BIOSCIENCES & BIOPRODUCTION

FLASH NEWS

No. 48-2021 – THE BIOTECH INDUSTRY INTELLIGENCE REPORT

CONTENTS

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1. FRACTIONATION & CONVERSION

3736 - Global Bioenergies: publication of a paper describing the mechanism of enzymes yielding renewable isobutene in Nature Communications.

This article is the result of collaborative work between Global Bioenergies and a team led by David Leys of the University of Manchester (UK), describing the enzymatic mechanisms yielding renewable isobutene, and the enzymatic evolution approach that enabled these biocatalysts to be improved. This is the first time a member of this widespread family of decarboxylases dependent on FMN, a vitamin B2 derivative, has been repurposed to yield isobutene. This has been made possible by the laboratory-based enzymatic engineering carried out at Global Bioenergies and detailed structure analysis of the enzymes at the University of Manchester. To build an alternative to fossil isobutene, Global Bioenergies assembled a novel enzymatic pathway and developed a process for the fermentative conversion of glucose (and other feedstocks) into renewable isobutene. The final step yielding the desired product is to use a decarboxylase. This particular enzyme has been evolved from naturally occurring microbial decarboxylases that depend on a modified vitamin B2 (called prenylated flavin or prFMN). Dr Leys' team has been at the forefront of studying this enzyme family and determined the structure and biochemical properties of isobutene-yielding enzyme variants evolved by Global Bioenergies. The company screened a library of enzymes with the potential to yield isobutene and achieved an 80-fold increase in their activity. Structure determination of the improved enzymes reveals that changes in the enzyme pocket are responsible for improved activity.

Publication: Directed evolution of prenylated FMN-dependent Fdc supports efficient in vivo isobutene production. Journal: Nature Communications. DOI: 10.1038/s41467-021-25598-0.

More information: Press release
En savoir plus : Communiqué de presse

3737 - Citrus canker bacterium can be an ally in the manufacturing of biobased products.

In looking to detail the biological processes used by the bacterium *Xanthomonas citri* to weaken the defences of plants, researchers at the Brazilian Centre for Research in Energy and Materials (CNPEM) discovered a new class of enzymes called CE20, which can assist infection in plants but can also be used to manufacture biobased products such as ethanol, aviation fuel, dyes, plastics and other chemical products currently derived from petroleum. The study shone a light on the molecular mechanisms inherent in the complex enzymatic cocktail of *Xanthomonas citri* to break down xyloglucan, one of the complex carbohydrates that make plants' primary cell walls resistant to pathogen invasion. The discovery could lead to the creation of new combinations of enzymatic mixes that are more effective at breaking down plant biomass. It also contributes to the development of strategies to fend off citrus canker, such as producing bacterial inhibitors.

Info: CNPEM is already developing other microbial platforms for biorefining, such as an enzyme cocktail produced by a fungus that has been tested in an industrial setting and for which a patent application has been filed.

Publication: Xyloglucan processing machinery in *Xanthomonas* pathogens and its role in the transcriptional activation of virulence factors. Journal: Nature Communications. DOI: 10.1038/s41467-021-24277-4.

More information: EurekAlert.org

3738 - New way of controlling gene expression in baker's yeast.

Researchers at the Rosalind Franklin Biotechnology Center (belonging to Dutch chemicals company DSM) and the University of Bristol (UK) have succeeded in simultaneously regulating numerous genes in the baker's yeast

Saccharomyces cerevisiae using a CRISPR technology based on protein Cas12a. Contrary to the more commonly used protein Cas9, Cas12a can quickly be conditioned to interact with those sequences responsible for controlling gene expression and easily targeting many different sequences at the same time. That makes it the ideal tool for performing the complex genetic regulation that is often required to produce compounds that are useful to industry. Using this system, scientists have succeeded in exercising precise control over the production of β-carotene, a compound of industrial importance that is used in the production of food additives and nutraceuticals. Their work opens the door to more efficient, sustainable biobased production.

Next step: To use this system based on protein Cas12a to develop other biomolecules of interest.

Publication: Efficient multiplexed gene regulation in *Saccharomyces cerevisiae* using dCas12a. Journal: Nucleic Acids Research. DOI: 10.1093/nar/gkab529.

More information: Press release

3739 - New key enzyme discovered in the lignin of poplar plants.

By studying the biochemistry of cell walls in poplar plants and particularly their lignin, researchers at the Brookhaven National Laboratory, USA, together with researchers at the University of Kyoto, Japan, have identified a key enzyme responsible for the synthesis and accumulation of p-hydroxybenzoate (pBA) in lignin. In making it possible to control expression of the gene that produces the enzyme, and thus adjust the level of pBA present in the biomass, this work could have a multitude of applications, especially in renewable p-hydroxybenzoic acid production, improved biofuel production and/or durability of the wood. They could, later on, bring about a new carbon sequestration method, as an increase in pBA levels in lignin would enable greater carbon capture in plant biomass.

Publication: Monolignol acyltransferase for lignin *p*-hydroxybenzoylation in *Populus*. Journal: Nature Plants. DOI: 10.1038/s41477-021-00975-1.

More information: Press release

3740 - New way of producing synthetic muscle protein from microorganisms.

Researchers at the McKelvey School of Engineering at Washington University in Saint Louis, USA, have developed a way of producing synthetic muscle protein from *Escherichia coli* bacteria that have been modified to reconstitute smaller segments of the protein. The scientists used this method to successfully produce titin, a high molecular weight muscle protein and one of the three major protein components of muscle tissue. They then used a wet-spinning process to convert the proteins into fibres of around 10 µm in diameter. The team then analysed the structure of these fibres to identify the molecular mechanisms that enable their unique combination of exceptional toughness, strength and damping capacity. These elastic fibres, supposedly tougher than Kevlar, could be used in textile manufacture. Because it is nearly identical to the proteins found in muscle tissue, and thus biocompatible, it could be used in many biomedical applications such as sutures, implants, prostheses, tissue engineering, and so on. According to the researchers' calculations, one litre of material cultivation could produce 250 metres of fibre.

Next step: To determine whether this '*protein-building bacterium*' could be used to create other types of polymers for other potential applications.

Publication: Microbial production of megadalton titin yields fibers with advantageous mechanical properties. Journal: Nature Communications. DOI: 10.1038/s41467-021-25360-6.

More information: Engineering.wustl.edu

En savoir plus : Futura Sciences.com, Formule Verte.com, Daily Geek Show.com

Calls for proposals

3741 - Call for proposals: *'Development of a sustainable aviation fuel industry in France'*.

This call for proposals (CFP) issued by Jean-Baptiste Djebbari, French Deputy Transport Minister, and Agnès Pannier-Runacher, Deputy Industry Minister, is designed to support R&D projects put forward by companies that, individually or as part of a consortium, are accelerating the market rollout of ambitious, innovative and sustainable solutions, from industrial research to operational demonstration. It can also finance engineering work prior to the investment decision. With a budget of up to €200 million, the CFP is part of the fourth PIA investments for the future programme (PIA4) and the national strategy *'Biobased products and industrial biotechnologies - Sustainable fuels',* to be presented shortly. The CFP has been open since 27 July and is set to close on 29 April. The proposal requirements are available here (in French). The call will be reviewed on 15 October 2021.

Recap: The European Commission's objective for aviation is to transition from 2% biofuel usage in 2025 to 20% in 2030 and even 63% by 2050.

En savoir plus : Communiqué de presse, France TV Info.fr, Air Journal.fr

Ongoing projects

3742 - The BioTfuel project: second-generation biofuel production.

Following on from a successful test programme resulting in the validation, development and optimisation of a chain of semi-industrial scale processes on four types of biomass to produce biokerosene, the Bionext consortium, which includes IFP Energies Nouvelles, Axens, Sofiprotéol, ThyssenKrupp Industrial Solutions, the CEA and TotalEnergies, has announced that BioTfuel technology is set to be sold in licence form starting early 2022.

En savoir plus : Techniques de l'Ingénieur.fr, L'Usine Nouvelle.com, Industrie & Technologies.com, Formule Verte.com

3743 - Amoéba: results of the 2nd round of testing on cereals and 3rd round of testing against downy and powdery mildew.

The company that produces an organic biocide capable of eliminating bacterial risk in water and human wounds, and a biological pest control product (still in development phase), has announced that the second round of agronomic testing against diseases in cereals, carried out in three countries (France, Italy and Germany) has confirmed the effectiveness of its biological pest control formulae. Encouraging results have been observed in especially extreme conditions this year, particularly with one of the tested formulae, which, under trial conditions, is just as effective as the reference chemical fungicide, and led to a statistically significant increase in yield (8.5% compared to the untreated control). These results will naturally be subject to a confirmation procedure in 2022.

More information: Press release
En savoir plus : Communiqué de presse

Amoéba announced promising results for the Biocontrol-Grapevine application in what was very much a *'mildew year'*. The 27 field trials distributed among 8 European countries confirmed, for the 3rd consecutive year, the activity of the active substance, but also confirmed that in the event of very high pressure from mildew, it is best to opt for conventional protection to complement the biological pest control. In addition, results of the strategy associating Amoéba's experimental products with copper, reducing copper input per hectare to around 1,500 g/year, are once

again highly encouraging in view of the regulatory review of copper at European level planned for 2026. As for powdery mildew, all contaminated test specimens very clearly demonstrated the effectiveness of Amoéba's experimental products: 90% effectiveness was achieved on vines in a test with high disease intensity, i.e. nearly as effective as sulphur in the same conditions.

More information: Press release
En savoir plus : Communiqué de presse

3744 - The 3BCAR Carnot institute publishes its 2020 annual report.

The report takes a look over the network of Carnot institutes and 3BCAR's skill areas before focusing on the platforms, key points and highlights of the previous year. It also lists the status of each project (beginning or end) and the five resourcing projects funded in 2020. Furthermore, it presents some of the projects and actions funded by the 3BCAR contribution, some examples of partner research, a focus piece on patents, technological offers, theses and start-ups. The report ends with a summary of the new international missions funded in 2020 and looks back on the international missions carried out between 2015 and 2019.

En savoir plus : 3BCAR.fr

3745 - Presentation of the Biological Resource Centre dedicated to filamentous fungi.

The international microbial resource centre – filamentous fungi (CIRM-CF) is a French biological resource centre dedicated to filamentous fungi (macromycetes and micromycetes) of biotechnological interest. It is joined with INRAE's Fungal Biodiversity and Biotechnology joint research unit, which studies filamentous fungi as a source of innovation for biomass valorisation for chemistry and energy, and whose objective is to develop bioprocesses based on renewable sources of carbon rather than fossil carbon. While the CIRM-CF collection is mainly made up of strains of saprotrophic species growing on plant matter in nature, it also includes strains from polluted agroindustrial sites. Today, this collection includes nearly 3,000 strains, 1,000 of which are recognised for their biodegradation capability, characterised at phenotypic level as molecular, and easily accessible thanks to an online catalogue that lets users choose strains based on the information provided. CIRM-CF's scientific environment positions it at the centre of scientific progress where fungal biotechnology is concerned. This also means it can place all its expertise at users' disposal by providing services in multiple fields (molecular analysis, functional screening and enzyme production, etc.).

Info: Currently, CIRM-CF's strains are used most notably for research programmes in the fields of biorefinery, development of biocontrol solutions, soil or side stream bioremediation, and biomaterials, etc.

En savoir plus : Inrae.fr

3746 - Master's degree course in Green Chemistry and Eco-Innovation launched.

Launched in September by the University of Savoie Mont-Blanc Chemistry Department, the objective of this Master's course is to educate students on a greener and more sustainable chemistry practice, within a circular bioeconomy context. All chemical industries and their applications are covered by the course, whose basis will be organic chemistry, material chemistry and polymer chemistry. It will also include lessons on the use of new analytical, digital and technological tools for chemistry, without forgetting transversal approaches on the possible impacts at environmental, societal and economic level. The course programme, which is oriented towards either the industrial sector or academic research depending on the student's professional pathway, is available in standard format, block release format (combining an apprenticeship with a professional training contract), or, for specific modules, as continued professional development training.

En savoir plus : Le Dauphiné.com

3747 - Carbiolice

Having been awarded *'OK compost HOME'* certification in November 2020 for flexible plastic packaging (single-layer film of up to 60 µm in thickness and multi-layer film of up to 30 µm) containing 33% polylactic acid (PLA), 62% PBAT and 5% Evanesto® enzymatic additive, the Carbios subsidiary has announced that it has just obtained the same certification for rigid plastic packaging (up to 450 µm) containing 70% PLA and 5% of its Evanesto® additive. Certified yoghurt pots, trays, cups, flowerpots and other containers will now fully biodegrade in a domestic compost bin in 255 days, leaving no residue or toxic waste, even at ambient temperature.

More information: Press release
En savoir plus : Communiqué de presse, Emballages Magazine.com, Environnement Magazine.fr, Formule Verte.com, France TV Info.fr

3748 - Carbios

The French specialist in the enzymatic recycling of plastics announced the launch of its industrial demonstration plant which uses its enzymatic recycling technology named C-ZYME®1. Located on the Cataroux site in Clermont-Ferrand, Puy-de-Dôme, the demonstration plant is the last step in the development of the C-ZYME® process. It will be used to validate the technical, environmental and economic performance of the PET enzymatic recycling process and heralds the design of future industrial units. Its operation will lead to the issue of comprehensive Process Design Package (PDP) documents by the end of 2022 for the construction and operation of an industrial reference unit (with an estimated capacity of 40,000 tonnes/year) as well as future plants to be operated under licence. The industrial demonstration plant will also make it possible to produce batches of monomers from enzymatic recycling of waste PET to guarantee technical and regulatory validation of the recycled PET for future licence holders. Initial tests have already been carried out successfully, reaffirming process scale-up.

More information: Press release
En savoir plus : Zone Bourse.com

3749 - Danimer Scientific

The American sustainable materials producer announced that it had received a $400,000 (€342,000) subsidy from the United Soybean Board. This funding will allow it to pursue its work in determining whether high-oleic soybean oil (HOSO) can be used as a raw material in the commercial production of Nodax®, its signature polyhydroxyalkanoate (PHA).

More information: Press release
En savoir plus : Formule Verte.com

3750 - Fermentalg

The French microalgae specialist announced that CarbonWorks, its equal-share holding with the Suez group, had inaugurated the first industrial demonstration plant for its Carbon Capture and Utilization (CCU) by algal photosynthesis technology. This first photobioreactor, installed on an agricultural methanation site based in Cestas, Gironde, has a capacity of 10 m^3 and will be able to:

- Capture and dissolve the CO_2 produced by the biogas works,
- Transform the sequestered carbon into organic biomass via photosynthesis,
- Promote this biomass as a natural antifungal treatment to replace synthetic pesticides.

For this first facility, CarbonWorks has teamed up with Immunrise Biocontrol, an enterprise with innovative new company status, specialising in the research and development of biological pest control solutions, and Pot au Pin (PAP) Energie, a company producing biomethane from raw agricultural materials using the Cestas site.

En savoir plus : Capital.fr, Formule Verte.com

3751 - Lantana Bio

This early-stage French industrial biotechnology company, which chose to move its entire R&D activity to TWB, has developed a technology based on microbial strain engineering to produce bioactive plant compounds (flavonoids, anthocyanins and other polyphenols). These compounds, which are in very high demand, are then used as functional ingredients and dietary supplements for their health benefits, and as natural food colouring in the food industry.

More information: Toulouse White Biotechnology.com
En savoir plus : Toulouse White Biotechnology.com

3752 - Lego

The Danish construction toy manufacturer has unveiled the first brick made of recycled polyethylene terephthalate (rPET) from plastic bottles. This prototype is the fruit of three years' research, requiring tests on over 250 different versions of PET and hundreds of other types of plastic resins meeting the brand's criteria in terms of quality, safety and playability. For even greater safety, the group chose rPET from suppliers based in the USA that use processes established by the US Food & Drug Administration (FDA) and European Food Safety Authority (EFSA). Nevertheless, these new bricks are unlikely to arrive on the market in the next 18-24 months, partly because the group announced that it wished to continue testing and developing its rPET-based formula before assessing the feasibility of progressing to the pilot production phase, and partly because it has filed a patent application for a formula that strengthens its prototype to give it the solidity required for its toy bricks.

Recap: In 2018, Lego began to produce parts made of bio-polyethylene derived from sustainable sugar cane for its plants (trees, bushes, etc.). In 2020, it announced that it wanted to remove all single-use plastics from its boxes.

More information: Press release
En savoir plus : Formule Verte.com, Enviro2b.com, L'Usine Nouvelle.com

3753 - Lesaffre

The French yeast and fermentation specialist has announced the upcoming inauguration of an industrial biofoundry in the Lille metropolitan area. It will be the first facility of its type in France and one of the biggest in Europe, boasting more than 14 robots, over 30 cutting-edge instruments, design and data analysis software, and a stereolithographic 3D printer for each laboratory equipment prototype development. It will also harness three major skill areas: engineers specialising in automation and software engineering; researchers specialising in high-speed screening; and biologists with expertise in biological design (a combined team of technical specialists in standard yeast selection methods, genetic engineering, metabolic engineering, physiology of microorganisms and systems biology). Above all, it will have access to a particularly innovative gene-editing technology since Lesaffre signed a strategic partnership with Recombia Biosciences in October 2020. The technology offers the possibility of making multiple genetic modifications in parallel, simultaneously generating thousands of different yeast strains. This should exponentially expand the catalogue of biobased ingredients that are synthesised by genetically reprogrammed yeasts, such as biofuel compounds, petroleum substitutes for manufacturing plastic materials, molecules of therapeutic interest, and agricultural biocontrol products that are free of pesticides, and so on, while also giving a considerable boost to standard genetic improvement programmes focused on yeast and bacteria. The innovation prospects are manifold for the food and animal feed sectors, but also for health, environmental protection, energy production and new material design.

More information: Press release
En savoir plus : Communiqué de presse

3754 - METabolic EXplorer (METEX)

On 23 September, the French biotechnology company inaugurated its first industrial facility at the Carling Saint-Avold complex in Moselle. The facility, which took two years to build and required a €50 million investment,

produces two substitutes to petrochemical derivatives: one aimed at the cosmetic and polymer markets (1,3 propanediol), and another at the animal feed market (butyric acid). To bring the project to fruition, METEX joined forces (via its Metex Noovista subsidiary) with the Société de Projets Industriels (SPI) public fund. The fund is led by Bpifrance with the participation of the European Investment Bank.

Recap: The first batches produced on the METEX NØØVISTA industrial site were sold in June.

En savoir plus : BLE Lorraine.fr, Formule Verte.com, L'Usine Nouvelle.com

3755 - NatureWorks

Having announced in June that the initial engineering phase relating to the construction of a new polylactic acid (PLA) manufacturing plant was being finalised in Thailand, the American producer has just announced that it has received permission from its shareholders to complete the project. The future complex, which will most likely require a $600 million (€514 million) investment, will include lactic acid, lactide and polymer production sites, making it *'the first PLA facility in the world designed to be fully integrated'*. Work is set to start in the second quarter of 2022 and the plant put into service in 2024. The site should eventually be able to produce 75,000 tonnes per year.

More information: Press release
En savoir plus : Formule Verte.com

3756 - Samsara

This Australian start-up is lab-testing an enzymatic technology developed by the scientists at the Australian National University (ANU) that breaks down waste plastic into basic components to be recycled into new plastic. Samsara is supported in the project by the ANU and Main Sequence, an innovation fund founded by the Commonwealth Scientific and Industrial Research Organisation, along with Australian supermarket chain Woolworths. The first commercial recycling plant is set to begin service in the next couple of years. It will deliver the first 5,000 tonnes of recycled materials to the Woolworths group, which will use them to make new packaging for its products.

Recap: Carbios developed a new enzyme capable of breaking down plastic for recycling in April last year.

More information: Food Mag.com, Packaging Gateway.com

3757 - Total Corbion PLA

The joint venture between French group TotalEnergies and Dutch group Corbion has announced that packaging containing its Luminy® PLA can now not only be certified as compostable but also recyclable. In addition, Total Corbion PLA has demonstrated that cardboard packaging made with its Luminy® PLA can also be used for recipients that need heating in a microwave or traditional oven.

More information: Press release

Total Corbion PLA has announced that its Rayong plant in Thailand, inaugurated in 2019, reached a cumulative production total of 100 kT of Luminy® PLA at the start of the year.

Recap: Total Corbion PLA is planning to build a second PLA plant with a 100 kT capacity on the Grandpuits refinery site in France. The facility, which is set to enter into service in 2024, will be the first of its type in Europe.

More information: Press release

3758 - TotalEnergies

The French broad energy group has announced the development of a 100% renewable fuel for motorsport competition. The new fuel, named 'Excellium Racing 100', is made from a bioethanol base derived from French wine residues, and ETBE, produced at the TotalEnergies refinery in Feyzin, Rhône, from raw materials also originating from the circular economy. The fuel, which will immediately reduce CO_2 produced by race cars by at

least 65%, will be introduced in next season's FIA World Endurance Championship (WEC), including the 2022 24 Hours of Le Mans, and in the European Le Mans Series (ELMS).

More information: Press release
En savoir plus : Communiqué de presse, Futura Sciences.com

Commercial launches

3759 - Agrauxine by Lesaffre

The division of French group Lesaffre dedicated to organic solutions for plant production has announced that it has received authorisation to market its first bionutrition product, Fertispring® (AMM 1210482). The new product acts as a nutrient for soil microflora as it can increase microbial populations in the soil and stimulate their activity. This boosts mineralisation of the organic matter and increases the quantity of nutrients that can be directly assimilated by the plant. The new yeast-based technology comes in powder form, to be incorporated into fertilisers and substrates to work in synergy with them. The solution can be used for large-scale farming, specialist crops (grapes, market gardening, horticulture, etc.) and turf, in conventional or organic agriculture.

Info: According to the results of different greenhouse and field trials on more than seven crops (lettuce, tomato, aubergine, ornamental plants, turf and wheat), Fertispring® boosts biomass above and below ground by 10%.

En savoir plus : Communiqué de presse, Formule Verte.com

3760 - Amyris

The American biotechnology company has teamed up with model, actress and influencer Rosie Huntington-Whiteley to announce the launch of their cosmetics brand, Rose Inc., and their first beauty product collection, Modern Essentials. Rose Inc.'s products are based on non-comedogenic formulae and developed with exclusive bioengineered ingredients from sustainable sources, including squalane, Amyris' pure, sustainable, plant-derived moisturiser; and hemisqualane, Amyris' sustainable, natural-origin alternative to liquid silicones and cyclomethicone. The new Modern Essentials collection includes various products, including luminous hydrating concealer, enriched shaping gel and brightening serum.

More information: Press release

3761 - Global Bioenergies

The industrial biotechnology company has announced that its LAST make-up range – the first long-lasting make-up range of over 90% natural origin – now includes lip products. Just like its 18 shades of mascaras, eyebrow mascaras and liquid eyeshadows available since June, the 14 shades of liquid lipstick combine high performance and naturalness in an all-new way, thanks to the natural-origin isododecane produced by Global Bioenergies. The new products can be purchased on the www.colors-that-last.com website.

More information: Press release
En savoir plus : Communiqué de presse, Formule Verte.com

Fundraising

3762 - French cleantechs raise €1.7 billion in the first half of 2021.

GreenUnivers, the media outlet for energy transition professionals, has published an exclusive report detailing 57 fundraising efforts (6 of which for confidential amounts) recorded in the first half of 2021, amounting to €1.7 billion

raised. According to the report, the renewable energies sector is leading the field with 16 operations totalling €705.8 million. Next up is the circular economy, with 6 operations and €313.2 million collected, and the hydrogen sector, with 3 operations and €231.1 million collected. According to GreenUnivers, *'although this is a broad-based dynamic, driven by the European and French recovery plans which are prioritising the green transition, these impressive results are also the result of a handful of major fundraising efforts, several of which were completed on the stock exchange. Six businesses therefore account for a little over 75% of the total amount raised: Neoen (€600 million), Back Market (€276 million), Hydrogène de France (€132 million), Carbios (€114 million), Hydrogen Refueling Solutions (€97.3 million) and BlaBlaCar (€97 million).'*
GreenUnivers is offering its members the exclusive tables of the fundraising efforts for the first six months of 2021 covering renewable energies, energy efficiency, mobility, hydrogen and storage, sustainable agriculture and green chemistry, the circular economy, and water/air treatment.

Info: This is a new six-month record, with the previous record standing at €1.5 billion for the whole of 2018.

En savoir plus : GreenUnivers.com

3763 - Afyren

The French green chemistry company announced that it had raised €66.5 million when it joined the Paris-based Euronext Growth trading market. The amount for the operation could rise to around €72.8 million if the full over-allotment option is exercised (up to 10% of the initial offering). Afyren shares were listed on Euronext Growth Paris for the first time on 1 October this year. The new cash will enable it to fund construction of two plants in North America and South-East Asia, tipped to produce 28,000 t/year. Entry into service of the new facilities is planned for late 2024 and early 2026 respectively.

Recap: Afyren intends to bring the first plant online in the first quarter of 2022. It will be capable of producing 16,000 t/year of biobased organic acids and 23,000 t/year of fertiliser. The new plant will be located on the Carling-St-Avold site in Moselle, France.

En savoir plus : Les Echos.fr, Formule Verte.com

3764 - Allozymes

The Singapore-based company, which has designed a proprietary biotech platform that can be used to analyse and map millions of enzyme variants per day and generate massive enzyme performance datasets, announced that it had raised $5 million (€4.2 million) in a seed financing round. The operation, led by Xora Innovation (the deep tech investment branch of Temasek Holdings), will enable it to develop its platform by discovering, designing and optimising enzymes that increase the production of natural ingredients, with a focus on sustainability and economic performance. To start with, Allozymes is targeting a wide range of industrial applications, ranging from sweeteners to natural colours to vitamins to personal care to cosmetics ingredients.

More information: Press release

3765 - Bota Bio

The Chinese company, which has developed a biotech platform employing an evolution-based fermentation process to sustainably produce low-cost products with high added value for various industrial products (such as sweeteners, vitamins and crop protection products) announced that it had raised $100 million (€845 million) in a Series B funding round. The fundraising operation was led by Sequoia Capital China and involved, among others, previous backers Matrix Partners China, Source Code Capital, Sherpa Healthcare Partners and 5Y Capital. The new funds should enable it to expand its global operations and develop its platform to facilitate the industrial scale-up and rapid deployment of its product portfolio in the areas of consumer goods, food, nutrition and pharmaceutical products.

Info: This operation brings its total funding to $145 million.

More information: Press release

3766 - Evoco

The Canadian start-up, which develops biobased alternatives to petrochemical compounds and harmful materials (particularly those found in sports equipment), announced that it had raised 5 million Canadian dollars (€3.33 million) from Forage Capital Partners in a Series A fundraising round. The new funds will enable it to develop innovative plant-based solutions while expanding its technologies to new markets. Evoco also hopes to grow its team.

En savoir plus : Formule Verte.com

3767 - FabricNano

The British company that specialises in the biomanufacturer of molecules of interest from enzymes placed on a *'DNA wafer'* announced that it had raised $12.5 million (€10.6 million) in a Series A funding round. The fundraising effort was led by investment fund Atomico with the participation of co-founder of Twitter Biz Stone, actress and UN Sustainability Ambassador Emma Watson, and former Bayer CEO Alexander Moscho. The operation means it can step up development of its technology so it can conquer new markets and expand its team from 12 to 30 people, as well as move to new premises in London.

Info: With its patented technology, FabricNano can already create chemicals such as 1,3 propanediol. The company – which also announced that it could manufacture four other commodity chemicals – declared its interest in the pharmaceutical and commodity chemicals markets.

More information: Techcrunch.com

3768 - Genomatica

The American industrial biotech company announced that it had raised $118 million (€99.7 million) in a Series C fundraising round led by the Danish investment firm Novo Holdings with the participation of Viking Global Investors and Casdin Capital, among others. It will use the funds to scale production of its portfolio of substances and continue investing in new technologies.

More information: Press release
En savoir plus : Formule Verte.com

3769 - Ginkgo Bioworks

The American biotech company announced that it had collected $1.6 billion (€1.37 billion) after joining the stock exchange. The proceeds will help it fund the growth of its cell programming platform.

More information: Press release

3770 - Solugen

The American start-up, which designs and uses enzymes to transform sugars into high added-value chemicals, announced that it had raised $357 million (€304.7 million) in a Series C fundraising round. The operation involved Lowercarbon Capital, Singapore's sovereign wealth fund GIC Private Limited, and the investment management firm Baillie Gifford. It will use these new funds to '*copy and paste*' its Bioforge platform, which can produce 10,000 tonnes of chemicals every year, and set up similar plants worldwide. The American company also plans to *'hire aggressively while continuing to develop new molecules using the cell-free, synthetic biology techniques'* that led to its early success in water treatment.

Info: This fundraising effort brings Solugen's valuation to over $1.8 billion (€1.5 billion) and its total capital raised to over $400 million (€341.5 million).

More information: Press release

En savoir plus : Formule Verte.com

3771 - Transition Evergreen

The largest listed investment fund in France focused on the green transition and reducing our carbon footprint announced that it had carried out a capital increase without shareholders' preferential subscription rights for €17.5 million (of which €11.3 million in cash). The funds raised through this private placement, carried out with a restricted circle of investors and combined with the introduction of a current account advance granted by Financière Evergreen, will help finance Transition Evergreen's foray into new participating interests, enable it to continue providing support for existing participating interests, and finance the working capital, which has been reduced from €32 million to €15.4 million until 30 June 2022. Transition Evergreen also announced that it had signed an investment agreement with the hydrogen bus manufacturer Safra and finalised negotiations to acquire a company that owns ten biogas facilities in Germany.

En savoir plus : Communiqué de presse, Les Echos.fr

3772 - Twelve

The American company specialising in the transformation of CO_2 into high added-value products announced that it had raised $57 million (€48.1 million) in a Series A funding round. The effort was led by the investment fund DCVC with the participation of Capricorn Technology Impact Fund and Carbon Direct Capital Management as main investors. The investment funds Munich Re Ventures, Microsoft Climate Innovation Fund, Breakout Ventures and Evok Innovations also took part in this fundraising operation. Twelve plans to use the new funds to develop its technology. It also announced carbon transformation partnerships with Mercedes-Benz, Procter & Gamble and NASA, to convert CO_2 emissions into essential products.

More information: Press release

New investments

3773 - Shell

The Anglo-Dutch petrochemical company announced plans to invest *'hundreds of millions of dollars'* to build a facility to produce renewable diesel and sustainable aviation fuel (SAF) from waste (used cooking oil, waste animal fat and other industrial and agricultural residual products). Built at the Shell Energy and Chemicals Park Rotterdam in the Netherlands, the new facility will be capable of producing 820,000 tonnes per year, making it one of the largest biofuel production facilities in Europe. Entry into service is scheduled for 2024.
Shell – which until now only used sustainable fuels produced by other companies – announced that it planned to produce 2 million tonnes of SAF by 2025. The group also wants SAF to make up 10% of its fuel sales to the aviation sector by 2030.

Info: Shell's goal is to reduce its production of traditional fuels by 55% by 2030.

More information: Press release
En savoir plus : L'Usine Nouvelle.com, Boursier.com, La Tribune.fr, Formule Verte.com, Le Journal de l'Aviation.com

New partnerships

3774 - Braskem & Gelmart International

The Brazilian group announced that it had signed a partnership agreement with the American manufacturer of intimate apparel Gelmart International, meaning its I'm green™ EVA biopolymer can be used to produce sustainable underwear. The agreement has opened the door for the American company to make the world's first mass-

produced plant-based bra cup. The new range of underwear was launched in August and is available exclusively across 3,300 Walmart retail stores and online at Walmart.com.

More information: Press release

3775 - Chevron USA & Gevo

The subsidiary of Chevron, the American oil and gas company, and Gevo, the producer of renewable biofuels, announced that they had signed a letter of intent to jointly invest in building and operating facilities to transform inedible corn into sustainable aviation fuel (SAF). These new facilities would also produce proteins and corn oil. According to the terms of the agreement, the partners will draw on Gevo's proprietary technology to produce SAF and renewable blending components for petrol. In addition to co-investing with Gevo in several projects, Chevron USA would have the option to offtake around 150 million gallons (over 567 million litres) per year to market directly to its customers.

More information: Press release
En savoir plus : Formule Verte.com

3776 - Chevron Products Company, Delta Air Lines & Google Cloud

Chevron Products Company, one of the divisions of the American oil and gas company, and the American airline Delta announced that they had signed a Memorandum of Understanding (MoU) to track sustainable aviation fuel (SAF) test batch emissions data '*using cloud-based technology*'. The partners hope to create a '*common, more transparent model*' to analyse potential greenhouse gas emission reductions that could then be adopted by organisations considering similar programmes. Chevron plans to produce a test batch of SAF at its El Segundo Refinery in the United States and to sell it to Delta Air Lines at its Los Angeles International Airport hub. At the same time, Google Cloud plans to build a data and analytics framework to securely ingest and analyse emissions data related to the SAF test batch. The goal of the pilot will be to provide better visibility into data from their project, allowing for greater transparency and improved reporting of SAF emissions.

More information: Press release
En savoir plus : Air Journal.fr

3777 - Circa Group & GazelEnergie

Circa, a specialist in the conversion of biomass co-products into advanced chemicals, and the energy producer GazelEnergie have agreed to build a ReSolute plant on the site of an old coal-fired power plant. The goal of the ReSolute project is to create a new, sustainably sourced, safer alternative to traditional, fossil-based solvents. The new plant will neighbour the Carling Saint-Avold site and the Total Chemesis Composite Park in Moselle, France, and will use Circa's Furacell™ process to convert non-food biomass co-products into advanced biobased chemicals, including the renewable solvent Cyrene™, which can replace traditional, toxic, fossil-based solvents such as NMP, DMF, DCM and DMSO. The ReSolute plant will manufacture Cyrene™ on an industrial scale. Entry into service is scheduled for the first half of 2023.

More information: Press release

3778 - Givaudan

The Swiss company specialising in flavours, fragrances and cosmetic ingredients and the Danish company **Biosyntia**, which specialises in the development of fermentation processes for select small molecules, have signed a multi-year agreement for the development and manufacture of natural, sustainable food and beverage ingredients.

More information: Press release

Givaudan and the American biotechnology firm **Gingko Bioworks** have signed a multi-programme collaboration agreement to produce *'a number of innovative and sustainable ingredients through fermentation'*. Under the terms of the agreement, Givaudan will use Ginkgo's platform to apply a technology to extract and produce rare natural ingredients.

More information: Press release
En savoir plus : Formule Verte.com

3779 - Henkel, L'Oréal, LVMH, Natura &Co, Unilever

The five companies announced that they had joined forces to co-develop an industry-wide environmental impact assessment and scoring system for beauty products. The aim is to work together to design an approach that can be shared by all cosmetics businesses and which provides consumers with clear, transparent and comparable information based on a common science-based methodology. They aim to improve the information available to consumers so they can make more sustainable purchases. To do this, a consortium will be created that is open to all cosmetics companies – regardless of their size or resources – that want to work together to create a system that allows consumers to compare the environmental impact of cosmetics in the same category, accounting for the entire product life cycle. To ensure the project's success, the partners will work with the consultancy Quantis as well as a panel of top independent scientists, academics and NGOs. The work developed by the consortium will be published and made accessible on a strictly voluntary basis, both to consortium members and all other interested parties.

More information: Press release
En savoir plus : Communiqué de presse, Journal du Luxe.fr, LSA Conso.fr, Premium Beauty News.com

3780 - iMEAN & Bayer

The start-up, which employs technology based on the reconstruction of digital organisms (predictive modelling), and the German chemicals company have entered into an open innovation partnership to help Bayer step up the discovery of innovative crop protection products. iMEAN uses a technology based on the reconstruction of digital organisms: it creates mathematical representations of the complex molecular networks of living organisms at the genome scale to accelerate the discovery of new crop protection products.

More information: Press release
En savoir plus : Bayer.fr

3781 - LanzaTech & Carbon Engineering

The New Zealand-based company specialising in the use of biotechnology to recycle carbon announced that it had joined forces with Carbon Engineering as part of a project to produce sustainable aviation fuel (SAF) from atmospheric CO_2. The project, named AtmosFuel and conducted in collaboration with British Airways and Virgin Atlantic, involves investigating the possibility of building a commercial-scale facility in the United Kingdom to produce 100 million litres of SAF per year. The project aims to use the Direct Air Capture (DAC) technology developed by Carbon Engineering to feed atmospheric CO_2 into LanzaTech's gas fermentation process. The ethanol will then be converted into SAF using the Alcohol-to-Jet technology developed by LanzaJet (a subsidiary of LanzaTech) and Pacific Northwest National Laboratory. The partners said this new British facility could be operational by the end of the decade.

Info: AtmosFuel is one of eight projects shortlisted for the UK Department for Transport's Green Skies competition. The competition has a £15 million (€17.6 million) pot of funding to support the development of facilities to produce SAF from waste.

More information: Press release
En savoir plus : Formule Verte.com

3782 - Newlight Technologies & Nike

The American biotechnology company and the group specialising in the manufacture of sportswear and sports equipment have signed a partnership agreement so Nike can study the possibility of using AirCarbon – a biomaterial made by Newlight Technologies from marine microorganisms – to produce its products.

Info: Other brands are already using AirCarbon to make eyewear, wallets and bags.

More information: Press release

3783 - TotalEnergies & Safran

The broad energy group and the engine manufacturer have signed a strategic partnership to develop technical and commercial solutions to address the challenges associated with the decarbonisation of the aviation industry. In line with the ambition of both companies to reach net zero CO_2 emissions by 2050, this major partnership aims to accelerate the reduction of the industry's CO_2 emissions, with sustainable aviation fuel (SAF) playing a leading role. The collaboration will draw on Safran and TotalEnergies' respective areas of expertise to develop and deploy SAFs and arrive at a shared, comprehensive understanding of the overall value chain and use cases, while integrating the objectives of sustainable development as a whole. In the short term, the partnership aims to make current engines compatible with fuel containing up to 100% SAF. Longer term, it will work to optimise engine/fuel energy efficiency and environmental performance. This collaboration may extend to other fields, such as adapting fuel systems to SAF or developing new-generation battery systems for electric engines. There are three pillars to the partnership:

- Research, technology and innovation, with the development of technological bricks validated through ground tests of propulsion systems and demonstrator flight tests of engines,
- Supply of sustainable aviation fuels produced in France by TotalEnergies to decarbonise Safran's aircraft and helicopter engine tests in France,
- Dialogue and promotion, through initiatives to raise awareness among public and private stakeholders in France, Europe and worldwide.

More information: Press release
En savoir plus : Communiqué de presse, L'Usine Nouvelle.com, La Tribune.fr, Le Figaro.fr, Air & Cosmos.com

3784 - Twelve & LanzaTech

The American company specialising in the transformation of CO_2 into high added-value products or materials, and the New Zealand-based recycler of carbon via biotechnology announced that they had formed a partnership to produce polypropylene (PP) from CO_2 emissions. The two companies received a grant of $200,000 (€170,482) for the project from Impact Squared, a fund designed and established by British bank Barclays and Unreasonable Capital.

More information: Press release

Takeovers

3785 - Danimer Scientific & Novomer

The producer of biodegradable materials announced that it had finalised the purchase of the American company Novomer, which specialises in the production of PHA-based resins and other biodegradable materials. The $152 million (€131 million) transaction will enable it to expand its portfolio of over 100 patents issued and over 140 patents pending, as well as use the poly(3-hydroxypropionate) (p(3HP)) produced by Novomer. p(3HP) is a perfect fit for Danimer's inputs and can be incorporated as a component in some Danimer resins. By combining the barrier properties of p(3HP) with the performance and biodegradability properties of its product Nodax®, Danimer will have greater flexibility in its response to customer requirements – in particular as regards packaging. The purchase will also help it reduce its production costs.

More information: Press release
En savoir plus : Formule Verte.com

4. PUBLIC POLICIES & REGULATIONS

In France

3786 - Launch of the platform 'LesDeeptech.fr'.

Launched by Bpifrance in collaboration with 23 stakeholders in technology transfer and innovation (APHP, the CEA, the CNRS, IFP Energies Nouvelles, INSERM, INRAE Transfert, INRIA, PSL University Paris, the C.U.R.I.E network, the SATT network (13 members), and Sorbonne University), and supported by the French government through the PIA investments for the future programme, this portal aims to encourage the emergence and growth of deep tech start-ups in France. It primarily offers a service to connect researchers, entrepreneurs and investors, as well as information and tools to help launch and develop a deep tech business. By the end of the year, the platform will also list training courses for entrepreneurs and start-up facilitators and include local web pages that provide access to all the information and support available in a given area.

Recap: The Deeptech Plan, entrusted to Bpifrance by the French government in 2019 to transform France into a major global player in breakthrough innovation, intends to usher 500 deep tech start-ups into being every year by 2030, ultimately creating the economic and industrial champions of tomorrow: the drivers of research-based breakthrough innovation. Two hundred deep tech start-ups were created in 2020, and €1.5 billion raised.

En savoir plus : Communiqué de presse, Le Figaro.fr, Les Numériques.com

3787 - 'France Relance' Plan: how are things looking one year in?

In September 2020 the French government unveiled the 'France Relance' economic recovery plan. It has a budget of €100 billion, €1.2 billion of which has been allocated to the French agency for the environment and energy management (ADEME) to accelerate the green transition of the economy. On 1 September 2021, the agency announced that it had distributed €282.5 million in aid for 2,052 structures, of which 192 local authorities, 82 large companies, 1,629 microenterprises and SMEs, and 149 associations. According to the agency, the submitted projects '*didn't come out of the blue – the plan was to boost regional dynamics that already existed'.* The ADEME also noted that, as a whole, the projects were evenly spread across France and all sizes of local authority.
Looking to the future, the ADEME believes that the dynamic started this first year will continue and accelerate by the end of 2021 and in 2022.

Recap: The ADEME has supported initiatives on the following topics on the back of its scientific and technical expertise: decarbonisation of industry, low-carbon hydrogen deployment, plastics recycling, waste management and the circular economy, brownfield site clean-up for repurposing, SMEs involved in the green transition, sustainable tourism, and appropriate carbon assessment for farming.

En savoir plus : Communiqué de presse ADEME, Communiqué de presse du Gouvernement, Gouvernement.fr, La Gazette des communes.com

3788 - Signature of a *contrat de filière* (industry agreement) for sustainable biofuels in the Grand Est region.

Signed by France's Grand Est region and 42 bioeconomy stakeholders, this agreement aims to accelerate the deployment of biofuels while strengthening the links between sector stakeholders and the region. The agreement, which covers the production of bioethanol, biodiesel, bio-NGV and hydrogen, is underpinned by three commitments:

- Jointly coordinate and energise the biofuel sector,
- Relay information on the available aid to the various target groups,
- Take part in decision-making or operational bodies.

As France's second-largest producer of sugar beet and the leading region for biofuel production, the Grand Est region is responsible for up to 40% of ethanol production in France. With this agreement, it has set itself the goal of doubling the share of sustainable biofuels in its regional energy mix for transport within three to five years.

En savoir plus : Environnement Magazine.fr, Bioéthanol Carburant.com, CP de la Collective du bioéthanol, La France Agricole.fr

3789 - Single-use plastics will be completely banned across the Nice metropolitan area by 2024.

While the French government has set objectives for the elimination of single-use plastics within 20 years, Christian Estrosi, Mayor of Nice and President of the Nice Côte d'Azur metropolitan area, has announced a plan to ban the use of such plastics in Nice and the surrounding 48 municipalities by 2024. There are three steps to the plan:

- January 2022: ban on single-use plastic on public authority premises, in public markets, and any structure occupying a public space,
- January 2023: ban on single-use plastics in shops and large retail establishments,
- January 2024: ban on single-use plastics for '*all commercial activities across the Nice metropolitan area'.*

Christian Estrosi also announced that a campaign to label Nice-based retailers '*zero plastic*' would be announced before January 2022 to '*promote those who have made the leap*'.

En savoir plus : Nice Presse.com, BFM TV.com

In Europe

3790 - GERMANY: palm oil banned in biofuels from 2023.

The environment minister announced that using palm oil as a raw material in biofuel production would be banned from 2023. Germany will instead give a quota for minimum use of waste materials for biofuel production.

More information: Nasdaq.com

3791 - BELGIUM: gradual elimination of first-generation biofuels.

The Council of Ministers approved a royal decree submitted by the minister for energy Tinne Van der Straeten (Groen), the aim of which is to ban the use of palm oil and soybean oil as a feedstock for the production of biofuels for transport. The measure will come into force on 1 January 2023 for palm oil and from July 2023 for soybean oil.

En savoir plus : RTL.be

3792 - A step closer to a new fuel tax system based on energy content rather than volume?

On 14 July this year, the European Commission presented an amendment to the 2003 directive on the taxation of energy, which contains a proposal to replace the EU-wide volume-based tax system with a tax system based on

energy content or gigajoules. The proposal seeks to end incentives for petrol and diesel, aiming instead to support the uptake of green biofuels, renewable hydrogen and synthetic fuels.

More information: Euractiv.com
En savoir plus : Euractiv.fr

5. AWARDS & EVENTS

EVENTS

OCTOBER 2021

European Forum for Industrial Biotechnology and the Bioeconomy (EFIB)

5-7 October 2021. Vienna (Austria).

More information: Website

7th International Polysaccharide Conference

11-15 October 2021. Nantes (France).

More information: Website

Cosmetic 360

13-14 October 2021. Paris (France).

More information: Website

Forum Recherche-Industrie matériaux biosourcés 2021

14 October 2021 Paris (France).

More information: Website

Annual Biocontrol Industry Meeting

19-20 October 2021. Basel (Switzerland).

More information: Website

DECEMBER 2021

Biostimulants Europe

1-2 December 2021. Granada (Spain).

More information: Website

COSM'ING

7-8 December 2021. Saint-Malo (France).

More information: Website

FEBRUARY 2022

5th TWB START- UP DAY

3 February 2022. Toulouse (France).

More information: Website

European Biopolymer Summit

2-3 February 2022. London (United Kingdom).

More information: Website

6th European Chemistry Partnering (ECP 2022)

16-17 February 2022. Online.

More information: Website

MARCH 2022

Biofuels International

15-16 March 2022. Brussels (Belgium)

More information: Website

APRIL 2022

ACHEMA

4-8 April 2022. Frankfurt (Germany)

More information: Website

In-Cosmetics Global

5-7 April 2022. Paris (France).

More information: Website

JULY 2022

25th ISPL

10-15 July 2022. Grenoble (France).

More information: Website