology
20H23	Shanghai Huiang Industrial
20L05	Shaoxing Greenstar New Material
20C01	Shenzhen Esun Industrial
20W49	Shenzhen Greennature Biodegradable Technology
20F03	Sichuan Methyrr Technology
20H13	Taizhou Huangyan Ze Yu New Material Technology
20W61	Thai Wah Public Company Limited
20L25	Thyssenkrupp Nucera (Shanghai)
20F25	Total Corbion
20W41	TÜV Austria (Shanghai)
20L21	TÜV Rheinland (Shanghai)
20F35	Weifang Huawei New Materials Technology
20C31	Yat Shun Hong Company
20C17	Yingkou Dazheng Plastics Technology
20G09	Yingkou Economic & Techn. Dev. Zone Baoyuan Plastic Packing
20W33	Zhejiang Boxai Ecotechnology
20W51	Zhejiang Changhong Biological Material
20M21	Zhejiang Eazzan New Material Technology
20H35	Zhejiang Hisun Biomaterials
20F31	Zhejiang Hongwu Technology
20W25	Zhejiang Jusheng New Material Technology
20L03	Zhuji Shi Guizhen New Material

Hall 20号厅 - 生物塑料专区



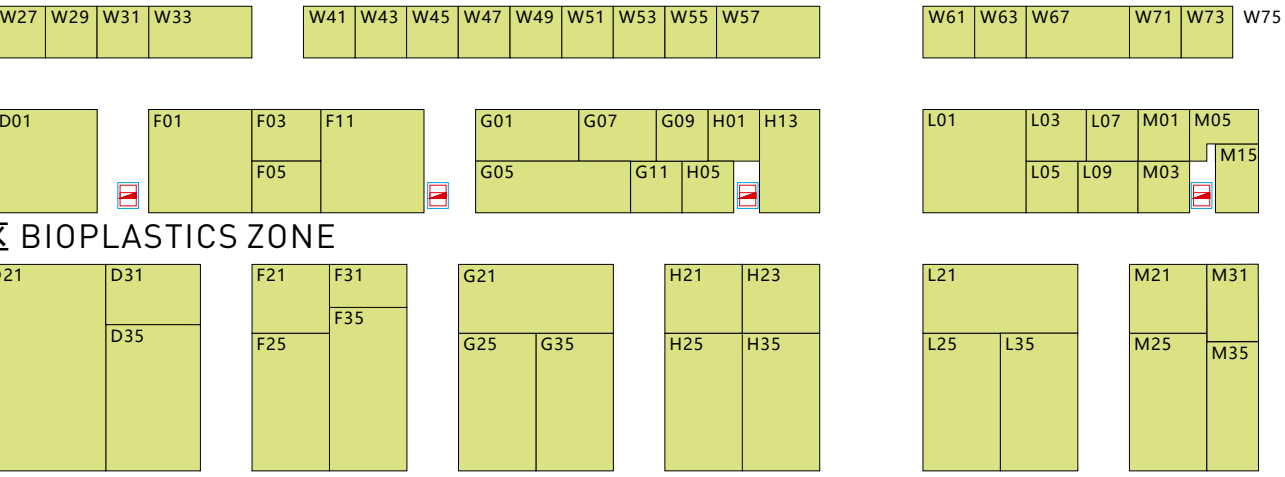


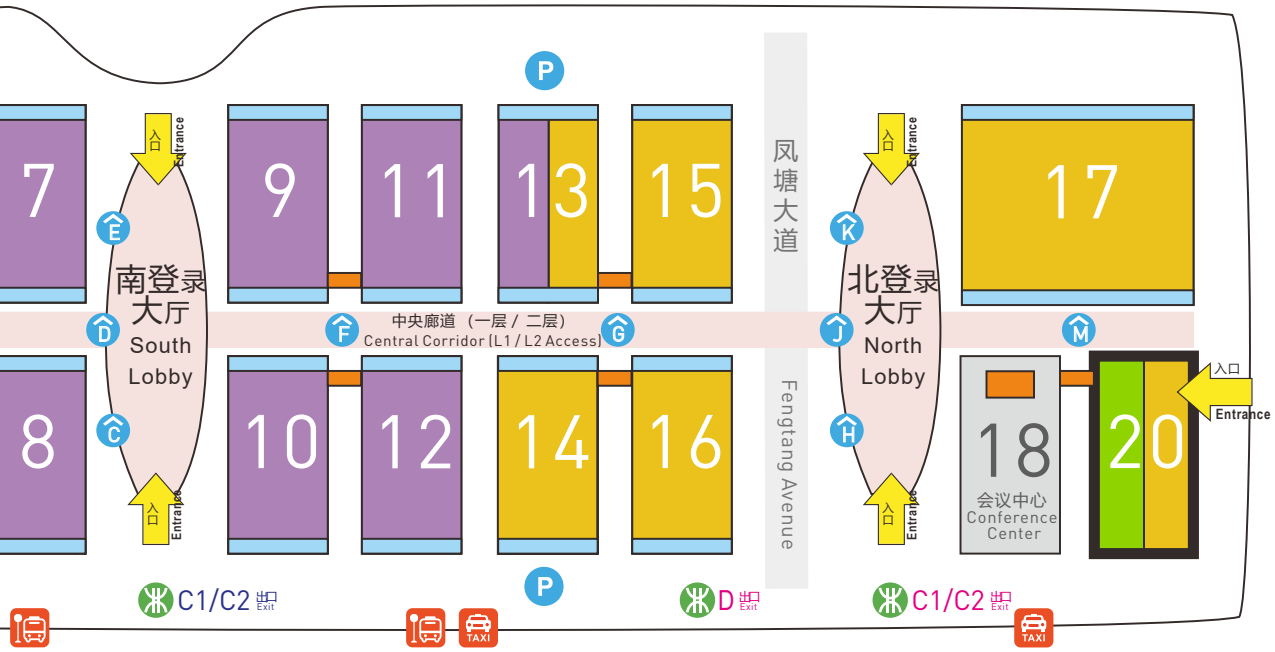
展馆总图
Overall SWECC Layout Plan

在本展会指南中，您可以找到大多数提供生物塑料产品的公司，如树脂、化合物、添加剂、半成品等等。

采购指南

Bioplastics Zone





机械馆
Machinery Halls

化工及原材料馆
Chemicals & Raw Materials Halls

创新科技制品专区 20
Innovative Products Zone

国家 / 地区展团
Country / Region Pavilions

In this Show Guide you find the majority of companies offering bioplastic products, such as resins, compounds, additives, semi-finished products, and much more.

Layout Plan courtesy Adsale Exhibition Service

CHINAPLAS 2023 Preview

Discover green plastics & rubber solutions in CHINAPLAS 2023

Green, Smart, Advance are the three keywords for most industries nowadays, including but not limited to the plastics and rubber industries. Green is the commitment to circular economy and sustainability. Smart can inspire innovations and enhance user experience. Advance is the powerful tool for improving productivity and quality. At CHINAPLAS 2023, to take place from April 17-20, 2023 in Shenzhen World Exhibition and Convention Centre (SWECC), Shenzhen, PR China, visitors will for sure immerse in these three hot technologies under one roof, helping inspire new ideas and explore new opportunities.

Intensifies innovations towards a Circular Economy

Under the theme "A Brighter and Shared Future, Powered by Innovation", Chinaplas 2023 will provide visitors with a whole spectrum of sustainable solutions in three theme zones, including the Recycled Plastics Zone, Bioplastics Zone, and Recycling Technology Zone. With over 14,000 m², 200+ machine makers and materials providers, including Erema, Starlinger, Avian, Tomra, Topcentral, Guolong, NatureWorks, BiologiQ, and Ruian, are to showcase the latest environmentally-friendly plastic materials and processing technologies.

Tech Talk: unveiling Greenovation and New Tech

Green is one of the hot topics in Chinaplas 2023, visitors can attend Tech Talk to learn more about green and leading technologies and their applications. Over 30 latest technologies will be revealed in a series of open forums and more than 20 industry experts will present the hottest and highly advanced products and technologies under five different themes: eco-friendly solutions, medical plastics & antimicrobial solutions, surface treatment solutions, lightweight solutions, and innovative materials.

Chinaplas has become a chosen platform to debut products and showcase advanced new technologies by exhibitors, Tech Talk remains the influential stage for launching state-of-the-art solutions of the year. Professional speakers will drill deeper into the practicability of sustainable and green solutions while audiences will quickly capture the industrial trends of plastics and rubber industries facilitating agile business decisions.

Leading companies from the plastics and rubber industries will attend Tech Talk and grasp the chance to interact with audiences. Dow Chemical will explore how close-the-loop packaging solutions empower the circular economy. SABIC will focus on their offer of innovative sustainable solutions towards a circular economy. ExxonMobil Chemical will introduce its design for recycling, offering advanced packaging solutions with sustainability benefits. Amcor will talk about how they made packaging solutions sustainable in the medical & healthcare sector. In addition to the open forum, the "New Tech Display Zone" is situated at the Tech Talk venue for visitors to get in touch with Avient and HP in a new meeting and interaction format. Avient will bring up their biobased solutions and successful case studies aiming at sustainability for a better tomorrow. HP will share the digital printing technology ready for sustainable on-demand packaging.

Some highlights of Chinaplas can be found on the previous and following pages, including a show guide with floorplan.

Make sure to visit the booth of bioplastics MAGAZINE at 20.W73

www.chinaplasonline.com

NatureWorks

NatureWorks is a pioneer in the development of biobased materials that reduce carbon impact and enable new end-of-use options with its Ingeo™ technology. 3D printing filaments and parts made with Ingeo PLA will be highlighted at the Installation Art *Sustainability Resonator* at Chinaplas. It is a co-creation installation that combines sustainable materials, additive manufacturing, technology, and art together. The notable performance characteristics such as precise detail, low odour while printing, and good adhesion to build plates with no heating needed make Ingeo PLA an essential material for the 3D printing market.

NatureWorks will also showcase the latest developments from their joint development partnership with CJ Biomaterials that brings unique PHACT™ amorphous PHA together with Ingeo biopolymer for new properties in flexible packaging, food serviceware, and rigid food packaging applications. Moreover, NatureWorks will serve the visitors with beverages using compostable coffee capsules and tea bags that demand sustainable, safe, low-carbon biomaterials and require the high-performance attributes that Ingeo is uniquely suited to deliver.

www.natureworksllc.com 13.2L41

Shandong Orizon Biomaterials

Shandong Orizon Biomaterials was established in 2009. It is one of the earliest specialized in R&D and production of biodegradable materials and products in China.

After more than ten years of continuous exploration and innovation, with a deep understanding and rich experience of fully biodegradable materials, they have established a series of efficient and practical production lines, which can produce a variety of fully biodegradable film products, such as shopping bags, garbage bags, mailing bags, dog-poop bags, etc.

As a pioneer in the domestic fully biodegradable product industry, Orizon have never set foot in non-biodegradable materials. They always focus on maintaining the leading edge in product quality and production technology. All products have passed the EU EN13432, Australia AS5810, US ASTM D6400 and other international standards certifications like BSCI and ISO. It is a set of practical solutions to deal with global *white pollution*.

www.orizonbio.com 20.G07

Biofibre Tech Sweden

By replacing fossil-based plastic with FibraQ, Biofibre Tech helps brand owners to reduce their CO_2 emissions!

Biofibre Tech's patented technology makes wood fibres hydrophobic and more compatible with plastics. Therefore, FibraQ can be used to create wood fibre compounds that can replace fossil-based plastics like PP/PE/ABS/TPE in existing products and applications.

With FSC and PEFC – certified European forests as a resource, Biofibre Tech creates sustainable materials for long-lasting plastic products. From car parts to 3D-printed furniture, household products, phone cases, or electronics. In 2022 Biofibre Tech was the first in the world to 3D-print a full-size kayak in one piece with wood fibre and recycled plastic compound.

The sustainable raw material FibraQ can be sold to any plastic compounder with a twin-screw extruder, no need to be specialized or adapt existing production. Giving any compounder a chance to offer wood fibre-based plastics.

The FibraQ compounds can be sold to brand owners or manufacturers for use in existing tooling and processes where they today use fossil-based plastic like PP/PE/ABS/TPE.

Biofibre Tech is funded by the Swedish government-owned investment firm Almi Invest GreenTech Fund. In 2018 Biofibre Tech was one of the finalists in the second International Innovative Entrepreneurial competition SahenZhen, China and won the second prize in the Stockholm, Sweden division.

www.biofibretech.com 20.W71

Bioplastics from microalgae

Biobased and biodegradable polymers such as polyhydroxy-butyrate (PHB) can contribute to sustainability and resource conservation by not only being produced by bacteria but also being completely biodegradable under difficult boundary conditions.

By using cyanobacteria (microalgae), PHB can be formed via material conversion processes as an energy store from biomass accumulated by oxygenic photosynthesis. At the University of Tübingen(Germany), a research group led by Karl Forchhammer was able to modify these microalgae in such a way that a yield of up to 80 % of PHB and its derivatives can now be achieved. For the production process, the microalgae only require nutrients, CO_2, and light, whereby the light is introduced directly within a reactor for the first time, thus offering an advantage in scaling up production compared to typical tubular reactors. Through processing in the form of centrifugation and removal of cell debris, the PHB is finally made accessible.

Thanks to the biodegradability of PHB, closed product cycles can be created (cradle-to-cradle principle) and thus special ecological requirements can be met. This property is very helpful for products that inevitably end up in the environment, as in agriculture, for example. The application of PHB in the form of nonwovens can also increase the microbial attack potential as a result of the increased surface. Due to their permeability, nonwovens can be used in particular for products such as plant pots, but also for filters and some packaging.

Despite these advantages, biopolymers such as PHB are rarely suitable for industrial applications in their pure form. This is where the joint research project of the Institute for Plastics Technology (IKT, Stuttgart, Germany), the German Institutes for Fiber and Textile Research (DITF, Denkendorf, Germany), and the company novis (Tübingen, Germany) comes in. The aim is to create novel and cost-effective production conditions for PHB using genetically modified microalgae. Furthermore, the produced biopolymer PHB is to be upgraded to a processable bioplastic by the IKT and afterwards processed into three-dimensional prototypes for the first time using the meltblown process by the DITF.

This project is supported by the Ministry of Food, Rural Areas and Consumer Protection Baden-Württemberg, Germany. **MT**

www.ikt.uni-stuttgart.de | www.novis.me | www.ditf.de

3D-moulded PHB nonwoven from a meltblown process in use as a flower pot.

Polycarbonate resin made from biomass-derived BPA

Teijin (Tokyo) is the first Japanese company to obtain ISCC PLUS certification for its PC resin products. The newly certified biomass PC resin products offer the same physical characteristics as resins made of conventional petroleum-derived BPA, allowing them to be used in commercial applications such as automotive headlamps and electronic components.

Beginning on January 30, Teijin, at the company's Matsuyama and Mihara production sites in Japan, has started producing and marketing biomass PC resin products containing BPA made from biomass naphtha that was tracked with the mass-balance approach as well as the conventional PC resin products using petroleum-derived raw materials. Under the mass-balance approach method, materials are verifiably tracked through complex value chains, as in the case of biomass-derived raw materials being mixed with petroleum-derived raw materials to create products. With the start of the environmentally friendly PC resin products, Teijin has launched a new product line called Circular Materials (CM) and the new biomass-derived PC resin products are now promoted under the names Panlite® CM and Multilon® CM.

Demands to reduce greenhouse gas (GHG) emissions throughout supply chains in order to support carbon neutrality are rapidly increasing, creating a need for more environmentally low-impact products. Going forward, Teijin will continue to expand its line-up of environmentally friendly resin products and solutions that help to reduce GHG emissions and other impacts throughout product lifecycles, thereby contributing to a more sustainable world. **AT/MT**

www.teijin.co.jp

Gum-rosin-based polymers for industrial applications

Driven by the world quest for biobased and environmental-friendly packaging solutions, an international consortium promoted under the EUROSTARS HORIZON 2020 Programme and formed by United Resins (UR – Lavos, Portugal), United Biopolymers (UB – Lavos, Portugal), Tecnopackaging (TP – Zaragoza, Spain), and Eversia (EVE – Murcia, Spain) intends to develop, demonstrate, and introduce into the market two novel biopolymers for industrial applications based on gum rosin derivatives. Being approved by the European Commission's Eurostars Programme under Reference Number 114728, *DDIBIORESIN* – Development and demonstration of innovative bio-resin-based polymers for industrial applications, combines four partners representing the complete supply chain for the manufacture and commercialization of the final products and targets a complete portfolio of biobased polymers for both flexible and semi-rigid applications. UR is the coordinator of the project and is a leading producer of gum rosin derivatives and counts on extensive experience in managing projects related to the development of technical solutions and products for the bioplastic industry. The knowledge brought by UR and UB was essential in raw material selection and bioplastics production, while the stated experience of industrial partners was crucial for the manufacturing processes and optimized conversion of such materials.

The project establishes two different lines of marketable food packaging products and targets the manufacture of three different end users' products: bioplastic films or bags; trays and a combined product featuring flexible and rigid solutions (i.e. tray with film sealing).

These novel biopolymers based on natural rosin derivatives are intended to improve some technical specifications and overcome some limitations with respect to the most common biobased commercial solutions. The addition of gum rosin derivatives enhances the melt flow index resulting in injection moulded materials with improved processability, allowing the reduction of the processing temperatures and consequently process energy consumption. Gum rosin it's a natural based material could also be used to increase the biobased carbon content if used in combination with conventional fossil-based plastics. Its antibacterial and highly hydrophobic character strongly impacts the water vapour permeability of bioplastics films, reaching values of less than 100 g/m²/day (at 25°C, 75 % r.h.) in the case of 15 µm films. Gum rosins are commercially compatible additives as they tend to have a lower price than PLA or PBAT which they are combined with. Preliminary results show that the incorporation of the resin affects the disintegration rate (slowing it down) and allows to control the biodegradability of these materials under composting conditions.

After almost two years of research and development, prototyping and industrial optimization the results are very optimistic. The process leads to the generation and acquisition of new knowledge regarding the usage and adaptation of natural based gum rosin derivatives to be incorporated into conventional compostable polymers such as PLA, PBAT, or starch blends. The resultant materials are then converted by means of injection moulding, thermoforming, and blown film extrusion. Presented by the name CoRez®-P2 to – P6, those materials are now under a final validation step and expect to be commercially available soon. AT

https://tecnopackaging.com | https://unitedresins.com | https://eversia.es/en | https://unitedbiopolymers.com

Sustainable packaging for perfume and cosmetics brands

Dow (Midland, MI, USA) and LVMH Beauty, a division of LVMH (Paris, France), the world leader in luxury and home to 75 iconic brands, will collaborate to accelerate the use of sustainable packaging across LVMH's perfume and cosmetic products.

This collaboration would enable both biobased and circular plastics to be integrated into several of the beauty multinational's product applications without compromising functionality or quality of the packaging.

Biobased and circular plastics, which are made from biobased and plastic waste feedstock respectively, will be used to produce sustainable SURLYN™ Ionomers, polymers used to manufacture premium perfume caps and cosmetic cream jars. Within 2023, some of LVMH's perfume packaging will include both biobased Surlyn and circular Surlyn. The sustainable Surlyn portfolio will deliver similar crystalline transparency and freedom of design expected from the rest of Dow's Surlyn range, at a low carbon footprint.

Biobased feedstocks for the production of biobased Surlyn include raw materials such as used cooking oil. As only waste residues or by-products from an alternative production process will be utilized, these raw feedstock materials will not consume extra land resources nor compete with the food chain.

Hard-to-recycle mixed plastic waste is transformed into circular Surlyn through advanced recycling technologies. The technologies break down waste plastics into their basic chemical elements using heat and pressure, creating raw material that is equivalent to those made from virgin fossil feedstock. This raw material, or circular feedstock, can be used in a wide range of packaging, giving waste that is currently going to landfill or being incinerated a second life. **MT**

www.dow.com | www.lvmh.com

Biobased polyolefins filled with cellulose fibre and waste coffee grounds

Avient Corporation (Avon Lake, OH, USA) recently announced an expansion to its portfolio of Maxxam™ BIO biobased polyolefins, strengthening its commitment to providing more sustainable solutions. The new grades utilize natural fillers such as cellulose fibre or recycled coffee grounds, which would otherwise go to waste, providing an alternative to conventionally filled polyolefins.

"We are constantly innovating to bring our customers new solutions that can help them reach their sustainability goals", said Matt Mitchell, Global Marketing Director of Specialty Engineered Materials at Avient. "In this case, our material science expertise has enabled us to utilize, and give value to, a material that would otherwise go to waste, contributing to a more circular economy".

Initially launched at the K Show in October 2022, Maxxam BIO biobased polyolefins are formulated with both biobased resin and/or filler from natural sources such as olive seed powder. The portfolio now includes newly added grades with up to 40 % filler from cellulose fibre or powder made from recycled coffee grounds. They can be based on either prime or biobased resin. Incorporating a biobased resin with a natural filler further enhances sustainability and reduces a products carbon footprint compared to fossil feedstock alternatives.

Aside from sustainability benefits, utilizing biobased fillers improves lightweighting compared to polymers traditionally filled with talcum, calcium carbonate, or glass fibre. Both cellulose and coffee-filled grades have good gloss and surface finish. Coffee-filled grades offer unique differentiation through visual appearance, and cellulose-filled grades are easy to colour and show improved mechanical properties compared to mineral-filled alternatives.

Depending on customer requirements, these formulations can be customized to provide additional performance characteristics such as scratch, UV, and mould/fungi/bacteria resistance.

Maxxam BIO biobased polyolefins with cellulose fibre or coffee powder can be useful for applications such as automotive interiors (decorative parts, trunk side liners, pillars, T-cup holders), consumers products (table and kitchenware, household goods), and packaging caps and closures. They are currently manufactured in Europe but are commercially available globally. **MT**

www.avient.com

Black is the new green

Newlight Technologies (Huntington Beach, CA, USA) is excited to announce the newest line extension to its family of AIRCARBON home-compostable straws – Aircarbon Straws in black – advancing the company's mission to help end climate change in this generation by creating products that work for people and the planet.

Designed with the consumer experience in mind, Aircarbon straws in black are smooth, never soggy, and home compostable, making them an ideal alternative to traditional paper straws that often get soggy during use. Available in a variety of sizes and both wrapped and unwrapped versions, Aircarbon Straws in black are the perfect answer for restaurants, resorts, and hotels looking to reduce their environmental footprint while enhancing the customer experience.

Aircarbon was born out of 10 years of research to mimic a process that occurs in the ocean every day, wherein naturally-occurring microorganisms in saltwater turn air and greenhouse gas into a material that is strong, smooth, carbon-negative, and home-compostable. The Aircarbon molecule, also known as PHB, is made naturally in every ecosystem on Earth, from the bottom of the ocean to the heart of rainforests. Today, Aircarbon is made at Newlight's production site in Southern California, harnessing the power of nature on land and at scale.

Aircarbon straws in black, together with straws in natural, green, and brown, are now available through select distributors across the USA, adding to the portfolio of Aircarbon Cutlery and Aircarbon Straws currently being distributed by Newlight's preferred partners. Aircarbon Straws have been certified home-compostable by TÜV Austria, industrially-compostable by BPI, and carbon-negative by SCS Global Services, turning everyday products into a force for change.

Aircarbon straws in black are the new brand standard for all Loews Hotels in the USA and are available for sale via select distributors around the country, including Imperial Dade, Edward Don, U.S. Foods, Sysco, Triple F, Premium, and VIP Foodservice. **AT**

www.rimax.com.co | www.ubqmaterials.com

Biobased cosmetic jar using amorphous PHA

CJ Biomaterials (Woburn, MA, USA) developed the first cosmetic jar based on their amorphous PHA technology. The cosmetic jar for Banila Co. (Seoul, South Korea) holds its Ceramide Cleansing Balm, part of Banila Co.'s popular *Clean It Zero* line of eco-friendly products. The new product is now available at CJ Olive Young's stores across South Korea.

The Clean It Zero Ceramide Cleansing Balm was created as part of an agreement between Banila Co. and CJ CheilJedang to introduce more eco-friendly materials. The balm is made with ingredients derived from plants, while the ceramide component is extracted from seeds of the moringa tree. In addition to the PHA-based container, biobased materials were used to create an accompanying application spatula. The paper packaging of the product is Forest Stewardship Council (FSC)-certified, meaning that the paper comes from wood that is harvested from forests that are responsibly managed, socially beneficial, environmentally conscious, and economically viable.

CJ Biomaterials is a leader in the production of PHA at a large scale and is the global leader in the development of amorphous PHA, a softer, more rubbery version of PHA that offers fundamentally different performance characteristics than crystalline or semi-crystalline forms of PHA. Their aPHA product, PHACT, is TÜV OK Certified for industrial and home compost, soil biodegradable, and marine biodegradable. It is considered *home compostable,* meaning that it does not require specialized equipment or elevated temperatures to fully degrade. Amorphous PHA is a tough, ductile, flexible, and thermoplastic biomaterial that has excellent thermal processability. In combination with other polymers, it can be converted into various structures, including sheet, injection moulded parts, fibres, films, and tubes. The Banila Co. cleansing balm is the first cosmetic jar using CJ Biomaterials' amorphous PHA with injection moulding that is in direct contact with the cleansing balm formulation.

"Consumers want to know that when they make purchases they are not harming the environment. We are proud to be working with Banila Co. to build on the already strong environmental profile of their Clean It Zero Ceramide Cleansing Balm", said Seung-Jin Lee, Head of the Biomaterials Business from CJ CheilJedang. "(This) announcement combined with the recent introduction of our first consumer brand application – a cosmetic container for the WAKEMAKE Water Velvet Vegan Cushion – demonstrates that demand for sustainable products is continuing to rise. We are committed to continuing to scale production of PHA to meet that demand". **MT**

www.cjbio.net/en/products/cjPha.do

Substituting ABS in cosmetics and beauty packaging

Beauty brands are seeking sustainable alternatives for conventional plastic packaging – but high-end brands have high-end demands.

An award-winning material innovation startup, Sulapac (Helsinki, Finland), has launched Sulapac® Luxe, a new biobased material ideal for substituting hard plastics, including ABS, as part of its expanded portfolio for cosmetics and beauty packaging. The new material comes in response to demands from the beauty industry's leading brands for more environmentally conscious packaging solutions that still offer high-end luxury feel, function, and aesthetics.

"One major challenge beauty brands face in replacing conventional plastics is the strict performance criteria of the chosen materials", says Colin Strobant, International Sales Director at Sulapac. "With Sulapac Luxe, we have shown that conventional plastics can be easily replaced without compromising on quality".

High density, resistance to temperature fluctuations, ceramic feel and sound, and a glossy, smooth surface are some of the material's characteristics, which are important for luxury brands. Sulapac Luxe is not only recyclable but like all Sulapac materials, it can also be made with recycled content, another feature important for many premium brands. "Sulapac is a pioneer in recycled biobased materials and our aim is to use only recycled biopolymers within the next five years", says Sulapac's CEO and Co-founder, Suvi Haimi. Sulapac Luxe is made from industrially compostable materials; it leaves no permanent microplastics or toxic load behind.

Several high-end beauty brands have already shown interest in utilizing Sulapac Luxe in combination with their existing glass fragrance bottles or jars. The material is commercially available to all manufacturers and slips seamlessly into existing injection moulding production lines.

Sustainable solutions for various applications and manufacturing technologies

With the expanded portfolio, Sulapac's customers can now create packaging for various product areas, including skincare, makeup, and fragrances.

Shiseido's brand Ulé utilizes Sulapac for their lids, while a diverse group of skincare brands from Lumene to Manik package their products in Sulapac jars. The selection of materials and production techniques allows brands to choose between a matt, glossy, or natural appearance complimented by a wide range of colour options.

Besides materials for injection moulding and extrusion, Sulapac's portfolio includes solutions for thermoforming, allowing cosmetic companies to create sustainable logistic trays and point-of-sale displays, as well as for 3D printing enabling sustainable prototyping.

Regulation and ambitious sustainability targets urge brands to switch to biobased, circular solutions

Demand for sustainable solutions is accelerating rapidly as companies are actively seeking alternatives for certain conventional plastics widely used in cosmetics packaging, including thermoset materials. They are unrecyclable and thus potentially subject to restrictions by European Commission's upcoming Packaging and Packaging Waste Regulation (PPWR). There are also upcoming country-specific restrictions for certain materials, such as ABS, that push companies towards more sustainable solutions. Sulapac's expanded portfolio enables cosmetic brands to replace controversial materials, such as thermosets and ABS, with truly sustainable alternatives – without compromising quality or aesthetics.

"We are happy to see the positive movement within the cosmetic sector as more and more brands are turning away from conventional plastic. Our job is to make this transition as easy and beneficial as possible – for brands, their customers, and the environment", says Haimi. AT

www.sulapac.com

Bio-attributed ABS for chrome plated sanitary fittings

INEOS Styrolution (London, UK), the global leader in styrenics, recently announced that Hansgrohe (Schiltach, Germany) a leading global manufacturer of sanitary fittings and fixtures has selected the company's sustainable Novodur ECO solutions for their next-generation products.

Hansgrohe is one of the world's largest producers of shower heads, hand-held showers, and taps/ faucets. As part of their challenge to reduce the company's ecological footprint, the company decided to look at the materials used for the production of their sanitary fittings. They selected INEOS Styrolution's Novodur ECO P2MC B50 for two reasons: Firstly, Hansgrohe's high-quality standards were not to be compromised and secondly, adjustments to production had to be minimal.

INEOS Styrolution's bio-attributed Novodur grades fulfil these demands: The products offer identical properties as the conventional material – including surface quality, impact strength, high flowability, and, in the case of Novodur ECO P2MC B50, suitability for electroplating. The material is also a plug-in solution not requiring any changes to the production setup. At the same time, Novodur ECO B50 grades offer product carbon footprint (PCF) savings of up to 71 % and a renewable content of up to 50 %.

"Thanks to the unchanged properties of INEOS Styrolution's bio-attributed ABS Novodur ECO P2MC B50 compared to the previously used material, we are now switching quickly, which makes our internal processes easier", said Matthias Stunder, Plastic Technology International Lead at Hansgrohe.

Frank Semling, Chief Operating Officer at Hansgrohe, said: "We are extremely pleased that the transition to the new sustainable Novodur ECO P2MC B50 was very swift and completely hassle-free".

Semling, added, "We are excited to be the first INEOS Styrolution customer in our industry to change to the new bio-attributed material. We encourage more companies in all industries to make the switch to sustainable materials to jointly improve our CO_2 footprint and achieve the goals defined in the Paris Agreement".

Eike Jahnke, Vice President Specialties EMEA at INEOS Styrolution said: "We consider Hansgrohe to be a pioneer in many ways. They led the way to the design bathroom of the 21st century, and at the same time, they are committed to sustainable management and responsible business practices. We will continue to develop sustainable styrenics ECO solutions for entrepreneurs like Hansgrohe. We are committed to delivering premium performance at a reduced ecological footprint". **AT**

www.ineos-styrolution.com | www.hansgrohe.de

Generic sample picture (Hansgrohe)

Origami Bottle made from biobased thermoplastic copolyester

DSM Engineering Materials (Heerlen, the Netherlands) recently announces its partnership with sustainability-focused startup DiFOLD (Sofia, Bulgaria), developing foldable reusable products.

The startup has chosen DSM Engineering Materials' Arnitel® Eco – a biobased thermoplastic copolyester – to manufacture its flagship Origami foldable water bottle. Adopting Arnitel Eco marks a major step forward in Difold's mission to reduce the environmental impact of packaging waste.

Inspired by the Japanese art of paper folding, the patented and award-winning design of Difold's Origami Bottle means it can fold down to less than 10 % of its original volume – greatly improving user convenience and reducing the carbon footprint of shipping. The Origami Bottle provides a durable, reusable, and recyclable alternative to single-use water bottles – helping to avoid plastic packaging waste. And because the bottles are made from DSM Engineering Materials' Arnitel Eco, the environmental benefits are even greater.

Arnitel Eco is a biobased thermoplastic copolyester, partially derived from renewable rapeseed oil. This significantly reduces the material's cradle-to-gate CO_2 emissions – delivering a carbon footprint reduction of up to 50 % compared to traditional copolyesters. This measurement is based on an in-depth life cycle assessment (LCA), which includes every stage of the material's production, from the growing of the feedstock crops to the finished product that leaves the factory.

These qualities make Arnitel Eco a perfect fit for Difold's Origami Bottle. According to the cofounders of Difold, Radina Popova and Petar Zaharinov, circularity and durability were the key factors to consider when choosing a material for their unique product. "We wanted a biobased material that could be recycled, as well as having the specific mechanical properties required by the folding design. We are happy to say that Arnitel Eco offers the perfect balance of elasticity, plasticity, and circularity", commented Popova and Zaharinov.

Arnitel Eco delivers high performance with a very low environmental impact. It is BPA-free and can withstand temperatures of between – 30°C and +100°C. And it does not absorb the smells or tastes of liquids, giving it a long usable life. On top of this, Arnitel Eco can also be recycled without any loss of quality in the recovered material. This is essential in helping Difold to meet its goal of creating a closed-loop recycling system for its products. As well as supplying the Arnitel Eco material, DSM Engineering Materials offered Difold sustainability advice, technical recommendations, and regulatory compliance services.

Pim Janssen, Marketing Manager for Food Contact, Water Contact, and Appliance markets at DSM Engineering Materials, said, "We are pleased that our services and materials could help Difold in their mission to minimize the impact of packaging on the environment – a topic which is also close to our hearts. By helping to de-fossilize the value chain, Arnitel Eco contributes to creating a circular economy for materials". **AT**

www.dsm.com | https://difold.com

Biobased artificial turf

With a biobased and biodegradable synthetic turf system, the city of Ellwangen, Germany, wants to reduce the discharge of microplastics into the environment and create a sustainable, future-proof alternative for new sports fields with synthetic turf.

The system is being developed by the biopolymer manufacturer Tecnaro (Ilsfeld, Germany) and the Institute for Plastics Technology (IKT) at the University of Stuttgart, Germany. The German Federal Ministry of Food and Agriculture (BMEL) is supporting the project.

Up to now, in most cases, sports fields made of artificial turf have been produced from fossil resources. The city of Ellwangen is now planning the first artificial turf pitch in Germany that will consist almost entirely of biobased materials. The model pitch is to have at least the same technical sports properties as its conventional counterparts and serves as a model and demonstration object.

Synthetic turf has a multi-layer structure. The top layer of fibres contains infill, which provides stability and elasticity and is also the main source of microplastic emissions. The development of a biobased and biodegradable infill is therefore the focus of the project. Here, the project team is relying on Tecnaro's Arboblend® materials as the basis for their new material. The goal is a biodegradability of 90 %, in soil within 24 months or in water within six months. The biggest challenge, however, is that biodegradation only starts when the infill enters the environment.

The research team is also looking for biobased alternatives for the fibre layer of the plastic turf. The aim is to find bio-compounds with suitable technical properties and to add them optimally. The materials must be particularly resistant to high temperatures during the summer months. For the elastic layer, pure, high-quality recyclates are to be used.

During the project, the researchers will check the actual plastic discharge from the site and its environmental impact. They will prepare a life cycle assessment for their plastic turf system and initiate a dialogue between the citizens and users of the sports field with the goal of education and training for sustainable development.

Background:

Microplastics, i.e. the smallest pieces of plastic, are accumulating more and more in the environment. They come from a wide variety of sources. Microplastics also include the plastic granulate (infill) that is used to fill artificial turf surfaces and is uncontrollably discharged into the environment from there by rainfall, wind, shoes, and balls. According to the European Chemicals Agency (ECHA), plastic turf pitches cause 16,000 tonnes of microplastic discharge every year across Europe. The ECHA has therefore recommended to the EU Commission a ban on the use of plastic granulate on plastic lawns.

There are currently already around 9,000 artificial turf pitches in Germany. This number could increase in the next few years, because more sports fields are needed, especially in large cities and conurbations. In contrast to natural grass, synthetic turf surfaces can be used all year round, are easier to maintain and are cheaper to run. Compared to sand and ash pitches, they pose a lower risk of injury.

Project information

The construction and use of the model pitch are being funded by the BMEL in the joint project "Sustainable synthetic turf pitches – development and investigation using the example of the town of Ellwangen" and is being supervised by the BMEL's project management agency, the Fachagentur Nachwachsende Rohstoffe (FNR). Tecnaro and the IKT are carrying out the project, which will run until mid-2025.

The two partners are supported by the Institute for Biomaterials and Biomolecular Systems (IBBS) at the University of Stuttgart in the further development and optimisation of the biogenic plastics. The extrusion tests for the artificial turf fibres are being carried out by Morton Extrusionstechnik (Abtsteinach, Germany), while the system development of the synthetic turf carpet and elastic layer is being carried out by FieldTurf Tarkett (Nanterre, France).

In addition to the city of Ellwangen, a project-accompanying committee is involved, including the Baden-Württemberg Ministries for Rural Areas and Consumer Protection and for the Environment, Climate and Energy Management, the Federal Institute for Sports Science, and the Baden-Württemberg Sports Federation. **MT**

www.fnr.de | www.tecnaro.de | www.ikt.uni-stuttgart.de/en

'Recycling of Plastics'

an attempt for a brief review of the new recycling bible

"The book intends to show the current state in plastics recycling", said *the Author* Norbert Niessner, but of course, he was not alone in making this 800-page monster of a book a reality. About fifty international industry leaders and renowned researchers contribute to *Recycling of Plastics*, exploring all aspects of the recycling of polymers, including new advanced recycling technologies. The result is a comprehensive and state-of-the-art guide on the global recycling value chain with a focus on the most important technologies. The book is divided into five parts:

A: Fundamentals; Legislative, Economic, and Political Considerations; LCA

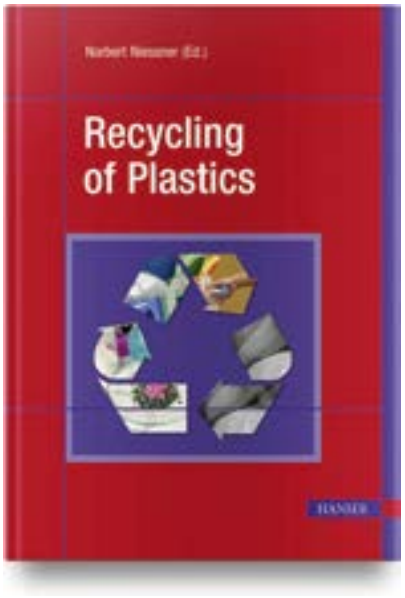
B: Major Recycling Technologies

C: Value Chain

D: Design for Recycling

E: Future Trends and Developments

Keeping a review of such a publication brief yet informative seems next to impossible. Thus, this review will focus on certain aspects of Part B, which focus more on the technologies in the field of Advanced/Chemical Recycling – mainly subchapters of chapter *9 Chemical Recycling*.



These technologies mainly focus on hard-to-recycle plastics that are often contaminated, have degraded properties due to mechanical recycling, or are simply hard to recycle due to their composition.

It lies in the nature of a publication such as this that the content will be quite technical, with most authors purely focusing on these aspects. However, the authors of subchapter *9.2 Chemical Recycling of Polyolefins* dared to go beyond the necessary technicalities and dabbled in almost poetical musing when talking about a material group that amounts to about 50 % of the total plastic demand in Europe. They introduce the end-of-life problem we face with an easily imaginable picture.

"The humble plastic bag in some ways epitomizes the problem of polyolefin waste with ghostlike images of bags drifting in our oceans, begging an environmental question that must be answered. This same image also illustrates the attributes of polyolefins – they perform far better than many alternative materials, are ubiquitous, are unbelievably cheap, and are so easily deemed valueless after use".

They point out that the goal of the feedstock recycling technology they are describing is to displace virgin feedstock, however, mechanical recycling should always be used first where applicable. Yet that point, *where applicable* is also the crux of the matter, not just for polyolefins. There is still a huge challenge to be overcome – identifying the recycling history of any item to be recycled. It is well known that mechanical recycling reduces the properties of a polymer and thus its value. Feedstock recycling, like many other chemical recycling approaches, only makes sense for materials that have degraded to the point that circular reuse is no longer possible, and we start talking about downcycling – something we would like to avoid whenever possible. The authors also point out that, "Each form of recycling will have a yield; no system is perfect". The yield of waste-to-oil polyolefin conversion lies at around 80 – 85 %, meaning there is a material loss of 15 – 20 %. These will have to come from someplace else for a truly circular economy in the sense of material-to-material recycling. Even without accounting for the growing global need for plastics, there will always be a need for *new* virgin material. But more on that later, let's look at some other technologies first.

Let's look at PET, the plastic material that currently seems to have the best working (mechanical) recycling system, well for bottles in Europe at least. The chapter begins with an overview of the scope of materials we are dealing with, quoting The Ellen MacArthur Foundation, which "reported the worldwide PET production of 78 megatonnes in 2017". And the recycling numbers for this massive amount aren't looking good but are probably not new to many readers by now, "After being used, about 40 % of produced PET is landfilled, 14 % incinerated or used for energy recovery, and about 32 % finds its way into the environment. The remaining 14 % is collected for recycling, whereas only 2 % of this amount is recycled in the true sense of a circular economy". Mechanical recycling could potentially handle a lot of the 72 % of plastics we just "put out of sight", but how much of that would amount to "recycling in the true sense of a circular economy" is another question (which is perhaps answered in other parts of this massive book).

In any case, two uses of PET are especially suited for chemical recycling simply by being unsuited for mechanical recycling – multilayer packaging and polyester textiles. In Europe alone about 1.1 megatonnes/annum of PET are going into thermoformed packaging, some are also "heavily coloured", which isn't exactly helpful for recycling purposes. The authors point out that, "Despite the large production quantity, these materials are usually incinerated for energy recovery or landfilled".

By:
Alex Thielen

Next to packaging, textile and fashion applications are responsible for a lot of difficult-to-recycle PET waste as "PET is the most commonly used representative of the polyester family. Polyester accounts for more than half of all produced textile fibres".

The technology that currently seems to be in the lead for industrial realization is enzymatic recycling, spearheaded by Carbios (Clermont-Ferrand, France). "They engineered an efficient PET depolymerase by introducing a disulfide bond in the enzyme LCC (leaf and branch compost cutinase) and applied the modified enzyme for depolymerization of amorphized and micronized post-consumer PET. A conversion to monomers exceeding 90 % was achieved within 10 h at 72 °C". Which sounds very promising. And PET is not the only material that could be suitable for enzymatic recycling as "enzymes such as cutinase, esterase and lipinase have been shown to depolymerize polyurethanes".

There are a bunch of other technologies that are applicable to PET such as pyrolysis, chemical depolymerization, methanolysis, glycolysis, or hydrolysis – even a rough explanation of each would already go far beyond the scale this humble review can offer. However, it is worth pointing out that "the recyclates recovered in monomer recycling of PET can potentially be used for production of other polymers". Whether or not this would be *truly circular*, might be another question, at least it would be material-to-material recycling.

Let's take a brief look at polystyrene. "The beauty of PS depolymerization recycling is the formation of monomers, allowing purification and re-polymerization to polymers without loss in quality. Thus PS depolymerization is one of the few recycling processes that fulfils the criteria of *fully circular* recycling. It can – admittedly with technical yields well below 100 % – repeated literally indefinitely". The idea isn't exactly new as a patent application for the depolymerization by twin-screw extruder was already filed in 1973.

Other materials are also really interesting for chemical recycling such as PA6, "as it is a polymer with a high carbon footprint (6.7 tonnes CO_2 per tonne of polymer in Europe) ... Its molecular structure, being based on one monomer, simplifies chemical recycling and purification efforts, as there is only one valuable monomer that needs to be recovered".

But also, more niche materials such as PTFE (polytetrafluoroethylene) and other perfluorinated polymers, with only a total production capacity of 160,000 tonnes (in 2015) can benefit from chemical recycling. "The conventional production of PTFE is a very energy-intensive procedure with many process steps, and 220 MJ is needed for 1 kg of PTFE. ... By far the largest amount is spent on producing TFE monomer, with less than 1 % of the energy being used for the polymerization process. Consequently, if the polymer could be successfully recycled into the monomer, most of the energy can be saved". PTFE is also heavily used as antistick coatings (Teflon®) for frying pans, this fraction of PTFE seems difficult to recycle.

Stepping away from material-specific approaches let's look at the technological approach of dissolution. "Despite its physical nature, these technologies have often (and falsely) been classified as chemical recycling". In chemical recycling a material goes from polymers back to feedstock; dissolution uses chemicals to essentially clean polymers, it is thus somewhere between chemical and mechanical recycling – which might be a point for a debate whether or not *Chemical Recycling* or *Advanced Recycling* should be the preferred "catch-all" term to distinguish these technologies from mechanical recycling.

In mechanical recycling "pre-treatment measures have to be very effective, as the final re-melting/melt filtration step allows for a limited amount of non-target polymers only (<2 %). The dissolution principle works with much higher loads of-non target components in the feed but is most effective with a maximum of 40 %".

The understanding of interactions between specific polymers and solvents is key for dissolution-based polymer recycling. "The use of dissolution-based recycling is intended to generate high-purity recovered polymers and enable production of high-quality recycled grades that exhibit qualities equal or very close to virgin polymers". Environmental concerns have led to the rise of *green* (biobased) solvents, "however, in this respect, it must be stated that a natural origin does not directly imply low toxicity, safe handling, long-term stability, suitable availability, and a reasonable price range".

This last point brings me back to a broad discussion on chemical recycling and its role in a circular economy. There are no silver bullets, and everybody knows that recycling, in any form, cannot fix the problem alone. Going back to an earlier quote, "Each form of recycling will have a yield; no system is perfect" and recycling purely for the point of recycling is also no solution as, "We must also be clear about the definition of recycling, as *recyclable* does not equate to *sustainable*". The gap recycling cannot fill will have to be filled by other approaches, and for that to happen sustainably, they cannot be of virgin fossil fuel origin – the solution here lies in renewable carbon, but the problem with the current system and all involving approaches is broader. "Sustainability is often associated with net zero carbon, but net zero conjures up a knife edge, which when something subsequently shifts could easily tip into carbon emissions again. For plastic, or any other material, to be truly sustainable it must become net positive by reducing the CO_2 currently in the atmosphere". A lot more needs to be done. This is not a problem that will go away by itself or as pointed out in the conclusion of chapter 9.2 "to do nothing is no longer an option".

CCU – more than hiding CO_2 for some time

The Scientific Advisory Committee of CO_2 Value Europe's (Brussels, Belgium) latest scientific paper *Carbon Capture and Utilisation (CCU): More Than Hiding CO_2 for Some Time* has been published in the peer-reviewed academic journal Joule.

CCU is a broad term that covers processes that capture CO_2 from the flue and process gases or directly from water and air and convert it into a variety of products such as renewable fuels, chemicals, and materials.

Last year, the United Nation's Intergovernmental Panel on Climate Change (IPCC) Assessment Report mentioned CCU for the first time as a solution to decrease net CO_2 emissions, as well as a necessary technology to move away from fossil carbon by using CO_2 as an alternative feedstock for the production of renewable chemicals and fuels. However, the actual impact of the CCU concept is difficult to assess because it is highly technological and context-dependent, and this can involve controversial discussions.

This paper clarifies some of the myths related to CO_2 utilisation and highlights some important facts about CCU technologies with a focus on synthetic fuels which refers to creating fuels from renewable energy, water, and carbon dioxide. These myths also exist at the level of public opinion and influence the general socio-political acceptance of CCU technologies.

Myth 1: We must decarbonise to achieve our climate goals

Almost everything living at the surface of the Earth is made out of carbon, so the cause of climate change is not the carbon itself, it is the fact that human activities have injected massive amounts of fossil carbon into the atmosphere. The negative connotation that carbon and CO_2 receive today needs to be reversed and important efforts should be carried out to "defossilise" rather than "decarbonise" our economy, and to find alternative carbon feedstock by creating a circular carbon economy based on the utilisation of CO_2.

Myth 2: CCU just delays CO_2 emissions and therefore – even if deployed at a large scale – will not help fight climate change

Many CCU technologies are already mature enough to be deployed and have the potential to reduce net CO_2 emissions in gigatonnes equivalence. Unlike other options, CCU technologies provide drop-in fuel solutions which can be introduced in existing markets without significant modifications of infrastructures. CCU technologies have the potential to provide solutions to hard-to-abate sectors and to generate revenues through the production of marketable products. Moreover, CCU can help achieve energy sovereignty and reduce dependence on fossil-based fuel energy.

The deployment of CCU technologies offers circular economic solutions for climate neutrality, via direct and indirect carbon savings in manufactured products which can store carbon for periods considered permanent, or which can be recycled without stored carbon being lost. The wider integration of CCU-based manufacturing processes has the potential to significantly contribute to the low-carbon economy and a consequent improvement in environment, climate and human health that can be quantified via environmental impact and full life cycle assessments (LCA).

Myth 3: E-Molecules are and will remain too expensive until at least 2035

E-Molecules (e.g. e-methane, e-methanol) made from renewable energy will be crucial in the energy transition towards carbon neutrality, in particular for long-term energy storage, long-distance energy transport and for processes that are hard to electrify in industry or long-distance marine and aviation transportation. Many current CCU projects reveal that an economically positive business case allowing the production of materials or synthetic fuels that can compete with their fossil alternative is difficult today.

Incentives and/or taxes are required for most e-molecule production to bridge the gap with their fossil alternative. However, concepts like the social cost of carbon or even the mortality cost of carbon are gaining traction and show that if we take the damage of climate change fully into account, CCU will be cost-effective. E-Molecules can also be used as building blocks in the plastic production.

CO_2 Value Europe is an international non-profit association representing the CCU community in Europe and beyond with a mission to promote the development of a circular carbon economy based on CO_2 to reduce greenhouse gas emissions and to move away from fossil. Its Scientific Advisory Committee comprises scientists covering a wide range of expertise related to CCU and ensures that the association's messages and activities are based on solid and objective scientific evidence.

The new scientific paper "Carbon Capture and Utilisation: More Than Hiding CO_2 for Some Time" can be found on the peer-reviewed academic journal Joule's website. **AT**

https://www.cell.com/joule/fulltext/S2542-4351(23)00036-3
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The Best Available on Bio- and CO_2-based Polymers & Building Blocks and Chemical Recycling

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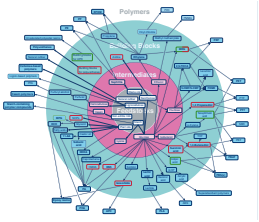

Authors: Pia Skoczinski, Michael Carus, Gillian Tweddle, Pauline Ruiz, Doris de Guzman, Jan Ravenstijn, Harald Käb, Nicolas Hark, Lara Dammer and Achim Raschka

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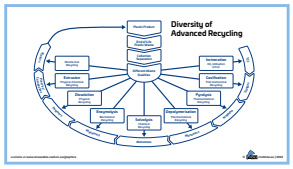
Mapping of advanced recycling technologies for plastics waste

Providers, technologies, and partnerships



Authors: Lars Krause, Michael Carus, Achim Raschka and Nico Plum (all nova-Institute)

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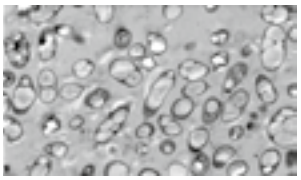

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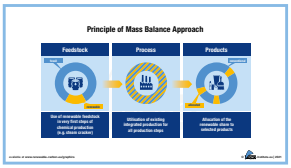

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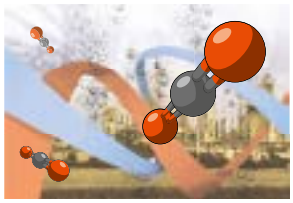

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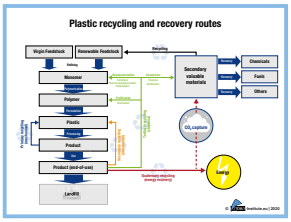

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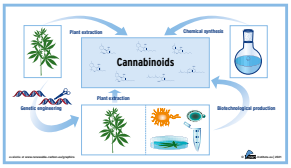

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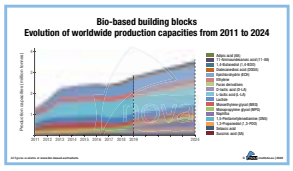

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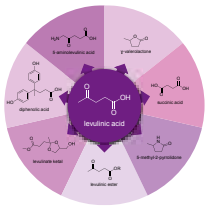

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Bridging the gap

From waste management to materials manufacturing

We are applying the wrong solutions to two crucial issues that urgently need to be addressed globally. First, there are key regulatory milestones that need to be reached in the world of packaging and product manufacturing, namely, reducing packaging waste and minimizing our reliance on conventional oil-based plastics, and other finite resources [1].

Secondly, waste is not being handled correctly at its end-of-life. Landfills, incineration, current approaches to recycling, and the way in which we attempt to extract value from waste are either not environmentally friendly, harm human health, or are not economically sustainable.

There is a solution to these two major problems – a new approach to waste and the materials we use to make everything from shipping pallets to 3D printing filament, from clothes hangers to automotive parts: post-consumer materials.

The new materials bottleneck

In global efforts to reduce our use of oil-based plastics in packaging and other products, there have been regulations put in place calling for greater use of post-consumer recycled materials (PCRM). However, there is a major supply and demand gap between the need for high-quality PCRM and its availability. With a lack of data and transparency regarding PCRM and limited access to high-quality and responsibly sourced recycled materials, the effectiveness of these policies is stunted [2].

This bottleneck on high-quality, high-performance sustainable materials must be solved if we want to substitute traditional oil-based resins with environmental-friendly alternatives.

This is further exacerbated by current recycling practices. Even with robust recycling programs in place, current recycling systems only capture a mere 18 % of plastics and packaging at their maximum efficiency. With these two challenges before us, it's clear that a new approach is needed to sustainable materials that are both readily available and economically viable.

Current approaches to waste management

In the realm of waste management, we have substantial work ahead of us. According to the World Bank, 2 billion tonnes of municipal solid waste are created every year, with approximately 37 % sent to landfills, 31 % openly dumped, less than 20 % recycled or recovered and approximately 11 % sent for incineration [3].

On the positive side, we have realized that waste certainly has value beyond the trash bin. Countries have increasingly invested in the waste-to-energy sector, where waste is sent to incineration to generate heat and fuel. While conceptually, this is an important idea, in practice incineration of waste for energy is a harmful approach. In fact, waste combustion for energy produces two times the carbon emissions of coal [4].

Incineration-driven energy generation also has harmful impacts on human health. Toxic emissions result from burning waste, polluting the air, and posing health risks to people living near incineration sites. Moreover, from an economic standpoint, waste-to-energy is not cost-effective. The high capital costs associated with constructing and operating waste-to-energy facilities often outweigh their benefits.

As such stakeholders must continuously explore innovative solutions that are environmentally friendly, cost-effective, and achieve the goal of extracting value from waste in circular consumption models.

The materials sector answers the call

To answer all of the above challenges, we must bridge the gap between the raw materials used in production and how we manage waste. We must move away from costly and inefficient plastic recycling models and move towards using the entire waste stream to create new, high-quality "Post Consumer Materials" (PCM) that, although made from waste, have the homogeneity, consistency, and volumes of virgin oil-based materials without their terrible environmental consequences.

By:

Albert Douer
Chairman and Co-CEO

UBQ Materials, Tel Aviv, Israel

By investing in high-quality PCM derived entirely from waste, including all the organic components, we will be able to simultaneously prevent the harmful health and environmental impacts of incineration, tackle the waste crisis with a circular solution that cycles waste back into the value chain, solve the materials bottleneck for circular materials, and help fulfil various global policies and regulations committed to waste reduction. Waste-to-materials can pave the way for the creation of more sustainable products and supply chains that protect planetary, economic, and human health.

The materials sector has a critical role to play in tackling climate change and reducing the carbon footprint of product manufacturing. By transforming waste into usable materials in a new category of Post Consumer Materials, we can extract the cleanest possible value out of waste while also reducing reliance on finite resources. This approach could represent a significant breakthrough in our efforts to address the immense waste crisis and promote greater sustainability through product supply chains.

www.ubqmaterials.com

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10 Years ago

Published in bioplastics MAGAZINE

In March 2023, Hermann Fuechter, Sr. Marketing & Product Manager, Specialty Engineered Materials, EMEA at Avient, said:

Avient continues to strengthen its commitment to sustainability, helping brands and OEMs to reach their goals by offering materials that help reduce both carbon footprint and reliance on fossil-based fuels. In response to a growing demand for biopolymers, Avient has launched several expansions to its biobased formulations portfolio, aiming to provide comparable functional performance to its fossil-based counterparts.

Some of Avient's most recently launched thermoplastic formulations include Maxxam™ BIO biobased polyolefins, Nymax™ BIO biobased polyamide solutions, and Gravi-Tech™ BIO biobased formulations. Maxxam BIO biobased polyolefins are formulated with biobased resin and/or 10–50 % natural filler from renewable plant sources, including olive seed powder, recycled coffee grounds, and cellulose fibre. Gravi-Tech BIO biobased formulations are density-modified formulations that contain biobased resin from renewable plant sources.

Avient has also extended its biobased thermoplastic elastomers portfolio, reSound™ BIO thermoplastic elastomers, to offer grades with 35–75 % biobased content and a range of reSound Ultra-Low Carbon Footprint TPEs, which are formulated to achieve negative, neutral or low product carbon footprint (PCF).

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Next issues

Issue	Month	Publ. Date	edit/ad/ Deadline	Edit. Focus 1	Edit. Focus 2	Trade Fair Specials
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06/2023	Nov/Dec	04.12.2023	03.11.2023	Films / Flexibles /Bags	Barrier materials	
01/2024	Jan/Feb	05.02.2024	23.12.2023	Automotive	Foam	
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Our frame colours

Topics related to the *Renewable Carbon Initiative*...

Bioplastics related topics, i.e. all topics around biobased and biodegradable plastics, come in the familiar green frame.

All topics related to *Advanced Recycling*, such as chemical recycling or enzymatic degradation of mixed waste into building blocks for new plastics have this turquoise coloured frame.

When it comes to plastics made of any kind of carbon source associated with *Carbon Capture & Utilisation* we use this frame colour.

The familiar blue frame stands for rather administrative sections, such as the table of contents or the "Dear readers" on page 3.

If a topic belongs to more than one group, we use crosshatched frames. Ochre/green stands for *Carbon Capture* & *Bioplastics*, e. g. PHA made from methane.

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No. 316, South Beijing Rd. Changji, Xinjiang, 831100, P.R.China
Tel.: +86 994 2716195
Mob.:+86 186 99400676
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www.lanshantunhe.com
PBAT, PBS, PBSA, PBST supplier

Zhejiang Huafon Environmental Protection Material Co.,Ltd.
No.1688 Kaifaqu Road,Ruian Economic Development Zone,Zhejiang,China.
Tel.: +86 577 6689 0105
Mobile: +86 139 5881 3517
ding.yeguan@huafeng.com
www.huafeng.com
Professional manufacturer for PBAT /CO_2-based biodegradable materials

1.1 Biobased monomers

1.2 Compounds

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Member of the Feddersen Group
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info@bio-fed.com
www.bio-fed.com

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D-84032 Altdorf
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www.biofibre.de

Earth Renewable Technologies BR
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slink@earthrenewable.com
www.earthrenewable.com

Elixance
Tel.: +33 (0) 2 23 10 16 17
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elixbio@elixbio.com/ www.elixbio.com

FKuR Kunststoff GmbH
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Tel.: +49 2154 9251-0
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sales@fkur.com
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GEMA POLIMER A.S.
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+90 (232) 251 5041
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http://www.gemabio.com

Global Biopolymers Co., Ltd.
Bioplastics compounds (PLA+starch, PLA+rubber)
194 Lardproa 80 yak 14
Wangthonglang, Bangkok
Thailand 10310
info@globalbiopolymers.com
www.globalbiopolymers.com
Tel.: +66 81 9150446

GRAFE-Group
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Tel.: +49 36459 45 0
www.grafe.com

Green Dot Bioplastics Inc.
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Emporia, KS 66801
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info@greendotbioplastics.com
www.greendotbioplastics.com

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Helian Polymers BV
Bremweg 7
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The Netherlands
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sales@helianpolymers.com
https://pharadox.com

Kingfa Sci. & Tech. Co., Ltd.
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Hi-Tech Ind. Development Zone,
Guangdong, P.R. China. w
Tel.: +86 (0)20 6622 1696
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www.kingfa.com

Natureplast – Biopolynov
11 rue François Arago
14123 IFS
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www.natureplast.eu

NUREL Engineering Polymers
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www.tecnaro.de

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+1 855 8746736
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1.3 PLA

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www.gehr.de

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1.4 Starch-based bioplastics

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info@biotec.de
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Sunar NP Biopolymers
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1.5 PHA

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1.6 Masterbatches

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Rue de la Jontière
57255 Sainte-Marie-aux-Chênes,
France
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www.treffert.fr

2. Additives/Secondary raw materials

GRAFE-Group
Waldecker Straße 21,
99444 Blankenhain, Germany
Tel.: +49 36459 45 0
www.grafe.com

3. Semi-finished products

3.1 Sheets

Customised Sheet Xtrusion
James Wattstraat 5
7442 DC Nijverdal
The Netherlands
+31 (548) 626 111
info@csx-nijverdal.nl
www.csx-nijverdal.nl

4. Bioplastics products

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info@bio4pack.com
www.bio4pack.com

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Esmy Huang, Vice president
Yunlin, Taiwan(R.O.C)
Mobile: (886) 0-982 829988
Email: esmy@minima-tech.com
Website: www.minima.com
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28100 Novara - ITALIA
Fax: +39.0321.699.601
Tel.: +39.0321.699.611
www.novamont.com

6. Equipment

6.1 Machinery & moulds

Buss AG
Hohenrainstrasse 10
4133 Pratteln / Switzerland
Tel.: +41 61 825 66 00
info@busscorp.com
www.busscorp.com

6.2 Degradability Analyzer

MODA: Biodegradability Analyzer
SAIDA FDS INC.
143-10 Isshiki, Yaizu,
Shizuoka, Japan
Tel.: +81-54-624-6155
Fax: +81-54-623-8623
info_fds@saidagroup.jp
www.saidagroup.jp/fds_en

7. Plant engineering

EREMA Engineering Recycling Maschinen und Anlagen GmbH
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Phone: +43 (0) 732 / 3190-0
Fax: +43 (0) 732 / 3190-23
erema@erema.at
www.erema.at

9. Services

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46047 Oberhausen
Tel.: +49 (0)208 8598 1227
thomas.wodke@umsicht.fhg.de
www.umsicht.fraunhofer.de

narocon
Dr. Harald Kaeb
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kaeb@narocon.de
www.narocon.de

nova-Institut GmbH
Tel.: +49(0)2233-460 14 00
contact@nova-institut.de
www.biobased.eu

Bioplastics Consulting
Tel.: +49 2161 664864
info@polymediaconsult.com

10. Institutions

10.1 Associations

BPI - The Biodegradable Products Institute
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New York, NY 10019, USA
Tel.: +1-888-274-5646
info@bpiworld.org

European Bioplastics e.V.
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10117 Berlin, Germany
Tel.: +49 30 284 82 350
Fax: +49 30 284 84 359
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www.european-bioplastics.org

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10.3 Other institutions

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www.greenseredipity.nl

10.3 Other institutions

GO!PHA
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1012JN Amsterdam
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www.gopha.org

Event Calendar

daily updated eventcalendar at www.bioplasticsmagazine.com

Chinaplas 2023
17.04. - 20.04.2023, Shenzhen, China
www.chinaplas.com

Conference on CO_2-based Fuels and Chemicals 2023
19.04. - 20.04.2023, Cologne, Germany (hybrid)
https://co2-chemistry.eu

interpack 2023
04.05. - 10.05.2023, Düsseldorf, Germany
www.interpack.com

bio!PAC
08.05. - 10.05.2023, Düsseldorf, Germany
by bioplastics MAGAZINE
www.bio-pac.info

CO_2 Capture, Storage & Reuse 2023
16.05. - 17.05.2023, Copenhagen, Denmark
https://fortesmedia.com/co2-capture-storage-reuse-2023,4,en,2,1,21.html

Rethinking Materials
16.05. - 17.05.2023, London, UK
www.rethinkingmaterials.com

Renewable Materials Conference 2023 (RMC)
23.05. - 25.05.2023, Siegburg, Germany (hybrid)
www.renewable-materials.eu

10th Circular Biobased Products (CBP) Symposium
22.06.2023, Wageningen, The Netherlands
https://event.wur.nl/cbp2023

Plastics for Cleaner Planet
26.06. - 28.06.2023, New York City Area, USA
https://innoplastsolutions.com/conference

Interfoam Vietnam 2023
23.08. - 25.08.2023, Ho Chi Minh City, Vietnam
www.interfoamvietnam.com

3rd PHA platform World Congress - 2023 USA
10.10. - 11.10.2023, Atlanta, USA
by bioplastics MAGAZINE
www.pha-world-congress.com

European Bioplastics Conference
12.12. - 13.12.2023, Berlin, Germany
www.european-bioplastics.org/events/ebc

ArabPlast
13.12. - 15.12.2023, Dubai, UAE
https://arabplast.info

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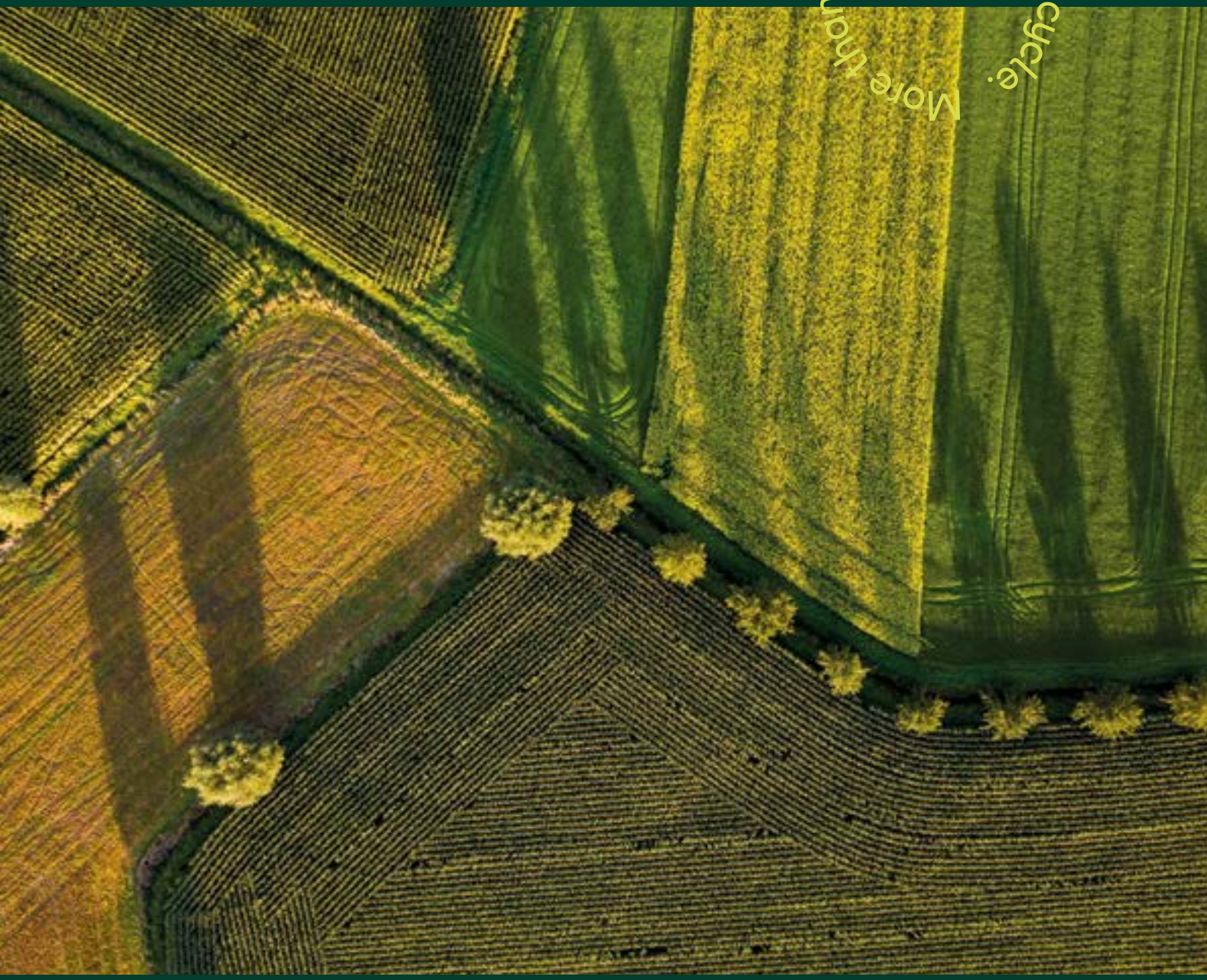

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