

The Bioeconomy Consultants

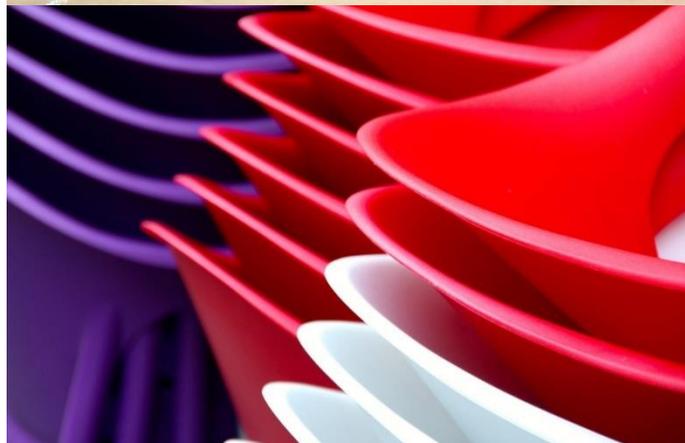


## News Review

Issue 61

April 2017

**Each month we review the latest news and select key announcements and commentary from across the biobased chemicals and materials sector.**



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# Foreword

Welcome, subscribers and non-subscribers alike, to April's Free edition of NNFCC's Biobased News Review.

There's nothing fishy about this month's news, which, considering it concerns fish-oils, is remarkable! We are all told by diet experts that Omega-3 is important for a healthy metabolism, and up until this point humans (who can't synthesise it themselves) have sourced this fatty acid from fish oil. There is, however, a problem here, firstly in that it contributes to depletion of fish stocks, but secondly (and perhaps more significantly) because 75% of fish oil is used as feed in fish farming. This raises obvious moral questions about feeding fish to fish, but also more practical problems like the need to farm fish in order to produce the fish oil to help farm more fish, which is unsustainable economics. Fortunately, thanks to DSM and Evonik, this could soon be a thing of the past, as they have developed a way of producing Omega-3 from algae. This highly pure source is due to be commercialised in the not-too-distant future, which could be a huge boost for the fish-farming industry (and healthy eaters) worldwide.

Another story that particularly pleased this editor is SYNLawn's announcement that they have released 100% biobased artificial turf. While it is not only a great moment for the artificial grass industry, potentially paving the way for reduction in fossil fuel consumption therein (especially if they can get the product certified in the US' BioPreferred scheme, which will see the turf employed across the US public sector), it is also quite amusing, as the bioplastic used is derived from sugarcane, meaning that this artificial grass is (in a broad sense) made from real grass.

Finally, before we unleash April's news upon you, it has been a fantastic month for biobased packaging. At the policy level, the European Parliament has voted in favour of reforms to the EU's Packaging and Waste Directive, which aims to encourage the use of biobased plastics in packaging, but also sets out legislation specifically recognising biobased plastics with regards to recycling. This represents a huge step forward for the biobased circular economy in Europe. This comes alongside announcements from Nestlé, Danone, and PepsiCo for the development of biobased plastic bottles (in the former two cases) and biodegradable plastic resins for packaging (in the latter case). Biobased packaging continues to make a big splash across industries, and this is wonderful news to hear.

Read on for the latest news.

# Policy

## USDA programme promises assistance with biorefinery



USDA

This program assists in the development, construction, and retrofitting of new and emerging technologies for the development of Advanced Biofuels, Renewable Chemicals, and Biobased Product Manufacturing by providing loan guarantees for up to \$250 million.

Funds may be used to fund the development, construction and retrofitting of commercial-scale biorefineries using eligible technology, and biobased product manufacturing facilities that use technologically new commercial-scale processing and manufacturing equipment to convert renewable chemicals and other biobased outputs of biorefineries into end-user products on a commercial scale. Refinancing, in certain circumstances, may also be eligible.

In broad terms, two types of projects are eligible for the program – Biorefineries, and Biobased Manufacturing facilities.

Click [here](#) for more information.

## Sustainability checklist published for food packaging

The Food and Drink Federation (FDF) and the Industry Council for research on Packaging and the Environment (INCPEN) recently published "Packaging for people, planet and profit – sustainability checklist".

With a foreword from Environment Minister Thérèse Coffey, the checklist will help companies choose and optimise their packaging systems in order to continuously improve the sustainability of their value chain. It provides practical guidance for companies to improve resource efficiency at all stages of a packaged product's journey while ensuring that the essential functionality of the packaging is not compromised. While including references to relevant regulation and guidance, the checklist also encourages companies to go above and beyond legal requirements.

It will support businesses in considering packaging as part of the total product system for delivering products from point of production to point of consumption. This in turn will help strike the optimal balance between the often-competing demands of designing packaging for optimum functionality, reuse and recovery considerations, and reduced transport impacts.

The checklist also represents the first deliverable under FDF's Ambition 2025 - to minimise the impact of used packaging associated with food and drink products and to encourage innovation in packaging technology and design that contributes to overall product sustainability.

Click [here](#) for more information.

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## European Parliament vote on waste legislation welcomed by bioplastics industry



*European Parliament*

European Bioplastics (EUBP), the association representing the bioplastics industry in Europe, welcomes the positive outcome of the European Parliament's plenary vote today on the waste legislation proposal concerning the EU Circular Economy Package. The vote of the Members of Parliament recognises the contributions of bioplastics to the EU circular economy.

The plenary's vote on amendments of the Packaging and Packaging Waste Directive encourages Member States to support the use of bio-based materials for the production of packaging and to improve market conditions for such materials and products.

In line with its ambitious goals to increase recycling targets and waste management efficiency, the Plenary also voted for amendments of the Waste Framework Directive that support a definition of recycling that includes organic recycling. A separate collection of bio-waste will be ensured across Europe facilitated by certified collection tools such as compostable bio-waste bags. In addition, the MEPs have voted to exclude mechanically or organically recyclable waste from landfills.

The vote sends a clear signal that re-use and recycling remain of paramount priority in the pursuit of an EU circular economy while at the

same time strengthening the bio-based economy in order to replace fossil resources and to drive the transition to a low-carbon, bio-based economy. EUBP looks forward to continuing the dialogue on the upcoming negotiations in the European Commission and the Council of the European Union and will work closely with European institutions and relevant stakeholders to build a coherent and comprehensive framework for a circular bioeconomy in Europe.

Click [here](#) for more information.

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## Markets

### Zion Market Research - Biobased Emulsion Polymer market

Bio-based polymers including the major amount of natural materials which undergo a radical polymerization after the mixture of water, monomer, or surfactant are termed as bio-based emulsion polymers. Their environment-friendly composition and biodegradable nature are fetching the attention of the manufacturers and consumers. Bio-based polymers are naturally obtained and extracted polymers.

Bio-based emulsion polymers are mostly utilized in paper industry for manufacturing papers, paper bags, boxes, cartons, and others. It is widely used in adhesives as the binding agent in tapes, labels, glue, application in diapers, and female hygiene products. These end-user segments are the key factors boosting the demand of the emulsion polymers. Increased demand for low VOC content in paints, bio-based emulsion polymers are widely preferred in paints and coating industry at large scale, rising awareness among the consumers about the painting ideas and protective coatings, and increasing craze of interior decoration are factors boosting the growth of the bio-based

emulsion polymers market. Wide utilization of colour and coating compounds in the automobile sector is also a factor fostering the growth of emulsion polymer market. Moreover, consumer's preference towards eco-friendly products to delivers safe and healthy environment has increased the demand of bio-based emulsion polymer globally.

Click [here](#) for more information.

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## Croda marks record profits in 2016

# CRODA

*Croda*

Croda International Plc, the speciality chemical company that creates high performance ingredients and technologies relied upon by industries and consumers globally, has announced its full year results for the year ended 31 December 2016.

Highlights include record profit delivered, with profit growth in all Core Business sectors. Adjusted profit before tax up 13.2% at £288.3m. This is accompanied by robust sales growth, up 15.0%, driven by the integration of Incotec, innovation and progress in high value markets, together with positive currency translation. This has resulted in excellent margin and return on capital retained, with return on sales of 24.0% and ROIC at 19.3%.

Relentless innovation has created more IP-protected business across all sectors, with sales of New & Protected Products (NPP) up 20% to 27.4% of total sales.

There has been impressive cash generation with free cash flow of over £155m, supporting net capital expenditure of over £100m, a 7.2%

increase in ordinary dividend and further de-leveraging after special dividend payment of £136m in June 2016.

Click [here](#) for more information.

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## €106 million fund for bioeconomy startups

Sofinnova Partners, a leading European venture capital firm specialized in life sciences, today announced the first closing of Sofinnova Industrial Biotech I (Sofinnova IB I) at €106 million. The fund, dedicated to renewable chemistry, follows a series of 9 investments in the sector since 2009, and places Sofinnova Partners at the forefront of this promising emerging market.

Sofinnova IB I will be invested in start-ups along the value chain from the transformation of renewable raw materials, like agricultural waste or CO<sub>2</sub>, to renewable end-products such as bio-plastics and other bio-sourced materials. It will equally look at technologies coming from advances in synthetic biology and alike. The investment thesis is based on growing market demand for innovative, renewable products leveraging non-fossil raw materials and novel technologies to produce better performing or cheaper, sustainable alternatives.

Pursuing the strategy applied consistently over the years with previous funds, Sofinnova Partners will seek to invest Sofinnova IB I as a founding and lead investor in start-ups and corporate spin-offs, in Europe and North America. The focus of the fund will consist in backing visionary entrepreneurs aiming at developing paradigm changing innovations from lab to the end users market. Sofinnova IB I will seek to invest in 8 to 10 companies during the next 3 to 4 years.

For this substantial first closing, Sofinnova IB I attracted premier investors, predominantly European institutions and major international

industrial players, from energy, chemical and agricultural sectors, including several returning investors from the seed fund raised in 2012 in the same sector: Sofinnova Green Seed Fund.

Click [here](#) for more information.

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## Corbion's 2016 results show decreases



*Corbion*

Corbion reported sales of € 911.3 million in 2016, a decrease of 0.8%. Organic sales growth was - 1.2%. EBITDA excluding one-off items grew by 13.2% in 2016. In Q4 2016 sales were € 226.1 million, a decrease of 1.9%. Q4 2016 EBITDA excluding one-off items increased by 6.3%. The company proposes to distribute a regular dividend of € 0.56 per share, an additional cash dividend of € 0.44 per share, and a new share buyback of € 25 million.

Click [here](#) for more information.

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## Global Bioplastic Market according to Morder Intelligence

Bioplastics are majorly consumed in the packaging industry in the form of plastic bags and bottles. The market is segmented by type as bio & synthetic based biodegradables and bio based non-biodegradables. Bio and synthetic based biodegradables plastics are further segmented into aliphatic polyesters (Polylactic acid, polyhydroxyalkanoates (PHA), polybutylene Succinate and Other Aliphatic Polyesters), starch based plastics, cellulose derivatives, poly anhydrides, poly vinyl alcohols and other biodegradable plastics. Also, bio based non-

biodegradables are segmented into biopolyethylene terephthalate (PET), biopolyethylene, biopolyamides, biopolyols and polyurethane, biopolytrimethylene terephthalate (PTT), bio-polypropylene (PP), other non-biodegradable bioplastics. Other industries include consumer products, agriculture, catering, pharmaceuticals, textiles, etc. Some of the most widely used bio-plastics are polylactic acid (PLA) and PLA blends, starch extracts, bio-polyethylene (bio-PE) and polybutylene succinate.

The market is also segmented by origin as bio based Plastics and synthetic based biodegradable Plastics. Moreover, the market is segmented based on applications as packaging and plastic bags, bottles and containers, loose film packaging, automotive and technical applications, agriculture, consumer products, catering, pharmaceutical, construction, textiles, and others.

The market for bioplastics is majorly driven by the reduced dependence on petroleum-based raw materials for eco-friendly and sustainable products. However, the major restraints include the higher cost of manufacturing and shortage of waste processing infrastructure, as there exists a lack of a standard procedure for the collection and recycling of the plastics.

The bioplastics market future has sufficient opportunity to increase the market at higher rate. The promotion of public awareness and government concern for bio based plastics has increased the usage of bioplastics globally.

Click [here](#) for more information.

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## Cargill completes refinery plant sale

Cargill has completed the sale of its soybean/rapeseed crush and oil refinery and the beans discharging operation alongside its processing plant in the port of Amsterdam, Netherlands as well as its soybean/rapeseed crush

facility in Brest, France to Bunge. As part of the deal, first announced in August 2016 employees associated with the business have transferred to Bunge.

Cargill will retain its two other soybean processing facilities in Western Europe, in the ports of Barcelona in Spain and Liverpool in the United Kingdom, together with a solid network of offices to distribute protein meal to its customers. The company also has an extensive network of plants processing and refining other oilseeds and tropical oils across Europe and it continues to focus on serving its customers and growing its longer-term business in this region.

Click [here](#) for more information.

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## Avantium shares highly popular on the market



*Avantium*

Sofinnova Partners, a leading European venture capital firm specialized in Life Sciences, today announced the successful initial public offering of Avantium which raised €103 M on Euronext Amsterdam and Euronext Bruxelles. Sofinnova Capital VI remains the main shareholder after the IPO. The initial public offering was multiple times oversubscribed.

Based in Amsterdam, Avantium is a pioneer company specialized in renewable and sustainable chemicals which develops efficient processes and sustainable products made from biobased

materials. Avantium offers a breeding ground for revolutionary renewable chemistry solutions. From invention to commercially viable production processes. One of Avantium's many success stories is the YXY technology to produce PEF: a completely new, high-quality plastic made from plant-based industrial sugars. PEF is 100% recyclable. It offers a cost-effective solution for applications ranging from bottles to packaging film and fibres, positioning it to become the next generation packaging material.

Funds raised will be used to further commercialise Avantium's inventions into viable production processes. This will start with the commercialisation of the YXY technology, in joint venture with BASF, by building the first commercial scale reference plant for FDCA. This is an important step in Avantium's strategic development to become a world leader in renewable chemistry. Avantium has a proven capacity to attract renowned global partners throughout the entire value chain, such as The Coca-Cola Company, Danone, Toyobo, ALPLA and Mitsui. Besides the YXY technology, the company is working on other projects which for some have reached or entering pilot plant stage.

Click [here](#) for more information.

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# Research & Development

## BioBTX announce establishment of plants in Netherlands

BioBTX is a company based in Groningen-NL that produces chemicals (Aromatics) from Biomass. This technique allows the manufacturing of 'green' plastics.

BTX stands for benzene, toluene and xylene. These chemicals are normally extracted from natural crude oil and form the building blocks for plastics. BioBTX developed a way in which the oil can be replaced by biomass.

BioBTX owns a worldwide license on this patented technology and wants to develop it for the usage of a wide range of Biomass. This can be a big step in decreasing independence on crude oil for the production of plastics. After the construction of a pilot plant in Groningen it is the intention to roll out the technology into the market. The first step will be the construction of a plant in Emmen, together with BioBTX's partners Cumapol and SunOil, to produce building blocks for example PET packaging for the cosmetic industry out of Glycerin.

Click [here](#) for more information.

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## Improvement to biobased methacrylic acid production

This paper reports a bio-based route to methacrylic acid via selective decarboxylation of itaconic acid utilizing catalytic ruthenium carbonyl propionate in an aqueous solvent system. High selectivity (> 90%) was achieved at low catalyst loading (0.1 mol %) with high substrate

concentration (5.5 M) at low temperature (200 – 225°C) and pressure ( $\leq$  425 psig) relative to previous contributions in this area. Direct decarboxylation of itaconic acid was achieved as opposed to the conjugate base reported previously, thereby avoiding basification and acidification steps. Also investigated was catalytic manganese (II) oxalate (5 mol %), but low yield (7.0%) and evolution of carbon monoxide via oxalate decomposition was problematic. Attempts at stabilization of the catalyst with triphenylphosphine were unsuccessful, but it exhibited greater catalytic efficacy (14.0% yield) than the manganese catalyst (7.0% yield) at 5 mol %. Neither carbon monoxide nor propylene (excessive decarboxylation) were detected during ruthenium-catalysed decarboxylation. In addition, co-solvents such as tetraglyme lowered vapor pressures within the reaction vessel by > 100 psig while minimizing decomposition of starting acids. In combination, these findings represent improvements over existing methodologies that may facilitate sustainable production of methacrylic acid, an important petrochemically-based monomer for the plastics industry.

Click [here](#) for more information.

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## Development of biobased polyesters

A range of fully biobased unsaturated polyesters (bio-UPs) derived from 2,5-furandicarboxylic (FDCA), itaconic acid (IA), succinic acid (SA), and 1,3-propanediol (PD) were obtained via direct polycondensation. The chemical structures of the bio-UPs were identified by Fourier transform infrared spectroscopy and <sup>1</sup>H NMR before they were cured together with a biobased, non-volatile reactive diluent, guaiacol methacrylate (GM). The thermal and mechanical characterizations of the cured bio-UPs were evaluated using thermogravimetric analysis, 3-point bending tests, and dynamic mechanical analysis. Results showed that the thermal properties, flexural strength, and modulus of the cured bio-UPs were greatly

improved after the introduction of FDCA. The temperature of 5% thermal weight loss reached 330 °C, and the flexural strength and modulus reached 122.8 and 3521 MPa, respectively. These results indicate that the bio-UPs have the potential to replace petroleum-based UPs.

Click [here](#) for more information.

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## Hydrogen from biomass with light



*Public Domain Pictures*

A team of scientists at the University of Cambridge has developed a way of using solar power to generate a fuel that is both sustainable and relatively cheap to produce. It's using natural light to generate hydrogen from biomass.

One of the challenges facing modern society is what it does with its waste products. As natural resources decline in abundance, using waste for energy is becoming more pressing for both governments and business.

Biomass has been a source of heat and energy since the beginning of recorded history. Lignocellulose is the main component of plant biomass and up to now its conversion into hydrogen has only been achieved through a gasification process which uses high temperatures to decompose it fully.

The new technology relies on a simple photocatalytic conversion process. Catalytic nanoparticles are added to alkaline water in which the biomass is suspended. This is then placed in

front of a light in the lab which mimics solar light. The solution is ideal for absorbing this light and converting the biomass into gaseous hydrogen which can then be collected from the headspace. The hydrogen is free of fuel-cell inhibitors, such as carbon monoxide, which allows it to be used for power.

The nanoparticle is able to absorb energy from solar light and use it to undertake complex chemical reactions. In this case, it rearranges the atoms in the water and biomass to form hydrogen fuel and other organic chemicals, such as formic acid and carbonate.

The team used different types of biomass in their experiments. Pieces of wood, paper and leaves were placed in test tubes and exposed to solar light. The biomass didn't require any processing beforehand.

With the help of Cambridge Enterprise, the commercialisation arm of the University, a UK patent application has been filed and talks are under way with a potential commercial partner.

Click [here](#) for more information.

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## Polymers

### **A review on new bio-based constituents for natural fibre-polymer composites**

Composite materials based on renewable agricultural and biomass feedstocks are increasingly utilized as these products significantly offset the use of fossil fuels and reduce greenhouse gas emissions in comparison with conventional petroleum-based materials. However, the inclusion of natural fibres in polymers introduces several challenges, such as

excess water absorption and poor thermal properties, which need to be overcome to produce materials with comparable properties to the conventional composite materials. Instead of using rather expensive chemical and physical modification methods to eliminate these aforementioned challenges, a new trend of utilizing waste, residues, and process by-products in natural fibre-polymer composites (NFPCs) as additives or reinforcements may bring considerable enhancements in the properties of NFPCs in a sustainable and resilient manner. In this paper, the effects of waste materials, residues or process by-products of multiple types on NFPCs are critically reviewed and their potential as NFPC constituents is evaluated.

Click [here](#) for more information.

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## Total Corbion begins PLA production

Total Corbion PLA today officially launches its operations to produce and market Poly Lactic Acid (PLA) polymers. PLA is a biobased and biodegradable polymer made from annually renewable resources. As announced by parent companies Total and Corbion last November, the new company is a 50/50 joint venture based in the Netherlands.

Total Corbion PLA's world-class PLA polymerization plant, with a capacity of 75,000 tons per year, is currently under construction at Corbion's site in Thailand. The plant start-up is planned for the second half of 2018 and will produce a full range of Luminy® PLA neat resins: from standard PLA to specialty, high heat resistant PLA.

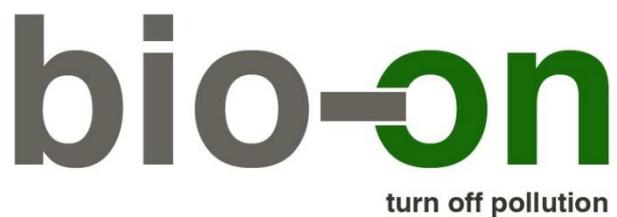
PLA is a fast-growing polymer market segment with an estimated annual growth rate of 10 to 15% to 2025. Biodegradable and industrially compostable, PLA is one of the first renewable polymers able to compete with existing polymers, combining unique functional properties like

transparency, gloss and stiffness. PLA is currently used in a broad range of markets, including food packaging, single-use tableware, textiles, oil and gas, electronics, automotive and 3D printing.

Click [here](#) for more information.

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## Bio-On to build PHA plant in Bologna



*Bio-On*

Bio-on announces that work will soon start on the construction of a new plant dedicated solely to production of PHAs special biopolymers for niche and rapidly developing product categories, particularly for the cosmetics sector.

This new plant, based in Castel San Pietro Terme in the province of Bologna, has 3,700 covered m<sup>2</sup>, 6,000 m<sup>2</sup> land for development and a total area of 30,000 m<sup>2</sup>. The plant will have a capacity dedicated to the research into and production of 1,000 tons per year rapidly expandable to 2,000 tons per year. The plant will be equipped with the most modern technologies and the most advanced research and development laboratories. New carbon sources from agricultural waste will be continuously tested to produce biopolymers to increase the range of technologies offered by Bio-on, which will invest 15 million Euro and will create 40 new jobs.

The revolutionary PHAs bioplastics (polyhydroxyalkanoates) developed by Bio-on are made from renewable plant sources with no competition with food supply chains. They guarantee the same thermo-mechanical properties as conventional plastics with the

advantage of being 100% eco-sustainable and naturally biodegradable at ambient temperature.

The direct presence of Bio-on in the high-performing biopolymer production sector is an important milestone in creating a global platform for bioplastic production in the future.

Click [here](#) for more information.

### **FKuR's Bio-Flex now up to 40% biobased**

The bioplastics specialist has developed new Bio-Flex blends for the production of low gauge films which will biodegrade completely in garden compost at low, variable temperatures. Vinçotte, based in Belgium, has already issued OK Compost HOME certificates for these grades. In addition, most of the new compounds meet the requirements of Article 75 of the French Energy Transition Law. Since January 2017, in the French retail sector, the use of plastic bags for fruit and vegetables, as well as at the cheese, meat and also fish counter was banned. However, bags made from home compostable bioplastic which contain a minimum amount of 30% renewable raw materials (and from 2025, 60% renewable raw materials) are excluded from this ban.

All home compostable Bio-Flex compounds are regarded as having outstanding moisture resistance. This is a great advantage when compared with many other commercially available starch-based plastics of this type. These biodegrade rapidly but should only be filled with dry contents. The range of possible applications for these new compounds of FKUR is wide and includes multi-purpose bags, as well as bags for fruit and vegetable packing, mulching films and other packaging.

The product range currently comprises of translucent and opaque grades. Bio-Flex FX 1803 (30% biobased) as well as F 1804 and F 1814 (both 40% biobased) grades are translucent, additionally Bio-Flex F 1814 offers increased tear resistance.

They are suitable for packaging goods with printed QR codes as well as for visually attractive packaging for all types of printed materials.

Bio-Flex FX 1821 (10% biobased), FX 1823 (30% biobased) and FX 1824 (40% biobased) grades are all opaque. These opaque grades show very good tear resistance and toughness.

As pilot tests with customers have shown, bag thickness can easily be down gauged to 8 µm with these new grades. The good processing properties using existing production facilities are similar for all Bio-Flex grades and are a characteristic of FKUR compounds.

Click [here](#) for more information.

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## Chemicals

### **Greenyug's Ethyl Acetate to hit the market**



*Greenyug*

HELM AG and Greenyug, LLC today announced an off-take agreement for the purchase and sale of bio-based Ethyl Acetate produced at Greenyug's planned Ethyl Acetate facility in Columbus, Nebraska.

Greenyug has formed a subsidiary, Prairie Catalytic, LLC, that will own and operate the production facility. This agreement will make significant amounts of bio-based Ethyl Acetate available first time to the market. The Prairie Catalytic production facility will be located next to Archer Daniels Midland Company's Corn

Processing Plant in Columbus, Nebraska. The ADM facility in Columbus will supply the project with bioethanol feedstock and other services. Construction of the facility is anticipated to start during 2017 with production set to begin about a year later. Greenyug and HELM are pleased to announce that HELM will take over exclusive responsibility for the worldwide sales and marketing of Ethyl Acetate from the Prairie Catalytic facility.

Greenyug developed its patented technology at its Santa Barbara, California Research Facility and continued the scale-up at its fully integrated demonstration plant in India. Greenyug has developed a proprietary platform to add value to bioethanol by upgrading it into a variety of bio-based chemicals with broad market appeal. Greenyug Ethyl Acetate, the first of such products, is a widely-marketed specialty solvent used extensively in products such as paints, coatings, pharmaceuticals, adhesives and a variety of consumer goods. Ethyl Acetate has a global market of more than \$4 Billion. The market for Ethyl Acetate is growing faster than GDP because of its desirable properties. Greenyug Ethyl Acetate will be the first commercially available in industrial quantities to be entirely sourced from renewable feedstock.

Click [here](#) for more information.

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## **Levulinic acid project launched by Bio-On and Sadam**

A team of two companies, Bio-on and Sadam Group, has begun working on a project to develop innovative industrial processes, at competitive cost and with low environmental impact, to produce levulinic acid, a key element of the sustainable chemical industry of the future.

The United States government considers levulinic acid to be one of the largest families of industrial derivatives of the future and it is deemed to be

one of the 12 most promising bio-intermediates by the National Renewable Energy Laboratory. According to the most recent forecasts and based on various independent research, Bio-on estimates that market demand for levulinic acid will grow 150-200-fold over the next 7-8 years.

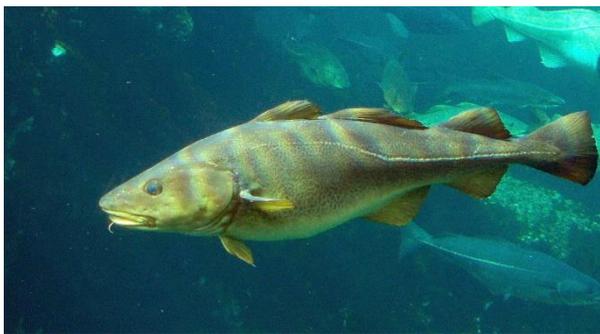
It is a natural compound made from biomass and the project envisages using sugar beet co-products as the raw material. It is a platform chemical product that can be used to produce other chemical substances or to replace the synthetic alternatives. The main end users of levulinic acid are the agricultural, pharmaceutical and cosmetics sectors, but this natural molecule also helps create new ecological fuels, fertilisers and anti-parasitic products. It is also used in the biodegradable plastics sector, expanding its field of application, and it is an intermediate element for making high-performance plastics, drugs and many other new-concept "green" products.

To anticipate the growing demand and exploit a competitive advantage, Bio-on and Sadam Group have launched a shared project to develop innovative industrial processes to produce levulinic acid using sugar industry by-products as raw material. Particular attention will be paid to economic and ecological aspects: current global production of levulinic acid comes from highly polluting plants, with an unacceptable environmental impact for European standards and with vast production costs, resulting in high market prices.

Click [here](#) for more information.

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## Omega-3 from algae instead of fish



*Wikimedia Commons*

Royal DSM and Evonik today announced their intention to establish a joint venture for omega-3 fatty acid products from natural marine algae for animal nutrition. This breakthrough innovation will, for the first time, enable the production of omega-3 fatty acids for animal nutrition without using fish oil from wild caught fish, a finite resource. Evonik and DSM's alternative omega-3 source is the first to offer both EPA and DHA and will be aimed at initial applications in salmon aquaculture and pet food. The companies will together build a commercial-scale production facility in the United States.

Evonik's and DSM's highly concentrated algal oil is a high value and pure source that will enable the animal nutrition industry to keep up with the increasing demand for these two essential omega-3 fatty acids without endangering fish stocks, contributing to healthy animal nutrition as well as to the ecological balance and biodiversity of the oceans.

The successful product and process development was only possible thanks to the complementary competencies that Evonik and DSM bring to the collaboration: DSM has expertise in the cultivation of marine organisms including algae and long-established biotechnology capabilities in development and operations, whilst Evonik's focus has been on developing industrial biotechnology processes and operating competitively large-scale manufacturing sites for fermentative amino acids.

The algal oil from DSM and Evonik means that the vision of salmon farming without using fish-based resources is – for the first time – becoming realistic. By replacing fish oil in salmon feed with this EPA and DHA rich alternative, the fish-in-fish-out ratio could be reduced significantly. This alternative will enable the aquaculture industry to continue to grow sustainably.

Worldwide fish oil production is approximately one million metric tons per year. Most of the fish oil is used in aquaculture, mainly for fat-rich fish species, such as salmon. The limited wild fish stocks restrict the amount of fish oil available and thus the growth of the aquaculture industry. Currently, the industry uses about 75% of the annual production of fish oil. Evonik and DSM's algal oil will offer a sustainable non-fish alternative.

Click [here](#) for more information.

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# Consumer Products

## Biobased artificial grass



*Wikimedia Commons*

SYNLawn is paving the way for the future by introducing a new biobased and environmentally renewable polyethylene (PE) product made from Brazilian sugar cane that is sustainably grown under some of the strictest environmental, social, and industrial practices in the world.

SYNReNew™ synthetic turf combines soy-based polyurethane BioCel™ and EnviroLoc™ backing technology with polyethylene fibres made from sugarcane technology to produce a new and completely biobased synthetic turf product.

According to industry manufacturers, it is nine times as efficient to derive ethanol from sugarcane as from corn, and four-and-a-half times as efficient compared to ethanol derived from sugar beets. Even more striking is the fact that the manufacturing of one pound of petroleum-based polyethylene releases 5.5 lbs. of carbon dioxide to the atmosphere—whereas the plants used to create the same amount of sugarcane-based polyethylene can capture that same amount of the greenhouse gas during a typical 18 month

growing season. And because of the short growing season, sugarcane is highly renewable.

As a lifestyle brand, SYNLawn's goal is to help educate consumers on why artificial grass is a great option to reduce and save water, as well as eliminate the use of harmful chemicals when it comes to landscaping applications. By using highly renewable biobased products, SYNLawn has set themselves apart from their competitors by offering products that make a positive environmental impact without sacrificing quality.

Click [here](#) for more information.

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## Danone and Nestle to develop biobased water bottles



*Pixabay*

Danone and Nestlé Waters, the world's two largest bottled water companies, have joined forces with Origin Materials, a startup based in Sacramento, California, to form the NaturALL Bottle Alliance. Together, the three partners aim to develop and launch at commercial scale a PET plastic bottle made from bio-based material, i.e. 100% sustainable and renewable resources. The project uses biomass feedstocks, such as previously used cardboard and sawdust, so it does not divert resources or land from food production for human or animal consumption. The technology represents a scientific breakthrough for the sector, and the Alliance aims to make it available to the entire food and beverage industry.

This next-generation PET will be as light in weight, transparent, recyclable and protective of the product as today's PET, while being better for the planet. The exclusive use of renewable feedstocks which do not divert resources or land from food production is the Alliance's main focus area. The R&D will focus initially on cardboard, sawdust and wood chips but other biomass materials, such as rice hulls, straw and agricultural residue could be explored.

Origin Materials has already produced samples of 80% bio-based PET in its pilot plant in Sacramento. Construction of a "pioneer plant" will begin in 2017, with production of the first samples of 60+% bio-based PET to start in 2018. The initial volume goal for this first step is to bring 5,000 metric tons of bio-based PET to the market. Thanks to their complementary skills and shared vision, the NaturALL Bottle Alliance aims to develop the process for producing at least 75% bio-based PET plastic bottles at commercial scale as early as in 2020, scaling up to 95% in 2022. The partners will continue to conduct research to increase the level of bio-based content, with the objective of reaching 100%

Click [here](#) for more information.

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## **Biodegradable resins for PepsiCo's packaging**

Biotechnology leader Danimer Scientific and global food and beverage company PepsiCo, Inc. (PEP) have announced an agreement that includes development of Danimer Scientifics' biodegradable film resins to meet the sustainable flexible packaging requirements of PepsiCo's global food and beverage business.

The agreement builds on a long-standing relationship that has included the development of bio-based compostable packaging for PepsiCo's snack brands and will facilitate the expansion of Danimer Scientifics' Nodax™ PHA plant.

In October 2016 PepsiCo announced its 2025 sustainability agenda, which includes the intent to reduce greenhouse gas emissions across its value chain and design 100 percent of its packaging to be recoverable or recyclable. This goal is part of PepsiCo's decade-long Performance with Purpose initiative to deliver top-tier financial performance over the long term by integrating sustainability into its business strategy. This collaboration is also expected to help expedite PepsiCo's transition to packaging that is completely biodegradable for their snack food portfolio by incorporating Nodax™ PHA bioplastic into certain of its next-generation snacks packaging.

Nodax™ PHA is a naturally occurring biopolymer produced by microbial bacteria as they ferment organically sourced oils. Produced using renewable biomass, Nodax™ PHA is both sustainably sourced and proven to be capable of replacing many short-term use petroleum-based plastics, for both performance and price. Traditional plastics are manufactured from chemicals obtained from mined crude oil or natural gas sources.

Danimer Scientifics' Nodax™ PHA received the first ever OK Marine Biodegradable certification from Vinçotte International, validating that the biopolymer safely biodegrades in salt water environments, leaving no toxins behind. Nodax™ PHA possesses seven Vinçotte certifications and statements of industrial and home compostability, biodegradability in anaerobic, soil, fresh water, and marine environments, and is bio-based. All of Danimer Scientifics' biopolymers, including Nodax™ PHA, are FDA approved for food contact.

Click [here](#) for more information.

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## First ever Spider Silk product is a necktie



*Bolt Threads*

Bolt Threads, a Bay Area-based biotechnology company creating the next generation of advanced materials, today unveiled the company's first step towards commercial apparel production. At SXSW Festival, the company will release a limited edition knit necktie made of 100 percent Boltspun spider silk—the first spider silk product ever available for purchase.

The unisex tie is 100 percent spider silk made by humans using the company's proprietary technology. It is the culmination of seven years and over 200 person-years of research and design, and embodies the company's mission to produce sustainable performance fabrics for commercial use.

Bolt Threads is releasing 50 limited edition synthetic spider silk neckties, which will be made available to the public to purchase on March 11. Ties will be sold on the company's website via a lottery, which opens on March 11 and closes on March 14. Winners of the lottery will be able to purchase a Boltspun silk tie and own a piece of history.

Following its launch from stealth in 2015, Bolt Threads has continued to pique the interest of investors and partners alike. Last year, the company announced a \$50 million round in Series C funding, along with a partnership with outdoor retailer Patagonia.

Click [here](#) for more information.

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## Solegear and Braskem to produce recycling containers



*Braskem*

Solegear Bioplastic Technologies Inc. and Braskem, the leading producer of biopolymers in the world, announced today a 3-year partnership in which Solegear will utilize Braskem's I'm green™ Polyethylene to produce and distribute a series of household recycling containers under its good natured™ brand. The first products resulting from this partnership will be on display starting this Friday at the Natural Products Expo in Anaheim, CA.

Braskem developed its I'm green™ material from Brazilian sugarcane - a renewable and sustainable resource - to be a drop-in biopolymer substitute to conventional polyethylene. Cultivation of sugarcane utilizes carbon dioxide and releases oxygen, which gives the material a negative carbon footprint. Braskem's analysis has confirmed the environmental impact of using 1 ton of green PE is the equivalent of capturing 2.78 tons of carbon dioxide from the atmosphere from a cradle to gate perspective.

Click [here](#) for more information.

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## Biobased plastic packaging for kids' snacks

The launch of erdbär Freche Freunde's new eco-friendly pouch demonstrates the company commitment towards sustainability, achieving a unique position in the German snack market for kids. The premade multi-layer laminated pouch, with spout and cap, is mainly made of bio-based

polyethylene obtained from renewable sources, such as sugar cane – and is a major achievement to reduce the company’s environmental footprint. The Freche Freunde offer a range of snacks for children, ideal for on-the-go, made of 100% organic fruit and veg with no added sugar or additives.

For Gualapack the launch of a new generation of eco-friendly CheerNEXT, made of more than 80% of renewable sourced polymers, is a world première that demonstrates the longstanding commitment of the Group to reduce the environmental impact of its products. The laminates used for this development are the bio-based LamiNEXT, an internal production by Safta, part of the Gualapack Group.

Click [here](#) for more information.

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## Events

### European Funding for Bio-Based Industries

London, 3rd May 2017

**Innovate UK**  
Knowledge Transfer Network

Brought to you by Knowledge Transfer Network (KTN), the H2020 UK National Contact Points, SusChem and Enterprise Europe Network, this free to attend event will give details about the 2017 call for proposals from the European Bio-based Industries Joint Undertaking.

This event is aimed at companies and research organisations that are interested in European

Funding for Bio-based Industries (BBI) and who wish to work with European counterparts in collaborative research and innovation projects. The morning session will highlight information about the 2017 call for proposals from the BBI Joint Undertaking and the afternoon will be highly participative in support of consortia building and proposal development.

Due to limited spaces this will operate an Expression of Interest scheme: Innovate UK will confirm your space at the event within 10 working days from submission of your details.

Click [here](#) for more information.

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### FDI Expo

London, 17<sup>th</sup> – 18<sup>th</sup> May 2017



The Foreign Direct Investment (FDI) Expo and FDI Magnet invite you to join Going Global Live and FDI Expo at ExCeL in London, 17 & 18 May.

FDI Magnet’s initiative “Invest in Bioeconomy” aims to promote sustainable and job-creating Foreign Direct Investment – globally.

Going Global Live is a leading event for companies looking to expand internationally. Once a company has proved a bioeconomy concept, global expansion is the way to scale. In the UK, many companies have developed technologies which can be applied with great advantage in other parts of the World: continental Europe, Americas, Asia or Africa.

FDI Expo runs alongside Going Global Live, gives countries and regions the opportunity to showcase their unique offerings in the bioeconomy: natural resources (agriculture, forestry, fisheries) agriculture and horticultural residues (such as cereal straws, manures, fruit pomace, and vegetable peel) as well as: universities and talents, prototyping labs and factories, transportation infrastructures, free zones and public incentives.

Click [here](#) for more information.

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## **Bio-Based Live 2017**

**Amsterdam, 31st May - 1st June 2017**



There has never been a more exciting time to work in the Bio-Based industry. Global production of bio-based chemicals now exceeds 60 million tonnes with the global market for bio-based chemicals expected to increase to at least \$12.2bn by 2021.

As part of our aim to support the shift towards bio-based products and the circular economy we bring you the second annual Bio-Based Live, hosted at the Amsterdam Science Park on the 31st May and 1st June 2017.

Our cutting-edge agenda focuses on the development of bio-based and green innovations that are cost-competitive at commercial scale and placing bio-based and green adoption at the heart of sustainability strategies.

Click [here](#) for more information.

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## **13th International Conference on Renewable Resources and Biorefineries**

**Wroclaw, 7<sup>th</sup> – 9<sup>th</sup> June 2017**



The 13th edition of the International Conference on Renewable Resources & Biorefineries will take place in Wroclaw, Poland from Wednesday June 7 until Friday June 9, 2017. Based on the previous RRB conferences, this conference is expected to welcome about 400 international participants from over 30 countries.

Delegates from university, industry, governmental and non-governmental organisations and venture capital providers will present their views on industrial biotechnology, sustainable (green) chemistry and agricultural policy related to the use of renewable raw materials for non-food applications and energy supply. The conference further aims at providing an overview of the scientific, technical, economic, environmental and social issues of renewable resources and biorefineries in order to give an impetus to the biobased economy and to present new developments in this area.

The conference will provide a forum for leading political, corporate, academic and financial people to discuss recent developments and set up collaborations.

Click [here](#) for more information.

## EFIB 2017

Brussels, 9th - 11th October 2017



The 10th European Forum for Industrial Biotechnology and the Bioeconomy (EFIB) returns to Brussels October 2017 and will attract industry executives committed to a shift towards renewable, biologically-based manufacturing. EFIB is organised by EuropaBio, Europe's largest and most influential biotechnology industry group and Smithers Rapra, global leader in rubber, plastics, polymer and composites information products.

Click [here](#) for more information.

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## European Bioplastics Conference

Berlin, 28<sup>th</sup> – 29<sup>th</sup> November 2017



Today, there is a bioplastic alternative to almost every conventional plastic material and corresponding application. While offering the same qualities and functionalities as their conventional counterparts, bioplastics strive to be even better by providing innovative solutions with improved properties and performances as well as the unique ability to reduce emissions and our dependency on fossil resources. The 12th edition of the annual European Bioplastics Conference will showcase just how biopolymers are Making the Difference in driving innovations forward for more sustainability, resource efficiency, and functionality.

Every year the European Bioplastics Conference features a well-researched conference programme and impressive speaker line-up attracting more than 300 senior bioplastics decision makers from across the bioplastics value chain, policy bodies, NGOs, and brand owners.

Click [here](#) for more information.

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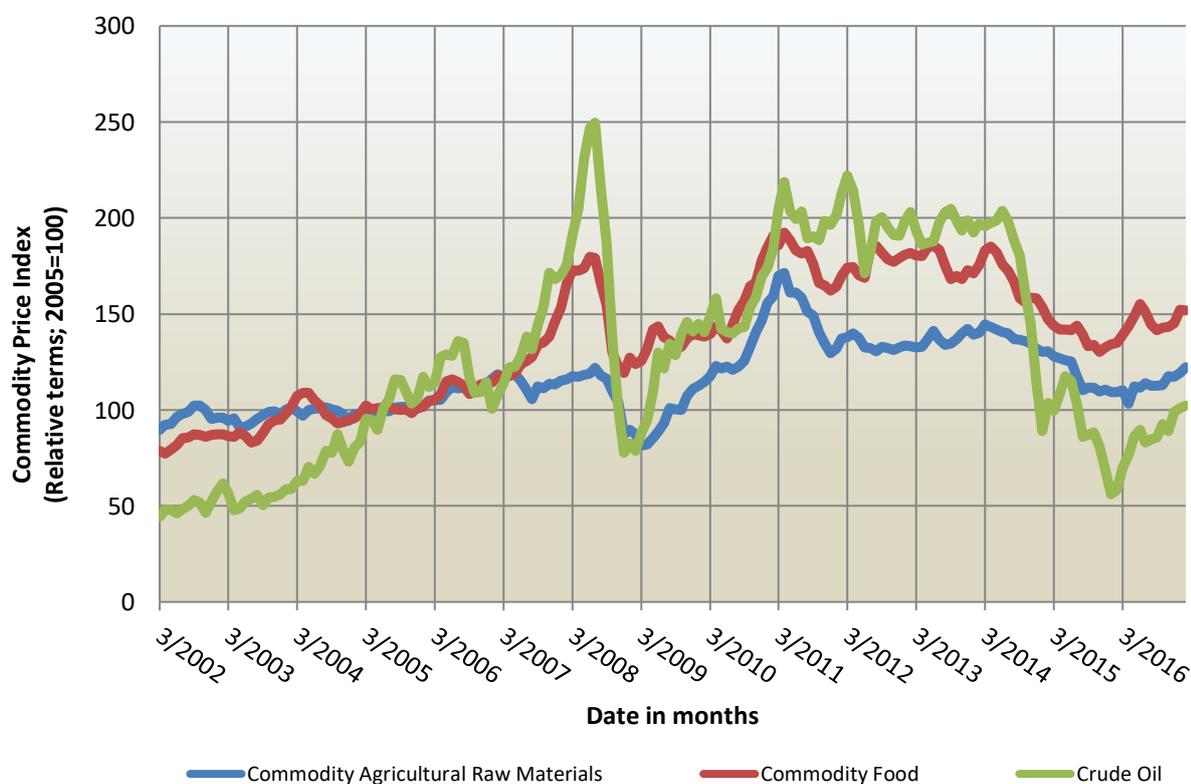
# Price Information

**Spot Prices of feedstocks as of today and five years ago, and percentile price change. Arrows indicate rise (↑), constant (–) or fall (↓) from previous month.**

Item	Price, US\$ (Feb 12)	Price, US\$ (Feb 17)	Price Change
Crude oil (petroleum, barrel)	112.70 (↑)	54.36 (↑)	-52%
Maize (corn, metric ton)	279.46 (↑)	162.88 (↑)	-42%
Sugar (pound)	0.2342 (↓)	0.2035 (↓)	-13%
Rapeseed oil (metric ton)	1,297.21 (↑)	872.33 (↓)	-33%
Soybean oil (metric ton)	1,170.22 (↑)	742.92 (↓)	-37%
Ethanol (gallon)	2.20 (↓)	1.51 (↓)	-31%

For details on indexes please see [www.indexmundi.com/commodities](http://www.indexmundi.com/commodities); Ethanol prices from Govt of Nebraska at [www.neo.ne.gov/](http://www.neo.ne.gov/)

## Raw materials 15-year Price Indices



For details on the nature of these commodities please see [www.indexmundi.com/commodities](http://www.indexmundi.com/commodities)

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**NNFCC**  
**Biocentre, York Science Park**  
**Innovation Way**  
**Heslington, York**  
**YO10 5DG**

**Phone: +44 (0)1904 435182**  
**Fax: +44 (0)1904 435345**  
**Email: [enquiries@nnfcc.co.uk](mailto:enquiries@nnfcc.co.uk)**  
**Web: [www.nnfcc.co.uk](http://www.nnfcc.co.uk)**  
**Twitter: @NNFCC**