The Bioeconomy Consultants

NNFCC

Bio-based Products

News Review

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

Contents

Foreword

Here at NNFCC we recognise the potential of bioplastics to reduce the carbon footprint of packaging and create new opportunities for a more circular economy. We also recognise the term bioplastic is confusing to those not in the industry and is potentially inhibiting the growth the sector. The confusion lies in multiple reasons for the use of the 'bio' prefix. This is normally used to denote either a material produced from renewable resource such as biomass, or a material that will biodegrade under certain conditions. A product produced from biomass, correctly termed a 'biobased product', may or may not be biodegradable, and a biodegradable product may or may not be produced from biomass, hence the confusion. The industry would do well to drop the bioplastic homonym, and in business to business communication specifically use the CEN-defined term "biobased" for materials derived from biomass, and be clear on whether and under what conditions the material may biodegrade. The best method of communicating the value of biobased products to the consumer is an ongoing topic of discussion and requires a brand story based on credible and defendable sustainability information.

The question of biodegradation is regularly discussed in respect to end of life disposal of hard-to-recycle packaging. This class of packaging includes many food packaging items such as laminated films and the ubiquitous single-serve coffee pod. These items are ideally suited to disposal with food waste, an opportunity potentially realisable through compostable packaging. The issue arises when food waste is disposed of through anaerobic digestion rather than composting. Compostable packaging is not guaranteed to biodegrade under anaerobic digestion conditions. This creates a barrier to growth of the biodegradable packaging industry.

To address this issue the Italian biobased plastic producer Novamont recently commissioned a scientific study into the behaviour of compostable plastic bags in a typical complete-system German anaerobic digestion process. The study looked at carrier bags produced from Novamont's MATERBI compostable plastic. The bags were shown to completely degrade within the normal processing time of the German facilities. It should be noted that although the degradation process began in the anaerobic digestion stage, German facilities use a post-digestion composting process and a total of 5 to 10 weeks was required for complete bag degradation.

Finally, on the topic of bags, new research has shown the possibility of developing a biotechnology based disposal route for conventional polyethylene bags. The research stems from the observation that wax caterpillars can consume 92mg of PE in 12 hours. We note however that the environmental issue around plastic bags has little to do with disposal options but revolves their excessive use and inefficient collection. The "bag for life" remains the preferred solution to the single-use carrier bag.

Read on for the latest news.

Policy

Clearing up confusion about bioplastics

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Wageningen Food & Biobased Research (WFBR) have published a new report collating facts and figures on technical, economical, and sustainability aspects of bio-based and biodegradable plastic food packaging.

The authors find that the term bioplastic is often used by the public. However, the term 'bioplastic' refers to either the bio-based origin of a plastic or the biodegradable character of a plastic. These two aspects of a plastic are not synonymous, and therefore the term 'bioplastic' is confusing.

Several relevant aspects regarding bio-based and biodegradable plastics are defined in the first chapter. In chapter 2, the appearance and recognition of these plastics are addressed. Next, figures for the availability and costs of bio-based and biodegradable plastics are presented in chapter 3. Their application and suitability for packaging of food is discussed in chapter 4, while end-of-life options for bio-based and/or biodegradable plastic products - with focus on post-consumer food packaging - are reviewed in chapter 5.

Finally, several sustainability issues of bio-based plastics are addressed in chapter 6, such as their impact compared to fossil-based plastics, the food-versus-biobased plastics discussion, the use of genetically modified organisms for bio-based plastic production, and their disposal in the environment.

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Markets

Amyris continues debt reduction with equity conversion

Amyris, Inc., the industrial bioscience company, has announced the closing of the first tranche of up to $95 million in planned equity financing that the company previously announced on May 8, 2017. The first tranche was approximately $47 million and was led by Koninklijke DSM N.V. (Royal DSM) with participation by qualified institutional buyers and accredited investors, including some which have previously engaged in equity and/or debt investments in Amyris.

Subject to the satisfaction of certain conditions and approval by DSM's Managing Board, DSM may invest an additional $25 million in Amyris within 90 days of the closing of the first tranche. Amyris has commitments from current, long term investors that exceeds the remaining $23 million to meet the company's $95 million objective.

As part of a development cooperation with DSM, the two parties have agreed to focus on a number of short- to medium-term product development & production opportunities in vitamins and other nutritional ingredients. Amyris noted that as the companies successfully engage in these activities

the revenue and margin will be accretive to Amyris's current revenue plan.

Amyris noted that of approximately $75 million in debt that it is in the process of reducing that the majority has already converted or is expected to be converted in the relative near term. As a result, outside of these conversions to reduce debt, the company expects to deploy less than $20 million of total cash raised to pay down the aggregate debt amount of $75 million.

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Amyris

Amyris writing off debt faster than expected

Amyris also announced it has already exceeded the debt reduction goal the company stated in its May 8, 2017 announcements regarding equity financings and its plans to reduce its debt by approximately $75 million. To date, $86 million in debt has been retired.

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Future Market Insights predicts moderate growth for HDMA market

One of the major consumption areas for hexamethylenediamine is the manufacturing process of nylon 66 fibre and resins. Hence, the increase in demand for nylon 66 fibres has largely impacted the global hexamethylenediamine market in a positive way. With the growth of nylon as a major substitute for a number of applications, especially in the automotive industry where nylon has substituted metals in a number of applications, it is expected that the hexamethylenediamine market will grow at a fast pace. During the past few years, there has been a significant rise in demand for hexamethylenediamine which is used for the manufacturing of nylon 6-6 resins.

The increasing research and development focused on the development of a better substitute to replace the use of hexamethylenediamine during the manufacturing of nylon 66 is a major restraint for the market. Additionally, hexamthylenediamine is a highly corrosive substance and hence, there are regulations governing the manufacturing, packing and transport of this chemical.

There has been a significant increase in demand for bio-based nylon resins and hence, companies are focusing on creating a bio-based production technology for the manufacturing hexamethylenediamine and adipic acid (the other component used in the manufacture of nylon 66 along with hexamthylenediamine). The major factors differentiating the conventional hexamethylenediamine from bio-based hexamethylenediamine include cost effectiveness, raw material prices and the production process.

Yet another major trend observed in the global hexamethylenediamine market is that major manufacturers are focusing on the expansion of their production capacity to gain an edge over other players in the market. Many of the manufacturers have expanded their footprints in the emerging markets of China, India and other Asian Countries. The manufacturers are also making significant investments on acquisitions in the global hexamethylenediamine market.

Click here for more information.

Persistence Market Research's Castor Oil market forecast

Pixabay

Castor oil is a vegetable oil derived from the seeds of castor plants. Castor oil is one of the most versatile plant oils available and contains a high amount of ricinoleic acid (over 80%) and oleic acid. Castor oil is pale yellow in colour and is majorly used in the production of soaps, lubricants, hydraulic and brake fluids, paints, dyes, coatings, inks, cold resistant plastics, waxes and polishes, nylon, pharmaceuticals, and perfumes.

Sebacic acid and dehydrated castor oil are among the major revenue generators in the global castor oil market. Large-scale adoption of sebacic acid in plasticizers, lubricants, hydraulic fluids, cosmetics, and manufacturing of candles is catalysing its growth in the global market. Castor wax is the fastest growing type of castor oil. Due to the growing acceptance of castor wax in applications such as cosmetics, lubrication, coatings and greases, its demand is witnessing a massive surge.

Click here for more information.

Strong first quarter showing for EcoSythetix

EcoSynthetix Inc., a renewable chemicals company that produces a portfolio of commercially proven bio-based products, announced its financial and operational results for the three months ended March 31, 2017. Financial references are in U.S. dollars unless otherwise indicated.

Net sales were $3.6 million for the three months ended March 31, 2017 (Q1 2017), compared to $3.0 million for the same period in 2016. The 22% increase was primarily due to higher sales volumes of $0.4 million, or 14%, and an increase in average selling price which positively impacted sales by $0.2 million, or 8%. The increase in sales volumes during the period was principally due to new commercial accounts. The increase in average selling price was primarily due to favourable pricing dynamics.

Gross profit was $0.8 million for Q1 2017, compared to $0.5 million in the same period in 2016. Gross profit as a percentage of sales was 22.2% for Q1 2017, compared to 16.1% in the same period in 2016. Gross profit as a percentage of sales adjusted for manufacturing depreciation was 27.1% for Q1 2017, compared to 22.8% for the same period in 2016. The improvement in gross profit was primarily due to higher average selling prices and an increase in sales volume.

Click here for more information.

Research & Development

Metabolic breakthrough for Amyris could allow massive diversification of development

Amyris, Inc., the industrial bioscience company, has announced that it has successfully expanded its world-class expertise in strain engineering and optimization to 26 key metabolic precursors across multiple organisms, as part of its Technology Investment Agreement (TIA) with the Defense Advanced Research Projects Agency (DARPA).

The development and optimization of metabolic networks to these 26 metabolic intermediates and many different pathways beyond terpenoids allows Amyris to develop an industrial-scale fermentation process for virtually any biological molecule. In addition to the expansion of the range of metabolic precursors, Amyris has also successfully expanded its industry-leading high-throughput S. cerevisiae strain construction and testing pipeline to several other industrially-relevant organisms.

These advancements have the cumulative effect of drastically reducing the R&D costs and timelines for developing a commercial process for any biological target, irrespective of the final application of the molecule. This is empowering Amyris with additional resources to develop next-generation capabilities to further advance its competitive position and accelerate its capabilities to produce go-to-market sustainable supply solutions at industrial scale for its partners.

Click here for more information.

Borregaard expands lignin capabilities

Borregaard will invest NOK 500 million in a programme to upgrade and specialise the production facilities for lignin products at the Sarpsborg site in Norway. The project includes new drying capacity, tanks for storage of liquid materials and improved solutions for logistics, infrastructure and energy. The investments will be completed by the end of 2019.

Lignin capacity at the Sarpsborg site is 160,000 metric tonnes dry solid per year, of which an increasing share is speciality products. The new investment will enable further specialisation on the unique raw material base, and will reduce the exposure to cyclical market segments. It will also facilitate optimisation of production campaigns and improve logistics.

New storage tanks for liquid materials meet future environmental standards, and will eliminate the need for external storage capacity and reduce logistics costs. New installations for infrastructure and energy will reduce energy costs and offer substantial environmental and safety benefits.

The investment programme will be classified partly as expansion and partly as replacement investment. The programme as a whole meets Borregaard's return requirements for expansion investments.

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Fast biodegradation of polyethylene by caterpillars

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A common insect larva that eats beeswax has been found to break down chemical bonds in the plastic used for packaging and shopping bags at uniquely high speeds. Scientists say the discovery could lead to a biotechnological approach to the polyethylene waste that chokes ocean ecosystems and landfill sites.

Scientists have found that a caterpillar commercially bred for fishing bait has the ability to biodegrade polyethylene: one of the toughest and most used plastics, frequently found clogging up landfill sites in the form of plastic shopping bags.

The wax worm, the larvae of the common insect Galleria mellonella, or greater wax moth, is a scourge of beehives across Europe. In the wild, the worms live as parasites in bee colonies. Wax moths lay their eggs inside hives where the worms hatch and grow on beeswax – hence the name.

A chance discovery occurred when one of the scientific team, Federica Bertocchini, an amateur beekeeper, was removing the parasitic pests from the honeycombs in her hives. The worms were temporarily kept in a typical plastic shopping bag that became riddled with holes.

Around a hundred wax worms were exposed to a plastic bag from a UK supermarket. Holes started to appear after just 40 minutes, and after 12 hours there was a reduction in plastic mass of 92mg from the bag.

Scientists say that the degradation rate is extremely fast compared to other recent discoveries, such as bacteria reported last year to biodegrade some plastics at a rate of just 0.13mg a day. Polyethylene takes between 100 and 400 years to degrade in landfill sites.

If a single enzyme is responsible for this chemical process, its reproduction on a large scale using biotechnological methods should be achievable.

Click here for more information.

Early-stage environmental assessment of biobased chemicals

Climate change and fossil resource depletion are driving a transition to a bio-based economy, for which novel bio-based chemical processes need to be developed. The environmental performance of the novel bio-based chemicals should be assessed during their development, when the production process can still be adapted, although data availability is limited. Many environmental assessment methods applicable during product development ('early-stage methods') exist in the literature. The aim of this study is to provide an overview of these early-stage methods and to evaluate to what extent they are suitable for assessing bio-based chemicals in their early-stage development. The paper first describes the characteristics of early-stage chemical design and the environmental impacts of bio-based products based on published life cycle assessments. Low data requirements, the inclusion of climate change and energy indicators, and the inclusion of environmental impacts from biomass feedstock production are identified as three good-practice principles for early-stage assessment of bio-based chemicals. In the second step, 27 early-stage assessment methods are reviewed and categorized based on their scope and

environmental indicators used. Finally, the reviewed methods are evaluated using the good-practice principles. A perfect early-stage method does not exist. However, choosing the most suitable method(s) based on the goal of an assessment and using complementary indicators leads to the most effective assessment for novel bio-based chemicals in development.

Click here for more information.

Assessing psychological reasons for buying biobased

This article explores whether subjective ambivalence increases the understanding of consumers' intentions to buy bio-based products. Subjective ambivalence is the aversive feeling that accompanies evaluations containing both negative and positive elements. Two studies in six European countries show that subjective ambivalence increases the explained variance beyond vested exploratory variables: emotions and variables of the theory of planned behaviour. This finding implies that the intention to purchase bio-based products is based on more than cognitive deliberations or emotions; it is also associated with an aversive feeling of subjective ambivalence. Additionally, this article divides attitudes into risks and benefits associated with bio-based products and thereby shows that subjective ambivalence strengthens the association between risks and intentions and not that between benefits and intentions. In conclusion, to understand public opinion regarding bio-based products, it is important to comprehensively monitor and understand ambivalence.

Click here for more information.

Life Cycle Analysis of Biobased vs Fossil-based plastic rubbish bags

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The development of bio-plastics significantly contributes to sustainable development in terms of the waste management aspects associated with lower environmental impact. To achieve the aim of this study the life cycle assessment (LCA) of garbage bags from cradle-to-grave is evaluated and compared. The materials to be studied in this paper are polyethylene (PE), biomass polyethylene from molasses (Bio-PE), and poly(butylene adipate-co-terephthalate)-starch blends (PBAT/starch). The functional unit defined for three types of garbage bags is 1 bag. The SimaPro LCA software 8.2.3 with the Eco-indicator 99 method for life cycle impact assessment (LCIA) is used to assess the environmental impacts. The normalized score from cradle-to-gate of almost all of the environmental impacts for the PE bag is lower than the scores for the Bio-PE and PBAT/starch bags, except for climate change and fossil fuels impacts, the Bio-PE and PBAT/starch bags have a small, normalized score for climate change impacts. The single score of PBAT/starch bags is 14.9% and 47.1% greater than the scores of PE and Bio-PE bags, respectively. The environmental impact performance from cradle-to-grave of the incineration of Bio-PE with energy recovery is better than the other options, in terms of fossil fuels. PBAT/starch bags also have the lowest normalized scores for climate change, and for respiratory inorganics impacts when the bags were composted. The single score values of the incineration of Bio-PE with energy recovery and

PBAT/starch in composting are favourable for all of the options studied. The environmental impact reduction of bio-based bags could be achieved through low resource consumption techniques in the packaging and production stages, and through the ultimate utilization of Bio-PE as a waste-to-energy concept and PBAT/starch when converted to fertilizers for agricultural applications.

Click here for more information.

Hexion in pursuit of biobased wood-panel resins

Geograph

Hexion Inc. has announced an expansion of its technology centre at its forest products complex in Edmonton, Alberta. The expanded research and development facility will focus on developing next generation resin chemistry for panel production that will complement the Company's existing EcoBind™ lower emitting resin technology and build on the inherent flame, smoke and toxicity (FST) properties of our current resin systems.

The expanded lab is focused on emerging phenolic resin technology that substitutes phenol with bio-based raw materials, such as lignin. An abundant, natural polymer, lignin is an organic material that has significant potential as an adhesive substitute in wood panel production.

The technology centre expansion is set to be complete by the third quarter of 2017. In addition to state-of-the-art analytical equipment, Hexion has also invested in new panelboard press technology at the Edmonton lab to test the bio-based resins in an actual production environment due to the difficulty in working with natural feedstocks. The "pilot plant" is meant to mimic commercial production in a typical Alberta facility and demonstrate that the new resins and press, working in concert, can deliver the same or better panel properties as traditional materials. The new lab also leverages an investment in lignin production announced by Alberta Innovates (AI), a program designed to help diversify the Alberta economy by accelerating growth of the bio-industrial sector.

In addition to the investments in Edmonton, Hexion remains committed to providing independent emissions testing as well as consulting on wood product development at its Advanced Testing Services (ATS) laboratory in Springfield, Oregon.

Click here for more information.

University of Maine operates pilot-scale biorefinery

A pilot plant capable of processing up to 1 ton of woody biomass per day into chemicals that can be used to manufacture bioproducts, including biofuels, biochemicals and advanced materials, was demonstrated in 100 hours of continuous operation at the University of Maine's Technology Research Centre (TRC) in Old Town.

Chemicals made from biomass could one day be an important revenue source for the forest economy. Organic acid platform chemicals, as they are known in the industry, have multiple uses, including the production of plastics and other specialty chemicals.

UMaine reassembled the pilot plant with a grant from the Maine Technology Institute's Cluster Improvement Program (CIP) and some funds from a previous Maine Technology Asset Fund (MTAF) award. This was further supplemented with federal funds from a recent Defense Logistics Agency award.

The Biomass to Bioproducts Pilot Plant, which occupies 10,000 square feet in TRC, is the first step in scaling up UMaine's jet fuel technology, which is still in bench-scale production. FBRI researchers hope to add another pilot plant that would use the platform chemicals to create larger quantities of biofuel — prototyping for commercialization. The two pilot plants would fully demonstrate the potential of creating diesel and jet fuels — and the chemical ingredients — entirely from biomass.

The Biomass to Bioproducts Pilot Plant is the newest addition to UMaine's research facilities that are dedicated to prototyping, and demonstrating technologies and new products to benefit commercialization of the emerging bioeconomy sector. UMaine's other pilot plants focus on pulp and paper, food and nanocellulose.

Click here for more information.

Noblegen looking to go global

Ontario bioproducts company Noblegen is expanding its marketing activities and looking to sell its algae-based bioproducts on a global scale. Noblegen has secured $1.8 million to target the global nutritional supplements and animal nutrition markets.

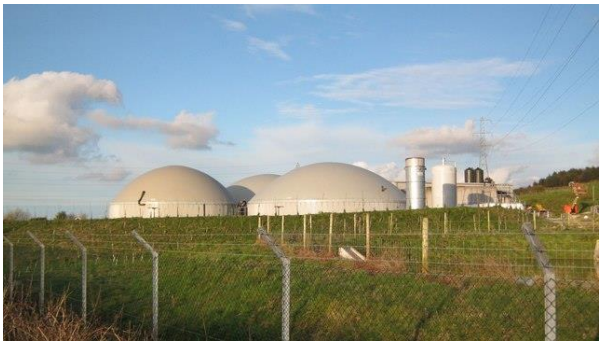
Noblegen opened its new Gen 1 production facility, the largest commercial manufacturing facility of its kind in North America, in Peterborough, Ont., on March 31. The facility sustainably grows algae that can be used to create bioproducts, such as plant-based proteins and oils.

FedDev Ontario is contributing $600,000 for Noblegen's scale up, which tops up $1.2 million from an accredited member of the Peterborough Region Angel Network.

Click here for more information.

Polymers

Success in test of anaerobic digestion of bioplastic bags



Geograph

Novamont commissioned IGlux Witzenhausen GmbH and Witzenhausen-Institut GmbH to conduct a scientific study into the behaviour of biodegradable carrier bags made from MATER-BI – the bioplastic made by Novamont – in German anaerobic digestion plants.

The use of biodegradable bags made from MATER-BI was tested in a procedure which encompassed the entire process using equipment made by four different companies: Kompogas, Thoeni, Bekon and WTT.

The bags were monitored during pre-treatment, anaerobic digestion, post-composting and maturation at each plant. The percentage by weight of MATER-BI in the input material was between 3.5% and 3.8%. Degradation began during the anaerobic stage and was completed

during composting. In total, the process took between five and ten weeks, depending on the plant. No MATER-BI residue was found in any of the samples examined at the end of the test, demonstrating that it had completely degraded in all four plants.

The test was commissioned in Germany, where organic waste plays a significant role in the national renewable energy plan and is increasingly used to produce biogas. Efficient interception of this type of waste is therefore crucial for recovering the most energy-rich component, namely kitchen waste. At present, however, even where separate collection of organic waste is in place, studies show that a significant percentage of organic waste is still sent to landfill. This explains increased usage of carrier bags made from compostable bioplastic, with users convinced of their practicality and hygiene.

The test was entirely successful, with complete degradation of MATER-BI carrier bags within the time normally taken for the process at all four plants, which are representative of the majority of anaerobic digestion facilities employed to process organic waste in Germany, eliminating any reservations about use of the bags.

Click here for more information.

Bio-Fed launches Castor-based polyamides

Bioplastic marketer Bio-Fed has launched its M-VERA ECS series, adding renewable polyamide compounds to its portfolio.

In part driven by ongoing fluctuations in the oil price, but also in an effort to reduce energy consumption and improve their carbon footprint, Bio-Fed, a subsidiary of Akro, has turned to bio-oil from castor seeds.

Castor oil from the seeds of the castor oil plant (Ricinuns communis) forms the basis of sebacic acid, which in turn serves as the basis for the product's renewable raw material content.

Unlike the previous products in the M·VERA line, the ECS products are partially biobased, but not biodegradable. Because a long service life of the product is desirable in technical applications, and high material resistance is required, these products are ideal to round out the BIO-FED range.

The material's carbon footprint is more favourable overall than that of polymers entirely of fossil origin, as the plant-based raw materials have already removed carbon from the environment during their growth phase. Since neither the seeds of the castor oil plant nor the castor oil are used as food, there is no conflict with the food industry.

Click here for more information.

Biobased Porous Membranes have wide ranging medical applications

Extensive employment of biomaterials in the areas of biomedical and microbiological applications is considered to be of prime importance. As expected, oil based polymer materials were gradually replaced by natural or synthetic biopolymers due to their well-known intrinsic characteristics such as biodegradability, non-toxicity and biocompatibility. Literature on this subject was found to be expanding, especially in the areas of biomedical and microbiological applications. Introduction of porosity into a biomaterial broadens the scope of applications. In addition, increased porosity can have a beneficial effect for the applications which exploit their exceptional ability of loading, retaining and releasing of fluids. Different applications require a unique set of pore characteristics in the biopolymer matrix. Various pore morphologies have different characteristics and contribute

different performances to the biopolymer matrix. Fabrication methods for bio-based porous materials more related to the choice of material. By choosing the appropriate combination of fabrication technique and biomaterial employment, one can obtain tuneable pore characteristic to fulfil the requirements of desired application. In our previous review, we described the literature related to biopolymers and fabrication techniques of porous materials. This paper we will focus on the biomedical and microbiological applications of bio-based porous materials.

Click here for more information.

TIPA partnership pursues biobased food packaging film

TIPA

TIPA Sustainable Packaging, a developer and manufacturer of breakthrough bio-based, fully compostable, flexible packaging, and Jindal Films Europe, a global leader in the development and manufacture of specialty packaging and labelling film solutions announced a signature of a partnership agreement at Interpack 2017.

The companies' collaboration will result in the co-development of an original bio-based, compostable high barrier film targeted at the snack food packaging, dairy and meat products, frozen food, coffee and tea markets, and more. With growing concerns over packaging and food waste, TIPA and Jindal Films Europe's partnership will develop new advancements in packaging technology to meet the growing needs of the industry.

Addressing the multi-material and laminate markets, where viable reuse or recycling pathways are currently not available, the collaboration will result in the development of a new, state-of-the-art solution that meets the food packaging industry's needs for a high barrier film, that is both a disposable and organically recyclable end-of-life solution.

Click here for more information.

Eastman announces TREVEA cellulosic bioplastic for engineering

Eastman Chemical Company, the world's leading producer of cellulosic materials, introduces Eastman TRĒVA™, a breakthrough in engineering bioplastics that help global brands concurrently meet their sustainability and performance needs in today's rapidly evolving marketplace.

TRĒVA™'s benefits are three-fold: sustainability, end-use performance, and design and brand flexibility.

TRĒVA™'s composition is about half cellulose, sourced from trees derived exclusively from sustainably managed forests that are certified by the Forest Stewardship Council (FSC). The new material is BPA-free and phthalate-free.

Its excellent flow rates, durability and dimensional stability allow for less material usage, thinner parts, and longer product life, enhancing lifecycle assessments.

TRĒVA™ offers excellent chemical resistance, standing up better than other engineering thermoplastics to some of the harshest chemicals,

including skin oils, sunscreens, and household cleaners.

The material's low birefringence means eliminating the unwelcomed rainbow effect some plastics experience with polarized light, improving the user experience with electronic device screens and retail displays.

Excellent flow characteristics also enable design freedom, allowing TRĒVA™ to be used with complicated designs and in filling thin parts. Under recommended processing conditions, recent thin-wall 30 mil spiral flow testing shows that TRĒVA™ flow rates are significantly better than polycarbonate and polycarbonate/ABS blends, and comparable to ABS.

TRĒVA™ is designed to allow for superior surface gloss, clarity and warm touch and feel, enabled through a combination of the base material and Eastman's technological expertise. The material also boasts great colour saturation, and superior secondary processing and decorating capability, creating additional design and branding options.

Click here for more information.

New biobased sealant film from Plastic Suppliers Inc

Plastic Suppliers Inc

Plastic Suppliers, Inc. announced the introduction of EarthFirst® UL, an ultra-thin, bio-based sealant web used for flexible packaging applications. This game-changing material lowers the cost of sealant films used in flexible packaging, while offering all the environmental advantages of PSI's EarthFirst family of bio-based plastics. EarthFirst UL is made from lactic acid found in several renewable organic feedstocks like tapioca roots, sugar beets, sugar cane, and corn.

Both brand owners and flexible packaging converters will benefit from improved efficiencies, lower energy usage, reductions in product-to-package ratios and lower cost per MSI versus traditional LDPE sealant films. Through commercial testing and trials, the company has been able to quantify significant improvements to the overall supply chain efficiency with EarthFirst UL in lower freight costs, reducing costly roll change-overs, requiring less storage and reducing the material volume entering the solid waste stream. At the same time, this can be accomplished with a more environmentally-friendly film.

EarthFirst UL is ideal for food packaging applications using single-serve pillow pouches, coffee frac-packs, gusseted stand-up pouches, frozen foods and multi-wall bags. When compared to LLDPE, EarthFirst UL forms superior seals at lower seal initiation temperatures. It's naturally high dyne levels make it ideal as a laminate to PET, metPET, PP, Nylon and paper

substrates. UL has a great aroma barrier, grease-resistant attributes and is available in 9, 12, and 15 micron gauges (.36mil, .48mil, and .6mil).

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Cargill acquires Agrol polyol line

Cargill has bolstered its biobased polyol product offerings by purchasing Rogers Arkansas-based BioBased Technologies'® vegetable-based polyol product line, Agrol® and other assets.

Cargill's Industrial Specialties business and BioBased Technologies are leaders in the development of soybean-based polyols that replace petroleum-based polyols enabling manufacturers to create more sustainable products for their consumers. Cargill's BiOH® product line produces biobased polyols in various flexible foam markets, including bedding, furniture and automotive seats. BioBased Technologies provides natural polyols to the foam sector and other industrial markets.

The acquisition pairs BioBased Technologies' unique processing model with Cargill's global manufacturing capabilities and leverages the sustainable chemistry expertise of the two organizations. Going forward, Cargill can offer customers products that incorporate higher levels of natural polyols which reduces dependence on petroleum polyols, without sacrificing performance. Further, the acquisition will enable Cargill to expand into applications beyond the foam market, such as elastomers, sealants, coatings, binders and adhesives enabling increased sustainability efforts across those industries.

Click here for more information.

Bolloré's films contain increasing amount of Braskem's biobased plastic

Bolloré, the pioneer in ultra-thin packaging, launched the first ultrathin packaging shrink film on a basis of green polyethylene called B-Nat®. It was developed to offer most attractive shelf presentation and the optic properties were optimized. It is also a good product for multipacking applications due to his cohesion strength. Although Braskem's I'm green™ PE is a drop-in solution for many applications, with Bolloré and its specialty films, it was quite a bit different. Bolloré worked hard to adjust its process to develop B-Nat® with Braskem's grades and has already achieved 40% renewable content. The production of I'm green™ Polyethylene contributes to the reduction of greenhouse gas emissions. For every kg of I'm green™ Polyethylene used in Bolloré's ultrathin packaging shrink film more than 4.5 kg of CO_2 is saved.

Click here for more information.

Accsys announces consortium for producing Wood Elements

Accsys

Accsys, the chemical technology group, focused on the acetylation of wood, is pleased to announce that BP Ventures ("BPV") will participate in a proposed consortium (the "Consortium") to fund, build and operate the world's first Tricoya® wood elements acetylation plant.

Tricoya® Wood Elements are produced using Accsys's proprietary technology for the acetylation of wood chips, and particles for use in the

fabrication of panel products such as medium density fibreboard and particle-board. These products demonstrate enhanced durability and dimensional stability which allow them to be used in a variety of applications that were once limited to tropical hardwood or man-made products.

BP's involvement in the Consortium results from a historical interest in acetylation with some of the initial research and development into wood acetylation having been carried out at its Hull site in the past. BP Chemicals has also been a key partner of Accsys, supplying acetic anhydride for its Accoya plant in Arnhem since agreeing a collaborative strategic relationship in 2012.

The Tricoya plant is expected to have an initial capacity of 30,000 metric tonnes of acetylated Tricoya chips per annum, equivalent to approximately 40,000 cubic metres of panel products. The acetylated chips will be used as feedstock for the production of high performance MDF or particle board panels in a market estimated to be approximately 200 million cubic metres annually. The Consortium envisages constructing the plant in Hull in such a way that further capacity can be added to the site as demand grows.

Click here for more information.

Chemicals

METEX branches out into butyric acid and PDO

METabolic EXplorer (METEX), an industrial biochemicals company specializing in the development and sale of industrial fermentation processes, announces its strategic priorities.

A breakthrough technological process: oil-free, pollution-free production of consumer products (textiles, plastics, animal feed, etc.) having similar or higher performance, with better competitive cost conditions.

METEX technology is a breakthrough solution whereby the same process can be used for making two different products (butyric acid and PDO). It addresses various markets, the two main ones being animal feed, with butyric acid, and cosmetics, with PDO:

The world market for organic acids in animal feed is estimated at more than €1 bn. Within this, butyric acid is particularly experiencing a strong growth (of 250% since 2010). This growth rate is linked to its nutritional, metabolic and antimicrobial qualities that make it beneficial to animal growth and health. This growth is expected to rise with the introduction of new regulations banning the use of antibiotics as growth promoters in Europe and the USA.

The market for preservatives in cosmetics applications is estimated at €400 million in 2016. The METEX PDO can be substituted as an ingredient to controversial preservatives such as parabens, formaldehydes and halogenated. METEX has a decisive edge here, with the only GMO-free PDO, enabling major cosmetics producers to offer their customers natural, GMO-free alternatives to oil-derived products.

PDO production will also open access to the world bio-polymers market, starting with the textile fibres market, especially as regards PTT, which offers superior properties to PET and can thus expect high growth. METEX will be offering a natural, proprietary alternative to the sole current manufacturer here.

Click here for more information.

Amyris expects massive growth in Vitamin E exports

Amyris, Inc., the industrial bioscience company, has announced that it expects revenue related to its Vitamin E partnership with Nenter to more than double based on the current success of the program. During 2016, the company shipped approximately $9 million of farnesene to Nenter for conversion to Vitamin E and expects 2017 shipments to Nenter to be about $20 million.

Amyris and Nenter have a strong partnership and commitment to grow together, supplying high performing Vitamin E oil to the global nutraceuticals market. The commercialization phase of this partnership has started very strong and is an exclusive commitment between the two companies for the commercial production of Vitamin E.

The company also announced that as part of its focus on growing its relationship with Koninklijke DSM N.V. (Royal DSM) it is entering into an exclusive licensing agreement for Vitamin A within the nutraceuticals market. This relationship is focused on a fast-track to market for the production and commercialization of low-cost supply of Vitamin A.

Click here for more information.

BioAmber's succinic acid sales up 46%

BioAmber Inc. recently released first quarter financial results, reporting sales of bio-succinic acid increased 46 percent when compared to the same quarter of 2016, reaching $2.1 million. The company also reported that seven new clients began buying succinic acid during the first quarter and that its plant, located in Sarnia, Ontario, achieved a new throughput record, briefly surpassing 70 percent.

During an investor call, Fabrice Orecchioni, president, chief operations officer and interim-CEO of BioAmber said the company's primary goal is to make the Sarnia plant cash flow positive as quickly as possible. Attaining this objective, he said, requires growing the sales of bio-succinic acid, lowering production costs and consolidating the plant's fixed cost. We made progress on all three fronts during the first quarter, he added.

Orecchioni also elaborated on achievements related to the Sarnia plant's throughput rates. He noted the company has been making steady progress in plant throughput, recently hitting a new record by running as high as 70 percent. Although sales do not yet warrant operating at these higher rates for prolonged periods, the achievement does increase BioAmber's confidence that it can operate consistently close to this level of throughput, he said. In addition, Orecchioni said the company has not identified any definitive barriers preventing the plant form achieving 100 percent of the design throughput over the course of the next year.

Regarding operations, Orecchioni also indicated that the plant's fermentation process continues to demonstrate that it is robust. We have not lost a single fermentation batch in 20 months of operation, Orecchioni said.

Click here for more information.

Huntsman & Clariant merge to form global speciality chemicals giant

Huntsman/Clariant

Clariant and Huntsman Corporation have announced that their Boards of Directors unanimously approved a definitive agreement to combine in a merger of equals through an all-stock transaction.

The merged company will be named HuntsmanClariant. On a pro forma 2016 basis, the combination of both companies will create a leading global specialty chemical company with sales of approximately $13.2 billion, an adjusted EBITDA of $2.3 billion and a combined enterprise value of approximately $20 billion at announcement.

The combined entity will benefit from each other's strengths. It will have a significantly improved growth profile in highly attractive end markets and geographies. HuntsmanClariant will leverage shared knowledge in sustainability and boast a much stronger joint innovation platform. This will enable the development of new products in order to deliver superior returns and drive shareholder value.

The new company will accelerate value creation for shareholders through a more robust combination of technology, products and talent. The combined company expects to realize more than $3.5 billion of value creation from approximately $400 million in annual cost synergies. The full synergy run-rate will be achieved within two years of closing. These synergies will be realized by reducing operational costs and improving procurement. The targeted synergies represent roughly 3 percent of total combined 2016 revenue with one-time costs up to $500 million. There will also be additional cash-tax savings.

The transaction is targeted to close by year end 2017, subject to Clariant and Huntsman shareholder approvals, regulatory approvals and other customary closing conditions. Clariant and Huntsman are confident that the required regulatory approvals can be obtained in a timely manner.

Click here for more information.

Consumer Products

Synvina receives approval for PEF bottles in circular economy

Pixabay

The European PET Bottle Platform (EPBP) has given interim approval for the recyclability of polyethylenefuranoate (PEF), produced by Synvina C.V., Amsterdam, in the European bottle recycling market. Following EPBP's assessment PEF bottles are expected to be disposable through existing recovery systems the same way as polyethylene terephthalate (PET), the conventional material for plastic bottles. The interim approval applies to a PEF market penetration of up to 2%. This corresponds to the amount of PEF that could be produced from Synvina's intended 50,000 tons reference plant for furandicarboxylic acid (FDCA). FDCA made from renewable resources is the main building block for PEF. A final statement based on PEF quality, packaging designs and regional launch markets will be issued before market introduction of the novel material.

PEF quantities in the European packaging market are expected to exceed the 2% market share on a medium term. Therefore, Synvina works jointly with recyclers and brand owners to develop a dedicated recycling stream for PEF based bottles to separate the valuable PEF from conventional plastics. PEF recycling in other markets like the US and Japan will be reviewed near-time. The EPBP interim approval can be found here.

PEF is a bio-based plastic with improved barrier properties for gases like carbon dioxide and oxygen which leads to a longer shelf life of packaged products. With its recyclability, Synvina's PEF offers a significant advantage to the packaging industry in comparison to alternative bio-based plastics or barrier materials. Moreover, it also offers a higher mechanical strength, thus thinner PEF packaging can be produced and fewer resources are required. PEF is suitable as the main component or as a barrier layer in cups and trays, flexible packaging as well as bottles for carbonated and non-carbonated soft drinks, water, dairy products, still and sports drinks, alcoholic beverages as well as personal and home care products.

Click here for more information.

Events

European Biomass Conference and Exhibition
Stockholm, 12th – 15th June 2017

25TH EDITION EUBCE 2017 European Biomass Conference & Exhibition 12-15 JUNE | STOCKHOLM SWEDEN Stockholmsmässan

The European Biomass Conference and Exhibition (EUBCE) is a world class annual event which, since 1980, is held at different venues throughout Europe.

The EUBCE covers the entire value chain of biomass to conduct business, network, and to present and discuss the latest developments and

innovations, the vision is to educate the biomass community and to accelerate growth.

The EUBCE will host a dynamic international Exhibition for companies and research labs to showcase their latest products and bringing scientists, technologists and key players together with leading Biomass industries and organizations.

Click here for more information.

Chemistry and Industrial Biotechnology Showcase
York, 20th - 21st September 2017

Innovate UK
Knowledge Transfer Network

Showcasing UK chemistry and industrial biotechnology sector innovation

This two day conference and exhibition hosted by the Knowledge Transfer Network is a major event to bring together industry, researchers, investors and government agencies to showcase how the UK chemistry and industrial biotechnology sectors are helping to enable growth in key UK supply chains through innovation.

Click here for more information.

EFIB 2017
Brussels, 9th - 11th October 2017

10th Annual EFIB 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.

European Bioplastics Conference
Berlin, 28th – 29th 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.

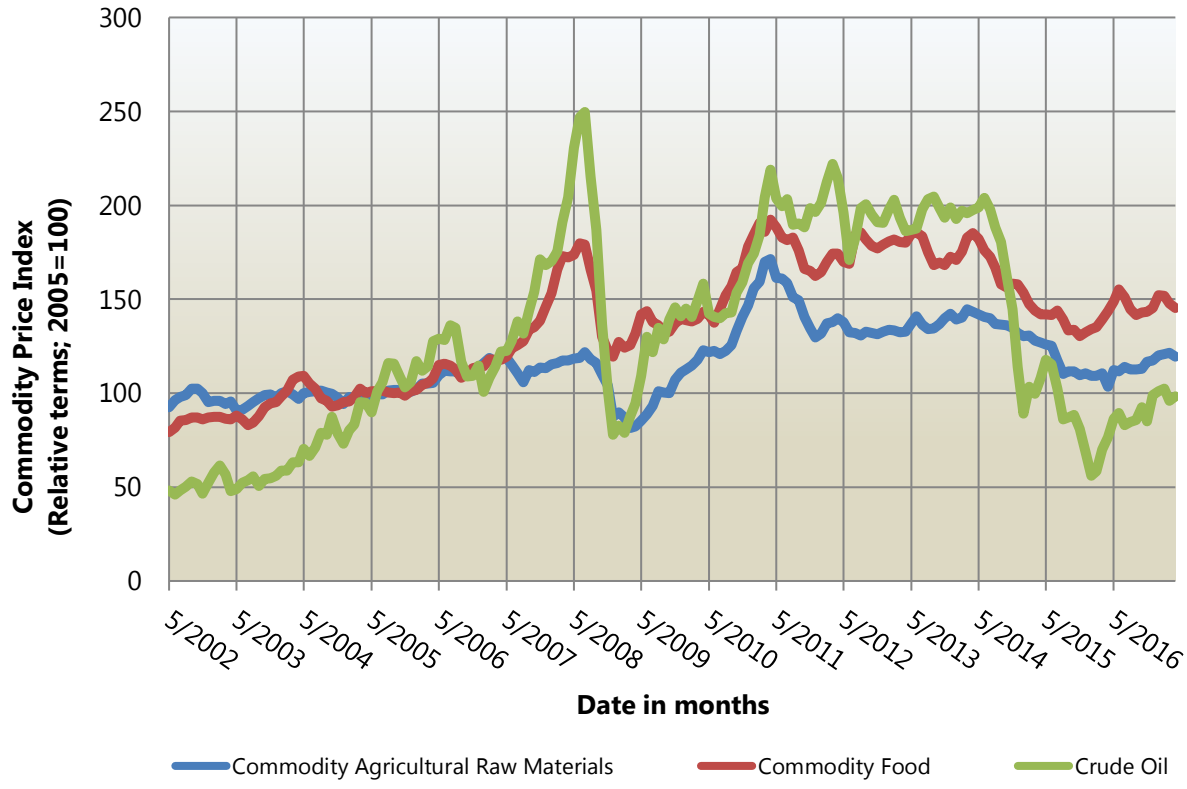
Price Information

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$ (May 2012)	Price, US$ (April 2017)	Price Change
Crude oil (petroleum, barrel)	104.16 (↓)	52.23 (↑)	-50%
Maize (corn, metric ton)	268.79 (↓)	156.44 (↓)	-42%
Sugar (pound)	0.2027(↓)	0.164 (↓)	-19%
Rapeseed oil (metric ton)	1,236.62 (↓)	823.03 (↓)	-33%
Soybean oil (metric ton)	1,134.58 (↓)	695.3 (↓)	-39%
Ethanol (gallon)	2.22 (↓)	1.64 (↑)	-26%

For details on indexes please see www.indexmundi.com/commodities; Ethanol prices from Govt of Nebraska at www.neo.ne.gov/;

Raw materials 15-year Price Indices



For details on the nature of these commodities please see www.indexmundi.com/commodities

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