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Bio-based Material Quarterly Newsletter

Q1 2023

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Bio-based Materials Quarterly Newsletter

Contents

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Headline

In Jan., China launched the Three-Year Action Plan for Accelerating the Non-Grain Bio-Based Material Innovative Development, setting targets by 2025: the non-grain biomass-based saccharification production capacity to reach 10,000 t/a (converted to pentose or hexose), lactic acid (LA) production capacity to 100,000 t/a, pentamethylene diamine (PDA) and polyhydroxyalkanoates (PHA) capacity to 10,000 t/a; and to cultivate 5 backbone enterprises and 3–5 bio-based material industrial clusters.

In 2022, Hisun Biomaterials' revenue was up 3.49% YoY and its net profit soared 33.33% YoY; its pure PLA raked in USD51.03 million (RMB354.14 million) in the year, an increase of 8.88%.

In Q1, Kingfa's 30,000 t/a PLA project has entered stable production; and there are updates of the PLA projects of BBCA Biochemical, Shanghai Kingfo, Tieling Yingzhihao and new proposals of PLA projects of Guangdong Sisan and Inner Mongolia Heguang.

Bluepha launched its first Bluepha™ PHA in March; it also signed a strategic cooperation agreement with Shanghai DODGEN in this Jan.

On 23 Feb., Huafon Group's 30,000 t/a bio-based PTT project was publicised before being approved.

Zhongke Biotech made progress in its 50,000 t/a diacid and 50,000 t/a bio-based new materials project on 8 Feb., at the heel of its forecast to post a loss for 2022 in late Jan.

On 3 March, Xinxiang Chemical announced its SSE-accepted prospectus for private placement for up to USD198.85 million (RMB1.38 billion), USD69.16 million (RMB480 million) of which is for developing its 10,000 t/a biomass-derived cellulose fibre project. In Jan., the company kicked start the 2nd-phase construction of its 20,000 t/a biomass-derived cellulose project, to build capacity of 10,000 t/a biomass-derived filament.

On 13 Feb., the environment impact report (draft for approval) of the 100,000 t/a lactide / polylactic acid (PLA) and 200,000 t/a lactic acid (LA) project of Golden Far East was publicised.

In Feb., two projects—one for 10,000 t/a lactic acid (LA), 1,000 t/a L-malic acid and 1,000 t/a succinic acid (SA), and another for bio-based new material (1,500 t/a SA)—were accepted with EI reports.

In March, SynMetabio raised over USD1.44 million (RMB10 million) funding in seed round and angel round, to expand its team and the production of the 100% bio-based leather—Naro Leather.

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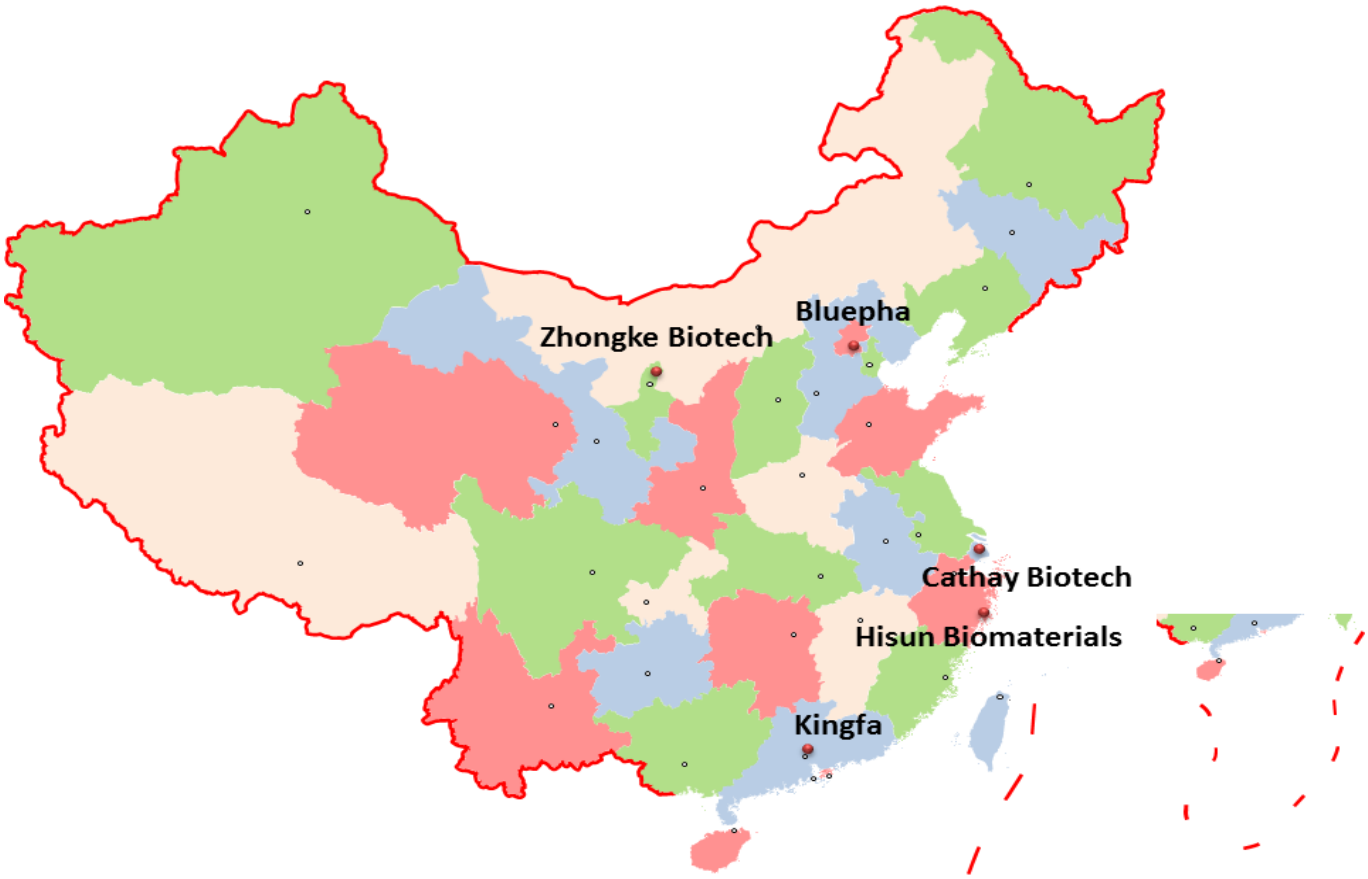

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Editor's Note

Welcome to the Bio-based Material Quarterly Newsletter Q1 2023.

Policy

In the quarter, the Ministry of Industry and Information Technology of China (MIIT), National Development and Reform Commission (NDRC) and other government bodies jointly issued the *Three-Year Action Plan for Accelerating the Non-Grain Bio-Based Material Innovative Development*, setting targets by 2025 to push the lactic acid (LA) production capacity to 100,000 t/a, and the pentamethylene diamine (PDA) and polyhydroxyalkanoates (PHA) capacity to 10,000 t/a.

Market dynamics & company performance

Kingfa's 30,000 t/a PLA project has entered stable production; and there are updates of the PLA projects of BBCA Biochemical, Shanghai Kingfo, Tieling Yingzhihao, Golden Far East, Juyuan New Material and new proposals of PLA projects of Guangdong Sisan and Inner Mongolia Heguang. Hisun Biomaterials reported a 3.49% growth in 2022 revenue and pure PLA sales growing by 8.88% YoY.

Anhui Yinchuang's 1,000 t/a succinic acid (SA) project, Shandong Qiantai's 1,500 t/a SA project and Land Biological's SA technological upgrade and transformation project, have moved further during the pre-construction phase; Zhongke Biotech's diacid & long-chain polyamides project was approved; Cathay Biotech's long-chain polyamide project was postponed to start up to Dec. 2023; and Xinxiang Chemical and Sichuan Siliya were ramping up their biomass-derived cellulose fibre capacity.

More are included: Bluepha launched its first Bluepha™ PHA; Huafon Group's 30,000 t/a bio-based PTT project was soon to be approved; SynMetabio planned to expand the Naro Leather production with the raised funding of over RMB10 million; Eyougene Biotech was pacing up to commercialise FCDA with the raised funding of over RMB100 million; HANVO Safety teamed up with Beijing University of Chemical Technology (BUCT) to bring further the R&D and application of bio-based degradable polyester rubber materials; the (EIA) document of Zhongke Juhe's PEF and PCT pilot project was approved shedding light on the details.

Price

In the period of Q1, there was a general decline in the PLA prices, while the PHA prices have remain flat.

The USD/CNY exchange rate in this newsletter is USD1.00=CNY6.9400 on 1 March, 2023, sourced from the People's Bank of China. Unless otherwise specified, all the prices mentioned in this newsletter will include the VAT.

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Governmental Direction

China launches three-year action plan for non-grain bio-based material innovative development

Summary: In Jan., China launched the *Three-Year Action Plan for Accelerating the Non-Grain Bio-Based Material Innovative Development*, setting targets by 2025: the non-grain biomass-based saccharification production capacity to reach 10,000 t/a (converted to pentose or hexose), lactic acid (LA) production capacity to 100,000 t/a, pentamethylene diamine (PDA) and polyhydroxyalkanoates (PHA) capacity to 10,000 t/a; and to cultivate 5 backbone enterprises and 3–5 bio-based material industrial clusters.

On 19 Jan., the Ministry of Industry and Information Technology of China (MIIT), National Development and Reform Commission (NDRC) and other government bodies jointly issued the *Three-Year Action Plan for Accelerating the Non-Grain Bio-Based Material Innovative Development*, laying out key areas to focus and industrial targets by 2025:

Breakthroughs in key technologies for utilisation of non-grain biomass

- Establish industrial strain and enzyme libraries: accelerate progresses in ultra-high-throughput screening (uHTS), rapid sequencing, strain calculation and design, high-throughput methods for genome synthesis and editing, large-scale evolution engineering, and other frontline technologies; develop industrial strain cultivation system and enzyme component library that provide core strain varieties and advanced technologies for efficient bio-synthesis of bio-based materials.
- Achieve breakthroughs in saccharification of non-grain biomass: seek out functional bacterial strains/colonies, exploit series of enzymes and develop bioreactors; introduce chemical, physical and biological methods to non-grain biomass saccharification; push the standardisation of non-grain biomass saccharification, for higher separation efficiency of lignin, cellulose and hemicellulose, for better enzymolysis and saccharification technologies, and for higher yields of sugars that are derived from non-grain biomass and high in pentose and hexose.
- Optimise fermentation process of biomass-derived sugars: optimise the fermentation process based on non-grain biomass and functional bacterial strains to boost the target product yields and separation efficiency; increase the quality stability of the products; consolidate the links with traditional chemical production; and raise the production efficiency of bio-based materials for a reduction in grain consumption.
- Develop high-efficiency purification and concentration techniques: develop and apply separation and purification technique such as highly selective adsorption and extraction; and introduce high-throughput and highly selective membranes, membrane equipment for long-period separation, complete sets of equipment for high-efficiency low-temperature evaporation, gas drying and separation, etc., so as to address the impurity and the low levels of initial concentration of target products during the non-grain biomass transformation.

Scale production technology and demonstrative application

- Saccharification of non-grain biomass: Use standardised non-food biomass materials to scale up production of industrial strains and enzymes; upgrade the bioreactors; improve the compatibility between raw materials and enzymes and between production processes; enhance process control of reaction-separation-concentration; increase the sugar conversion rates and yields; meet the purity requirements for bio-based monomers; reduce unit consumption of sugar products; achieve high-efficiency and stable saccharification; and form a single set of saccharification production line with the capacity scale up to 10,000 t/a.
- Preparation of basic chemicals and polymers: Firm up iteration and optimisation of fermentation process; push establishment of 100,000 t/a lactic acid (LA) lines, 10,000 t/a pentamethylene diamine (PDA) lines, 10,000 t/a polyhydroxyalkanoates (PHA) lines as demonstration projects of non-grain biomass materials; facilitate industrialisation of furfural downstream products such as 1,2-pentanediol, 1,4-butanediol (BDO); improve product performance and reduce the comprehensive product costs; carve out a competitive non-grain biomass lane and accelerate replacement of grain-derived starch.
- Demonstrative use of non-grain biomass: Properly distribute non-grain biomass pretreatment points and standard material

production sites; set up large-scale residual fertiliser reactors and devices to improve utilisation of saccharification residues, which also responds to China's goals to build high-standard farmlands and improve soil quality.

- Development of bio-based material processing technology: Quicken development and application of agents applicable to bio-based material processing (heat stabilisers, hydrolysis stabilisers, plasticisers, tougheners, and such), development and demonstration of continuous polymerisation and spinning techniques of bio-based monomers, to fix the problems of low processing stability and degradation.

Product diversity to improve the bio-based material system

- Carbon-containing chemicals: lactic acid (LA), succinic acid (SA), adipic acid, sebacic acid, malic acid, 2,5-furandicarboxylic acid (FDCA), aminobutyric acid , 5-aminovaleric acid, hydroxy fatty acid, 3-hydroxypropionicacid (3-HP), ethylene glycol (EG), 1,3-propanediol (1,3-PDO), 1,4-butanediol (BDO), pentamethylene diamine (PDA), 2-pyrrolidinone, 2-piperidone, 1.6-diaminohexane, 1,10-diaminodecane, furfural, tetrahydrofuran, 2-methyltetrahydrofuran (2-MTHF), lactide, dimethyl carbonate (DMC), bio-based olefins, etc.
- Carbon-containing polymers: polylactic acid (PLA), polyamide (PA), polyhydroxyalkanoates (PHA), polyurethane (PU or PUR), polybutylene succinate (PBS), polybutylene adipate-co-terephthalate (PBAT), polycarbonate, polytetrahydrofuran, poly (ethylene 2,5-furandicarboxylate) (PEF), bio-based elastomers, etc.

Application expansion

- Support bio-based material firms to work with key downstream players of plastic products, textile fibres and medical apparatus and instruments in developing upstream and downstream integrated platforms; encourage the use of biodegradable products in different areas like food catering, logistics, retail and hotel business; and promote green consumption in daily life.
- Promote the use of high-performance products including biomedical materials of good biocompatibility and biodegradablity, bio-based anti-fouling and -erosion coatings, degradable buoyant materials; and exploit the potential of green consumption.
- Introduce biodegradable agricultural films and drip irrigation pipes with the assists of agricultural producers' cooperatives and major crop growers; and speed up demonstrative (large-scale) application of such films and pipes in economic crop producing areas; and grow up the green rural areas.

Leading enterprise cultivation

- Guide petrochemical and chemical enterprises to extend the bio-based material industry chains and innovate supply chains; and cultivate 5 competitive, backbone enterprises operating throughout the industry chains.
- Cultivate groups of specialised enterprises that focus on segmented areas like industrial strain cultivation, enzyme composition preparation, separation membrane materials, and materials of highly selective absorption.

Establishment of industrial clusters

- Lead concentration of bio-based material innovation resources and elements and proper distribution of non-grain biomass saccharification production sites.
- Support development of state-level innovative industrial demonstration bases in the bio-based material industry, and upgrade and transformation of industrial concentration to move up the industrial scale and economic benefits.
- Construct 3–5 bio-based material industrial clusters by 2025.

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Market Analysis

Hisun Biomaterials reports growths in 2022 results

Summary: In 2022, Hisun Biomaterials' revenue was up 3.49% YoY and its net profit soared 33.33% YoY; its pure PLA raked in USD51.03 million (RMB354.14 million) in the year, an increase of 8.88%.

On 14 March, Zhejiang Hisun Biomaterials Co., Ltd. (Hisun Biomaterials, Stock code: 688203.SH) released its first annual financial report since its listing on Science and Technology Innovation Board of the Shanghai Stock Exchange (SSE STAR Market).

Key results for 2022:

- Revenue: USD87.24 million (RMB605.43 million), up 3.49% YoY—in the year, lower downstream demand for bio-plastics limited the growth of the company's overall sales; and product price reduction squeezed the gross margin.
- Net profit attributable to shareholders of the parent company: USD6.78 million (RMB47.03 million), up 33.33% YoY— there were extraordinary gains from government subsidy in place and assets disposal.
- Net profit attributable to equity shareholders of the listed company excl. extraordinary gains/losses: USD4.77 million (RMB33.12 million), down 1.87% YoY

Hisun Biomaterials sets revenue targets for 2023 of USD112.39 million (RMB780 million), to make an increase of 30% YoY.

Main business sales in 2022

- Pure polylactic acid (PLA) saw sales growth, when the company's PLA market share were rising in the straw and film bag markets in 2022.
- Modified PLA revenue dropped, as export demand and the export prices of household products, disposable tableware and 3D printer consumables diminished amidst the uncertainties in the plastics policies and regulations in the Europe and Australia.
- By region, the domestic market made up 83.6% and the overseas claimed 16.94% of the company's total sales in 2022.
- By channel, direct distribution accounted for 82.66% and dealers for 17.34% of the company's total sales in 2022. Hisun Biomaterials' trade partner at home is Guangdong EcoCity Biomaterials Co., Ltd. and its Japan-based partner is Kobe Fine Chemical Co., Ltd.

TABLE 1: Sales by focused sector, products, region and distribution channel in 2022

By sector			
Sector	**Revenue, million USD**	**YoY change**	**Proportion**
Fibre manufacturing	86.14	3.10%	100%
By product			
Product	**Revenue, million USD**	**YoY change**	**Proportion**
Pure PLA	51.03	8.88%	59.24%
Modified PLA compound	34.22	-5.09%	39.73%
Primary products	0.89	41.42%	1.04%
By region			
Region	**Revenue, million USD**	**YoY change**	**Proportion**
China	71.55	7.36%	83.06%
Overseas	14.59	-13.68%	16.94%
By distribution			
Distribution channel	**Revenue, million USD**	**YoY change**	**Proportion**
Direct distribution	71.21	3.78%	82.66%
Dealers	14.94	-0.02%	17.34%

Source:Hisun Biomaterials' Annual Financial Report for 2022

TABLE 2: Production and sales in 2022

Main products	Output, tonne	Sales volume, tonne	Inventory, tonne	YoY change in output	YoY change in sales	YoY change in inventory
Pure PLA	25,866.80	16,856.64	3,512.78	6.26%	21.39%	-3.10%
Modified PLA compound	13,901.43	12,473.96	1,748.79	17.95%	7.90%	328.44%

Note:1. The company's pure PLA is distributed through direct sell and used for internal production and innovation of modified PLA compound. In 2022, the self-consumption of pure PLA totalled 9,122.36 tonnes.
2. The significant rise of modified PLA compound inventory in 2022 was the combined result of the year-end preparation for the halt of production lines during the Spring Festival holiday, and a relatively low inventory at the end of 2021 when voluminous orders were shipped out.
Source:Hisun Biomaterials' Annual Financial Report for 2022

Production capacity

Hisun Biomaterials currently has 45,000 t/a pure PLA capacity and is building more:

- Its subsidiary Zhejiang Honor Biomaterials Co., Ltd. has started commissioning and making rectification for the phase II construction (20,000 t/a) of the 50,000 t/a PLA resin and related products project.
- Its subsidiary Zhejiang Haichuangda Biomaterials Co., Ltd. has the publicly funded 150,000 t/a PLA project under construction; this project kicked off construction work in June 2021, after the completion of relevant written application for land use and engineering.

Hisun Biomaterials is the first enterprise engaging in the whole industrial production of "lactic acid–lactide–PLA" in China, and has been the leader in the domestic PLA industry. It produces more than 10 major types of PLA and modified PLA compound and 30 types of PLA products for downstream customers in segments with extensive requirements on the physical properties, mechanical properties, processing techniques. Its products are food contact materials certified by the US FDA, Japanese food contact regulations, and registered with the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) of the European Union. The biodegradability of its products has passed the tests required by the Biodegradable Products Institute in US, DIN CERTCO in Germany (Deutsches Institut für Normung), etc. It is expected that the company could catch up with the international leading levels of the PLA sector, after 2-3 years of building up its overall production capacity.

Updates of China's PLA projects in Q1

Summary: In Q1, Kingfa's 30,000 t/a PLA project has entered stable production; and there are updates of the PLA projects of BBCA Biochemical, Shanghai Kingfo, Tieling Yingzhihao and new proposals of PLA projects of Guangdong Sisan and Inner Mongolia Heguang.

In Q1, Kingfa Sci. & Tech. Co., Ltd. (Kingfa) announced that its polylactic acid (PLA) project has started operation since the end of 2022; meanwhile, some PLA projects have seen progresses, operated by Anhui BBCA Biochemical Co., Ltd. (BBCA Biochemical), Shanghai Kingfo Industrial Co., Ltd. (Shanghai Kingfo) and Yingzhihao (Tieling) Biotechnology Co., Ltd. (Tieling Yingzhihao); and there are new project proposals raised by Inner Mongolia Heguang Biotechnology Co., Ltd. (Inner Mongolia Heguang) and Guangdong Sisan Biotechnology Co., Ltd. (Guangdong Sisan) to build 60,000 t/a and 5,000 t/a capacity for PLA.

Kingfa: 30,000 t/a PLA project in operation

On 2 Feb., Kingfa noted that its 30,000 t/a PLA project operated by its subsidiary Zhuhai Kingfa Biomaterial Co., Ltd. had completed commissioning and has started operation since the end of 2022. This project produces products throughout the industrial chain from lactide, PLA to modified PLA, conducive to the company's application innovation and product quality improvement upon the downstream market demand.

BBCA Biochemical: 3,000 t/a D-lactic acid project and 5,000 t/a PLA project made public

On 21 March, the environmental impact (EI) reports of two Anhui BBCA Biochemical Co., Ltd. (BBCA Biochemical)'s projects—3,000 t/a PLA industrialisation demonstration project and 5,000 t/a D-Lactic acid industrialisation demonstration project, were publicised before getting approval.

In order to seize the policy opportunity and make full use of the advantages of existing technology and raw material supply, BBCA Biochemical intends to invest in these two projects to develop and produce D-Lactic acid and PLA. Both will be constructed in Guzhen Economic Development Zone, Bengbu City, Anhui Province.

Overview of 3,000 t/a PLA project:

- Construction content: To rent a standard factory equipped with supporting equipment for fire fighting, environment protection, electricity, etc., and purchase and install equipment such as rectification tower, crystalliser and polymerisation tower.
- Product scheme:
  - Main product: 99.8% PLA—3,000 t/a
  - By-product: Racemic lactic acid—1,000 t/a
- Total investment: USD19.16 million (RMB133 million), 5.98% (USD1.15 million or RMB7.95 million) of which for environmental protection
- Production process: PLA is to be produced by the dehydration and polymerisation of D-Lactic acid.
- Working system: 38 people in three 8-hour shifts for 300 days a year or 7,200 hours a year

Overview of 5,000 t/a D-Lactic acid project:

- Construction content: To rent a standard factory equipped with supporting equipment for fire fighting, environment protection, electricity, etc., and purchase and install equipment such as fermentor, separator and filter.
- Product scheme:
  - Main product:
    - 100% D-lactic acid—4,500 t/a, to be used in the 3,000 t/a PLA project abovementioned
    - 60% D-lactic acid—500 t/a, all for sale
  - By-product: Calcium sulfate dihydrate—7,200 t/a
- Total investment: USD16.28 million (RMB113 million), 12.48% (USD2.03 million or RMB14.10 million) of which for environmental protection
- Working system: 30 people in three 8-hour shifts for 300 days a year or 7,200 hours a year

Shanghai Kingfo: 15,000 t/a PLA new materials and products project broke ground

On 13 Jan., Shanghai Kingfo 15,000 t/a PLA project started construction work. The high-tech company was founded in April 2010 with a registered capital of RMB50 million, focusing on spunbond and spunbond meltblown non-woven fabric.

Project overview:

- Construction nature: New construction
- Total investment: USD36.89 million (RMB256 million)
- Location: Private Economic Science and Technology Industry Base of Wenzhou Bay New Area
- Total area: 2.4 ha (36 mu)
- Construction content: 4 PLA biodegradable new material production lines
- Product capacity: 15,000 t/a PLA biodegradable materials and products
- Economic evaluation: Annual sales income is projected to be USD70.61 million (RMB490 million).

Tieling Yingzhihao: 35,000 t/a straw-derived PLA project approved

On 2 Feb., the environmental impact report of the high-value utilisation of straw for the production of bio-based new PLA materials project of Tieling Yingzhihao was approved. The company was set up in Sept. 2016 with a registered capital of RMB90 million. Its parent

Yingzhihao (Liaoning) Biotechnology Co., Ltd. is a business specialised in the R&D, production and sale of straw-derived cellulosic ethanol, L-Arabinose, D-Xylose.

Project overview:

- Construction nature: New construction
- Total investment: USD50.43 million (RMB350 million), USD1.83 million (RMB12.70 million) of which for environmental protection
- Location: Tienan Industrial Zone of Tieling County
- Site area: 79,206 m^2
- Product capacity: 35,000 t/a PLA, to be produced through steps including hydrolytic saccharification, fermentation, polymerisation, with straw as the basic material.

Inner Mongolia Heguang: 20,000 t/a fully biodegradable materials and 60,000 t/a PLA project registered

On 6 Feb., Inner Mongolia Heguang's 20,000 t/a fully biodegradable material and 60,000 t/a PLA project was registered with the local department. The company was formed on 31 Jan. 2023 with a registered capital of RMB30 million and is wholly-owned by Inner Mongolia Yaohe Biotechnology Co., Ltd. It mainly operates in the technological R&D for harmless treatment and recycling of agricultural and forest wastes, and the manufacturing and sale of bio-based materials and plastic products.

Project overview:

- Construction nature: New construction
- Total investment: USD144.09 million (RMB1 billion)
- Location: Tumd Right Banner Innovative Industrial Park, Baotou City, Inner Mongolia Autonomous Region
- Total area: 10.67 ha (160 mu)
- Two-phased construction plan:
  - Phase I: To build 30 lines for biodegradable materials and 10 lines for PLA, with USD57.64 million (RMB400 million) of investment
  - Phase II: To build 30 lines for biodegradable materials and 10 lines for PLA, with USD86.46 million (RMB600 million) of investment
- Product scheme: 20,000 t/a fully biodegradable materials (agricultural film, package bags, delivery bags and cutlery) and 60,000 t/a PLA
- Planned time to enter production: March 2027

Guangdong Sisan: 5,000 t/a PLA biodegradable material construction project unveiled

On 9 Feb., Guangdong Sisan proposed a 5,000 t/a PLA biodegradable material construction project. The company was set up with a registered capital of RMB10 million. It is wholly-owned by Shenzhen Sisan Technology Co., Ltd., currently cooperating with a US-based R&D centre in the PLA sector.

Project overview:

- Construction nature: New construction
- Total investment: USD7.20 million (RMB50 million)
- Location: Xinping Town, Huiyang District, Huizhou City

- Site & floor areas: 2,300 m^2 & 2,300 m^2
- Product scheme: 5,000 t/a PLA and 5,016.55 t/a lactide (middle product)
- Planned time to enter production: May 2023

Bluepha: PHA product debut and new strategic partnership with Shanghai DODGEN

Summary: Bluepha launched its first Bluepha™ PHA in March; it also signed a strategic cooperation agreement with Shanghai DODGEN in this Jan.

On 1 March, Beijing Bluepha Microbiology Technology Co., Ltd. (Bluepha) hosted a launching ceremony for its first portfolio of marine degradable biopolymers, Bluepha™ PHA (polyhydroxyalkanoates), after over five years of R&D. At the event, Bluepha's founders introduced the product properties, applications, production processes, biorefinery construction, and the revolutionary technology "Biohybrid".

Product properties

Bluepha™ PHA is developed into two grades—BP350 and BP330. The former one is a flexible grade with a high comonomer content and the latter is a rigid grade with a low comonomer content. They are delivered in powder and pellet forms. In addition, the direct application of BP330 and BP350, as well as blends in different proportions, can be adapted for different products, and they can be degraded in all typical artificial and natural environments. In 2022, both BP330 and BP350 completed degradation experiments in different environments, including home composting and marine degradation. According to the Belgium-based leading testing institution OWS, the Bluepha™ film samples of both grades were completely degraded in only 10 weeks in the home composting test; and reached a biodegradation percentage of nearly 90% in only 16 weeks in the marine degradation tests, which is close to cellulose.

Green production

In 2022, the company completed the first-phase construction of its first industrial-scale facility, BioFAB1, in Yancheng of Jiangsu for Bluepha™ production. The BioFAB1 finished trial run in Jan 2023, and the second-phase construction (BioFAB2) is moved ahead with the smooth progress seen in the facility so far. It is estimated that the total capacity for Bluepha™ PHA will amount to 25,000 t/a once the facility comes on full stream.

Three key advances

Bluepha highlights three key advances in the basic research and development of Bluepha™ PHA:

- In the study on the rheological curves of different grades of PHA to improve the processability, Bluepha found that by adjusting the temperature and shear rate, the processing efficiency could be improved by 50%, which could be introduced to different production sites and technical improvements.
- Bluepha™ PHA has a special melt memory effect which enables a balance between the temperature and crystallisation rate and speeds up crystallisation by 2 orders of magnitude, making the material 30% tougher and 50% more transparent.
- In mechanical properties which are related to the polymer's aggregate state, Bluepha™ PHA shows differences in crystalline structure at different temperatures: large crystals can provide strength and small ones can provide toughness. Due to this property, the size and distribution of crystals can be controlled so that the strength and toughness can both be increased by 20%, respectively.

The "Biohybrid" technology

In Bluepha, the carbon sources for biomanufacturing are divided into three generations:

- The 1st generation is traditional biomass, such as starch and plant oil;
- The 2nd generation is non-food biomass, such as used cooking oil and agricultural straws;
- The 3rd generation is greenhouse gases, including carbon dioxide and industrial waste gas, which is of the greatest environmental benefit, as it transforms carbon dioxide into PHA feedstock in a direct way, contributing to carbon neutrality, but in terms of technology and engineering, it is extremely hard to achieve. While the 'Biohybrid' technology manages to combine the carbon dioxide from the air and plant oil to synthesize Bluepha™ PHA.

At present, the pilot test of Bluepha™ PHA production based on the 'Biohybrid' technology has concluded and the mass production is slated to happen in the coming 24 months. Bluepha also mentioned that it would progressively increase the proportion of carbon atoms in Bluepha™ PHA derived from greenhouse gases, and to increase the proportion from 10% to 20% by 2027, and ultimately to 100%, adding that Biohybrid is a fundamental and prospective technology for almost any bio-manufacturing process for various chemicals and materials.

On 7 Jan., Bluepha signed a strategic cooperation agreement with Shanghai DODGEN Chemical Technology Co., Ltd. (Shanghai DODGEN), for co-development of bio-based material industrial technology, with terms including technical exchanges and in-depth cooperation in continuous technological transformation, such as monomer separation and purification, monomer polymerisation and devolatilisation, annealing, polymer recycling.

Shanghai DODGEN has a wide range of advanced technologies, patents and services in purification of bio-based chemicals and production of degradable and high-performance materials; while Bluepha has developed a global synthetic biology R&D platform, and the R&D and production capability for polymer materials. Such tie-up may help accelerate the biosynthesis innovation and industrialisation of the related products.

Company Dynamics

Huafon Group's 30,000 t/a bio-based PTT project to be approved

Summary: On 23 Feb., Huafon Group's 30,000 t/a bio-based PTT project was publicised before being approved.

On 23 Feb., the environment assessment statement of Zhejiang Huafon Synthetic Resin Co., Ltd. (Huafon Resin)'s 30,000 t/a bio-based polytrimethylene terephthalate (PTT) polymerisation project was publicised before being approved.

Project overview:

- Construction type: Expansion
- Total investment: USD20.17 million (RMB140 million), USD144,092 (RMB1 million) of which for environmental protection
- Location: Rui'an City (county-level), Wenzhou City, Zhejiang Province
- Main construction content: New PTT polymerisation line and one set of heat-transfer oil system
- Designed capacity: 30,000 t/a Bio-based PTT polymers
- Consumption of materials: 10,000 t/a self-produced 1,3-propanediol (1,3-PDO) and 24,000 t/a outsourced purified terephthalic acid (PTA)
- Production technique:
  - PTT is made via the transesterification route, or esterification of PDO and terephthalic acid which is to be adopted by this project.
  - Polyesters can be made from two advanced processes: the "5 Reactors Process" uses two esterification reactors and three polymerisation reactors, and the milder "3 Reactors Process" uses one esterification reactor and two polymerisation reactors which is to be applied by this project.
- Working system: 75 production workers and 15 technical and administrative staff; production workers in four shifts and two 12-hour running system (300 days in a year)
- Commencement of construction: Dec. 2023

TABLE 3: Product specification for the bio-based PTT project

PTT Product	A	B	C	D	E
Grade	First grade	First grade	First grade	First grade	First grade
Dullness	Semi-dull	Semi-dull	Semi-bright	Bright	Super-bright
Intrinsic viscosity	1.02±0.01	0.96±0.01	1.02±0.01	1.02±0.01	1.02±0.01
-COOH content, mval/kg	<15	<15	<15	<15	<15
L* Colour value	>75	>75	>75	>75	>75
b* Colour value	8–11	8–11	8–11	10.5–13.5	/
TiO2, wt%	0.3±0.03	0.3±0.03	0.12±0.02	/	1.5±0.03

Source:Environment assessment statement of Huafon Resin's 30,000 t/a PTT project

Registered in March 2008 with a capital of RMB308 million, Huafon Resin now has capacities of 150,000 t/a PU intermediates, 300,000 t/a PU resin for leather and 50,000 t/a waterborne PU resin. It is a subsidiary company of Huafon Group Co., Ltd. (Huafon Group), a major global polyurethane (PU or PUR) product manufacturer.

On 9 Feb., You Feifeng, vice president of Huafon Group, responded in an interview that green materials that are bio-based, carbon neutral, degradable, or waterborne (solvent-free) remain keys for its growth during the 14th Five-year Development Plan period (2021-2025). Instead of petroleum-derived polymers that go through processing of from petroleum to chemicals, Huafon Group makes bio-based polymers from corn-derived PDO. At present, it has 9 USDA (U.S. DEPARTMENT OF AGRICULTURE) Biopreferred Certified bio-based products (each's bio-based content≥22%) and 11 bio-based products that have succeeded through beta testing.

In June 2022, Huafon Group bought from DuPont one bio-based PTT factory and one bio-based PDO factory in the US, which now produce from 100% green source (industrial corn) and supply for the group's and its subsidiaries' PU and PTT production, including for this project.

Zhongke Biotech's 50,000 t/a diacid and 50,000 t/a bio-based materials project approved

Summary: Zhongke Biotech made progress in its 50,000 t/a diacid and 50,000 t/a bio-based new materials project on 8 Feb., at the heel of its forecast to post a loss for 2022 in late Jan.

On 31 Jan., Ningxia Zhongke Biotechnology Co., Ltd. (Zhongke Biotech, Stock Code: 600165) said it expects to post a loss for 2022:

- Net loss attributable to equity shareholders of the listed company: USD23.05 million (RMB160 million)–USD19.45 million (RMB135 million)
- Net loss attributable to equity shareholders of the listed company excl. extraordinary gains/losses: USD23.05 million (RMB160 million)–USD19.45 million (RMB135 million)

Two key contributors were cited:

- The subsidiary company Ningxia Zhongke Biochemical Material Co., Ltd. (Zhongke Biochemical) has put its dodecanedioic acid (DDDA) project into full operation, which would incurred a hike in depreciation expense and interest expense in the year.
- The long-chain dibasic acids (LCDAs) production line has been under construction for a technological upgrade since Aug. 2022. So the production and sales of the product saw a steep fall in H2, followed by a reduced gross margin; this upgrade would also incur an impairment loss to its fixed assets and inventory.

To maintain its product diversity and foster its competitiveness in markets, Zhongke Biotech commits to continued enhancement of the diacid (or dibasic acid) and bio-based new material businesses. On 8 Feb., the environmental impact report (EI report) of its 50,000 t/a diacid and 50,000 t/a bio-based new materials integrated project was approved by the Administrative Committee of Economic and Technological Development Zone of Shizuishan City.

Project overview:

- Construction nature: New construction
- Total investment: USD324.68 million (RMB2.25 billion), 5.17% (=USD16.77 million or RMB116.40 million) of which for

environmental protection

- Location: Economic and Technological Development Zone of Shizuishan City, Ningxia Hui Autonomous Region
- Construction unit: Zhongke Biochemical
- Site area: 20.31 ha
- Product/capacity plan:
  - Main products: Sebacic acid – 50,000 t/a (7,460 t/a for self-consumption); nylon products (PA610, PA612, PA1012, PA1212 and PA12T) – 50,000 t/a
  - By-products: Sodium sulfate (industrial grade) and nylon off-grade products (PA610, PA612, PA1012, PA1212 and PA12T)
- Main construction content:
  - Three sebacic acid lines—two 15,000 t/a lines incorporating fermentation, extraction and refining, and one 20,000 t/a line incorporating extraction and refining
  - Six nylon products lines—four 10,000 t/a lines for PA610, PA612, PA1012 and PA1212, and two lines (9,000 t/a and 1,000 t/a) for PA12T
- Process route:
  - Sebacic acid: With liquid wax (food grade) as raw material, sebacic acid-containing fermentation broth is prepared through microbial oxidation; sebacic acid crude product is then formed after membrane filtration, decolorisation and crystallisation; sebacic acid product is obtained after drying in the last step.
  - PA610: To be obtained from synthesise and polymerisation, using 1.6-Diaminohexane and sebacic acid as raw materials and water as a medium
  - PA612: To be obtained from synthesise and polymerisation, using 1.6-Diaminohexane and DDDA acid as raw materials and water as a medium
  - PA1012: To be obtained from synthesise and polymerisation, using 1,10-Diaminodecane and DDDA acid as raw materials and water as a medium
  - PA1212: To be obtained from synthesise and polymerisation, using 1,12-Dodecanediamine and DDDA acid as raw materials and water as a medium
  - PA12T: To be obtained from synthesise and polymerisation, using 1,12-Dodecanediamine and terephthalic acid as raw materials and water as a medium
- Working system: 281 workers in three eight-hour shifts (24-hour workday) for 330 operating days in a year
- Construction duration: around 2 years

Zhongke Biochemical was founded on 2 June, 2017, with a registered capital of RMB1.0 billion. The company mainly engages in the R&D, manufacturing and sale of LCDAs and the derived chemical products, organic fertilisers, sodium sulfate and other refined chemical products produced by biological methods, and it currently owns 50,000 t/a DDDA production capacity.

Xinxiang Chemical ramping up biomass-derived cellulose fibre capacity

Summary: On 3 March, Xinxiang Chemical announced its SSE-accepted prospectus for private placement for up to USD198.85 million (RMB1.38 billion), USD69.16 million (RMB480 million) of which is for developing its 10,000 t/a biomass-derived cellulose fibre project. In Jan., the company kicked start the 2nd-phase construction of its 20,000 t/a biomass-derived cellulose project, to build capacity of 10,000 t/a biomass-derived filament.

On 3 March, Xinxiang Chemical Fiber Co., Ltd. (Xinxiang Chemical, Stock Code: 000949.SZ) announced having received Shenzhen Stock Exchange (SSE)'s acceptance for its Prospectus for Private Placement, look for funding up to USD198.85 million (RMB1.38 billion)

to support its 10,000 t/a biomass-derived cellulose fibre project and the 100,000 t/a high-quality micro-polyurethane fibre project (three-phased construction project), and to supplement working capital.

The 10,000 t/a biomass-derived cellulose fibre project in question accounts for total investment of USD104.62 million (RMB726.03 million), USD69.16 million (RMB480 million) of which will come from the net proceeds. This project is set at a large-scale regenerated cellulose fibre production base in northwest region where supply of raw materials and energy abounds, along with established logistics and markets inbound and outbound. The aim is to optimise the company's industrial layout and consolidate its place in the biomass-derived cellulose filament field.

Biomass-derived cellulose fibre is regenerated, made from natural cellulose sources like wood and cotton pulp. Biomass-derived cellulose filament is silk-like, known as artificial silk. It has bright colour and is antistatic, breathable, hygroscopic and comfortable to wear, making it widely used for high-end clothing and home textile products.

More details about the 10,000 t/a biomass-derived cellulose fibre project:

- Executive entity: Xinjiang Tianlu New Material Technology Co., Ltd.
- Location: Daban Mountain Industrial Park, Economic and Technological Development Zone of Tumushuke, Xinjiang Uygur Autonomous Region
- Product capacity: 10,000 t/a Biomass-derived cellulose fibre
- Construction period: 18 months from Oct. 2022 to March 2024
- Project features:
  - The viscose process and acid bath process that are efficient in energy and environmental conservation; high-volume dry xanthation reaction will be conducted in the viscose process.
  - China-made advanced continuous spinning machine, upgraded transmission system, take-up system, transverse system and air-exhaust system

TABLE 4: Filament capacity utilisation and sales-output ratio in Xinxiang Chemical

Item	Jan.–Sept. 2022	2021	2020	2019
Capacity, tonne	56,250	75,000	75,000	70,000
Output, tonne	49,724	64,374	60,787	61,422
Capacity utilisation	**88.40%**	**85.83%**	**81.05%**	**87.75%**
Sales volume, tonne	52,557	67,122	41,376	57,948
Sales-output ratio	**105.70%**	**104.27%**	**68.07%**	**94.34%**

Note:Xinxiang Chemical's 20,000 t/a biomass-derived cellulose project (1st phase) completed construction for 10,000 filament capacity in 2020; in July 2021, approx. 10,000 t/a filament capacity built at Fengquan base in Xinxiang City was suspended for production, due to a heavy flooding in the region; the capacity in the table is discounted according to the company's actual production time.
Source:Xinxiang Chemical Fiber Co., Ltd.

Aligning with its strategic plans and market outlook, Xinxiang Chemical unveiled plans for market exploration to digest the adding capacity:

- Step up cooperation with its current customers and move further into the downstream.
- Make good use of its present geographical advantages in the expansion to Middle East and South Asia markets; export products directly to these markets via the China-Pakistan Economic Corridor (CPEC), which offers a convenient and fast route to end markets.
- Expedite portfolio restructure and product innovation; make progressive moves in upgrading products; increase the proportion of high value-added and differentiated products, such as innovative solvent cellulose fibre, innovative bamboo-derived fibre, regenerative herbaceous-plant-derived cellulose fibre.

In addition, Xinxiang Chemical's 2nd-phase construction of the 20,000 t/a biomass-derived cellulose project to build capacity of 10,000 t/a biomass-derived filament broke ground on 9 Jan, expected to complete by the end of this Sept. This project is appointed with USD59.08 million (RMB410 million) of investment, to cover a site area of over 10,000 m^2 and building area of around 22.000 m^2. The 1st phase construction (capacity: 10,000 t/a) was started in May 2019 and entered operation in May 2020. Once in full operation, this 20,000 t/a project's sales income is estimated to be USD66.28 million (RMB460 million) and profit on sale to USD21.04 million (RMB146 million).

Update on Golden Far East's 100,000 t/a lactide/PLA and 200,000 t/a LA project

Summary: On 13 Feb., the environment impact report (draft for approval) of the 100,000 t/a lactide / polylactic acid (PLA) and 200,000 t/a lactic acid (LA) project of Golden Far East was publicised.

On 13 Feb., the environment impact report (draft for approval) of the 100,000 t/a lactide / polylactic acid (PLA) and 200,000 t/a lactic acid (LA) project of Shouguang Golden Far East Modified Starch Co., Ltd. (Golden Far East) was publicised on the website of the Government of Shouguang City, Shandong Province.

Project overview:

- Construction type: Expansion
- Total investment: USD216.14 million (RMB1.50 billion), USD0.29 million (RMB2.00 million) of which for environmental protection
- Location: Gucheng Subdistrict, Shouguang City, Shandong Province
- New site area: around 3.33 ha
- Construction duration: 24 months
- Main construction content: new structures—three workshops, one warehouse, one utility facility leveraging the existing workshop
- Adding capacity:
  - 269,453 t/a 80% LA (made from 34% starch sugar solution after liquefaction and saccharification of starch emulsion): 27.84% (=75,009 t/a, equal to 60,007 t/a 100% volume) will be for sale and 72.16% (=194,444 t/a) will be processed into 100% LA via molecular distillation.
  - 140,000 t/a 100% LA (mainly from molecule distillation equipment), for sale or going to the later product production (if all are sold, no subsequent production will be conducted)
  - 100,000 t/a Lactide (with 100% LA as input), for sale or going to the later product production (if all are sold, no subsequent production will be conducted); and 3,210 t/a low-grade LA, to be diluted to 4,012 t/a of low-grade 80% lactic acid for sale
  - 100,000 t/a PLA (with lactide as input), all for sale
- Working system: This project will re-distribute the 100 workers assigned for the project under construction presently at the same site, to work for three 8-hour shifts per day, for 330 days per year.

Currently, the company is also running a 5,000 t/a lactide / PLA and 20,000 t/a LA project, in which the LA section has started commissioning since May 2022 and has continuously produced over 10,000 tonnes of highly optically pure D-lactic acid without use of calcium salt, but the lactide and PLA workshops are yet to be finished. All that said, this factory will turn capable to produce 220,000 t/a LA and 105,000 t/a lactide or 105,000 t/a PLA as a whole, once the two projects aforementioned are in full operation.

Golden Far East is founded in Sept. 2004 with a registered capital of USD13.85 million and owned by Shandong Shouguang Juneng Golden Corn Co., Ltd. (64.65%) and China Starch Group Limited (35.35%).

Two bio-based succinic acid projects accepted with EI reports

Summary: In Feb., two projects—one for 10,000 t/a lactic acid (LA), 1,000 t/a L-malic acid and 1,000 t/a succinic acid (SA), and another for bio-based new material (1,500 t/a SA)—were accepted with EI reports.

On 24 Feb., the 10,000 t/a lactic acid (LA), 1,000 t/a L-malic acid and 1,000 t/a succinic acid (SA) project, and the bio-based new material (1,500 t/a succinic acid) project were accepted and publicised with the environmental impact reports (EI reports) by the local departments of ecology and environment of Bengbu City of Anhui Province and Jinan City of Shandong Province.

The 10,000 t/a LA, 1,000 t/a L-malic acid and 1,000 t/a SA project was proposed by Anhui Yinchuang Biotechnology Co., Ltd. (Anhui Yinchuang, formerly known as Anhui BBCA Biotechnology Co., Ltd), with details disclosed as follows:

- Construction type: Reconstruction
- Total investment: USD16.57 million (RMB115 million), including USD15,850 (RMB110,000) for environmental protection
- Location: Economic and Technological Development Zone of Guzhen County, Bengbu City, Anhui Province
- Site area: 43,707.17 m^2
- Construction plan: Equipment installation and commissioning inside the operating factory in the zone that runs a 5,000 t/a glucosamine hydrochloride industrial demonstration project (via fermentation method) by Anhui BBCA Fermentation Technology Engineering Research Co., Ltd.; no new factory buildings will be added.
- Capacity: 10,000 t/a LA, 1,000 t/a L-Malic Acid, 1,000 t/a SA
- Construction duration: 3 months
- Working system: 110 workers, 314 work days in a year

Anhui Yinchuang was founded on 5 June, 2017, with a registered capital of RMB115 million. It is a subsidiary of China BBCA Group Corporation, responsible for the R&D and application of bio-fermentation, chemical isolation and extraction technologies, as well as production and sale of biological chemicals.

The bio-based new materials (1,500 t/a SA) project was proposed by Shandong Gantai Biotechnology Co., Ltd. (Shandong Qiantai), with details disclosed as follows:

- Construction nature: New construction
- Total investment: USD8.65 million (RMB60 million), USD0.14 million (RMB1.0 million) of which for environmental protection
- Location: The rental factory owned by Shandong Yingcheng Holding Group at the Laiwu Pharmaceutical Industrial Park, Jinan City, Shandong Province

- Area: 4,713.28 m^2 of site area and 12,492.55 m^2 of building area
- Construction content and capacity: Two production lines and the supporting facilities for SA capacity of 1,500 t/a
- Main production steps: Raw material batching (glucose, carbon dioxide, etc)—fermentation—filtration—evaporation and concentration—centrifugation—drying—target product (bio-based new material SA)
- Working system: 32 workers, 300 24-hour work days in a year
- Economic evaluation: Once in operation, the annual gross profit is USD5.56 million (RMB38.60 million) and net profit is USD4.17 million (RMB28.95 million) in estimates.

Shandong Qiantai was set up on 4 March, 2021, with a registered capital of RMB9.60 million, and is wholly-owned by Beijing Tidetron Biotechnology (Guangzhou) Co., Ltd. (Tidetron Biotech, formerly knowned as Beijing Tidetron Biotechnology Co., Ltd.). It operates in the R&D of bio-based material polymerisation technology, as well as the R&D, manufacturing and sale of bio-based materials. Last June, it parent Tidetron Biotech kicked start an 1 million+ t/a bio-based polybutylene succinate (PBS) project in Guangzhou City, Guangdong Province.

SynMetabio raises over RMB10 million funding

Summary: In March, SynMetabio raised over USD1.44 million (RMB10 million) funding in seed round and angel round, to expand its team and the production of the 100% bio-based leather—Naro Leather.

On 9 March, the startup company Shanghai SynMetabio Technology Co., Ltd. (SynMetabio) announced it had gathered over USD1.44 million (RMB10 million) funding in the seed round lead by MiraclePlus and the angel round led by Linear Capital and followed by MiraclePlus (Beijing), Danen Capital and K2VC. The funding proceeds are to be used to expand its team and the production of the 100% bio-based leather—Naro Leather.

Company background

SynMetabio was founded in Dec. 2021 by Su Rui and Wen Yujie, two undergraduates of the School of Life Sciences, ShanghaiTech University. The startup company is the first in China that adopts synthetic biology to produce such biomaterials as fibre materials, spider fibroin and mussel adhesive protein. In 2021, the school team led by Su Rui won the golden award of the International Genetically Engineered Machine Competition (iGEM) and the third place in the final. Su Rui and Wen Yujie then established SynMetabio aiming to transform the entry into an industrial product. At present, SynMetabio is a company of about 20 people, most focusing on product R&D. It has a R&D centre of nearly 2,000 square meters, and has designed and built a microbial fibre-based material development and pilot platform.

Bio-based leather materials by synthetic biology

The core idea is to cultivate nanofibres of different lengths with microorganisms, form a structure similar to the real leather, and modify the fibres through materials compositing into ones with the characteristics of real leather. SynMetabio starts with selection and modification of the smallest genome, and applies unique material composite method on synthetic biology and material platforms, to develop its Naro Leather.

Naro Leather is a four-layer leather—the outermost layer is a flat and smooth biological nanofibre film of high crystallinity; the second layer is elastic and has different textures made of natural rubber and agricultural wastes; the third layer has real leather-like fibre structure; and the fourth is the extra thin biological nanofibre film or bio-based fibre sheet.

In China, the leather industry creates about 138 million tonnes of wastewater each year, and that include nearly 40,000 tonnes of chemicals. And the processing treatment of the wastewater also generates huge amount of carbon emissions. Many known brands at home and abroad are looking for more environmentally friendly and green bio-based leather materials, in line with the concept of sustainable development. The production of per square meter of Naro Leather uses 36 litres of water, which is only 2% of the usage in making real leather.

In terms of texture and touch, the Naro Leather shares the similar mechanical properties to the real one; regarding cost factor, the mass production of Naro Leather is estimated to cost less than producing real leather and could even be less than artificial leather.

Industrial production and application process

SynMetabio has completed the pilot-scale experiment on Naro Leather, in which they succeeded in producing tens of square meters of leather fibre materials in each 7-day production cycle. Su Rui revealed earlier that the trial production of Naro Leather would begin in the second quarter this year and the scale could be larger producing up to 2.5 million square meters of fibre per year in the four quarter this year.

He added that they would borrow production lines from other factories for the pilot production but was also planning to build thier own plant, which would include two parts: lines for fibre film cultivation and lines for material processing and preparation.

Meanwhile, SynMetabio is applying for a patent for its basic bacterial strain and cell factory construction method that implements a biological fermentation mode in both solid and liquid state—use traditional fermenter for controlled cell amplification in the beginning, and put the seed solution into static liquid medium and let it naturally set to form film. This technology bypasses the separation and purification but collects the gel film on the medium directly; and the application is relatively low in cost and accessible to scale production.

SynMetabio's short and long term focus is placed on the textile sector, with the main products of bio-based leather and functional fabrics. So far, Naro Leather has attracted cooperation invitations from the downstream businesses in packaging materials, sports materials, automotive manufacturing, and the company says it would soon settle a technical purchase agreement with a well-known automobile manufacturer.

Price Update

TABLE 5: Average market prices of major raw materials of bio-based materials in China, Jan.–March 2023

No.	Product	Price, USD/t
1	Sugarcane	165.66
2	Corn	412.21
3	Wheat	454.89
4	Bagasse	43.14
5	Corn cob	60.54
6	Wheat straw	79.66
7	Corn stover	75.62

Source:CCM

TABLE 6: Average ex-works prices of major bio-based materials in China, Jan.–March 2023

No.	Product	Price, USD/t	Remark
1	PHA (Polyhydroxyalkanoates)	8,869	Films
2	PBS (Polybutylene succinate)	5,415	Extrusion grade and injection moulding
3	PPC (Propylene carbonate)	3,985	Injection moulding
4	PLA (Polylactic acid)	3,362	Injection moulding
5	PVA (Polyvinyl alcohol)	2,301	Flocculent
6	Starch-based material	3,635	Film moulding
7	PTT (Polytrimethylene terephthalate)	3,490	fibre

Source:CCM

News in Brief

First disclosure of Sichuan Siliya's cellulose fibre project

On 18 Jan., Sichuan Siliya Fiber Technology Co., Ltd. (Sichuan Siliya)'s green and high-end cellulose fibre material project was disclosed for the first time with the environmental impact assessment. The company was set up in Sept. 2022 with a registered capital of RMB2 billion and engages in the manufacturing of raw materials of cellulose fibre and fibres.

Project at a glance:

- Construction type: New construction
- Location: Gaoxian County Industrial Zone, Yibin City, Sichuan Province
- Product capacity: 180,000 t/a Cellulose staple fibres (80,000 t/a of viscose staple fibre and 100,000 t/a Lyocell fibre)

Juyuan New Material to build 50,000 t/a PLA capacity

On 3 March, Zaozhuang Juyuan New Material Technology Co., Ltd. (Juyuan New Material)'s 50,000 t/a polylactic acid (PLA) project was accepted for environmental impact assessment (EIA). The company was set up in Sept. 2022 with a registered capital of RMB10 million.

Project at a glance:

- Construction type: New construction
- Total investment: USD24.50 million (RMB170 million)
- Location: Shanting District, Zaozhuang City, Shandong Province
- Site & floor areas: 16,650 m^2 of site are and 7,200 m^2 of building area
- Main construction content: 3 PLA production lines, modification workshop, refining working, polymerisation workshop, and warehouses
- Product scheme: PLA—50,000 t/a
- Working system: 50 workers in four shifts and three running systems, for 300 days a year

Cathay Biotech delays 20,000 t/a long-chain polyamide operation start

On 10 Jan., Cathay Biotech Inc. (Cathay Biotech) notified that it rescheduled the operation start of the 30,000 t/a long-chain dibasic acids (LCDAs) and 20,000 t/a long-chain polyamide (PA) project to be in Dec. 2023, and of the public funded project for developing a bio-based PA engineering technology research centre to be in June 2023. These two projects were originally planned to turn operational in Dec. 2022.

The company cited that the repeated COVID-19 infection cases over recent years have made a dent in the projects' progress on material purchase and foundation building. In particularly in 2022 when the project site was under stricter controls on individual traffic and construction works, equipment transfer, etc., these projects were progressing far slower than expected.

Eyougene Biotech secures RMB100 million+ Series B financing

In Jan., Shanghai Eyougene Biotechnology Development Co., Ltd. (Eyougene Biotech) completed a Series B funding round securing over USD14 million (RMB100 million) from the leading investor Huadian Fund, followed by Lingdu Capital. The financing proceeds will be used

to support the company's R&D business and acquisition of industrial factories. Eyougene Biotech was set up in Aug, 2016 and is a CDMO (contract development and manufacturing organisation) specialised in offering services related to innovative medicines and new materials. In new material area, it has built large-scale production capacity for the degradable bio-based plastic monomer 2,5-furandicarboxylic acid (FCDA) of up to 1,000 t/a, and it has cooperation with companies in the downstream chain. Reportedly, Eyougene Biotech will launch its third round of financing in this June, to boost its R&D strength, commercialise its core catalytic technologies for the FCDA production and achieve billions of sales income.

Zhongke Juhe's high-end bio-based polyester pilot project approved

On 6 Jan., the environmental impact assessment (EIA) document of the high-end bio-based polyester pilot project of Shandong Zhongke Juhe New Materials Co., Ltd. (Zhongke Juhe) was approved. The project proposes research-based production of polyethylene furanoate (PEF) and poly(1,4-cyclohexylene dimethylene terephthalate) (PCT), serving as the foundation for the future industrial production.

Project overview

- Construction nature: New construction
- Total investment: USD3.75 million (RMB26 million), 2.69% (USD0.1 million or RMB0.7 million) of which for environmental protection
- Location: Economic and Technological Development Zone of Dongying City, Shandong Province
- Site area: 3,612 m^2
- Project plan: Constructing two pilot-scale lines, which are:
  - the 100 kg/h line for continuous experiment, producing 15 t/a PEF (1,600 hours/year) and 160 t/a PCT (150 hours/year);
  - the 60k g/batch line for batch experiment, producing 1.2 t/a PEF (60 hours/year) and 1.2 t/a PCT (60 hours/year).
- Working system: 20 workers in 3 shifts, working for 1,950 hours or 300 days per year.
- Project duration: Jan. 2023 to Jan. 2025

Founded in Aug. 2022 with a registered capital of RMB10 million, Zhongke Juhe mainly operates in the sale of metal functional materials and coatings, as well as the manufacturing of synthetic materials.

HANVO Safety and BUCT form strategic cooperative partnership

On 17 Feb., Jiangsu Hanvo Safety Product Co., Ltd. (HANVO Safety, Stock code:300952.SZ) and Beijing University of Chemical Technology (BUCT) signed a strategic cooperation agreement, which would help push the company's R&D progress related to bio-based degradable polyester rubber materials' applications and raise its market presence in the bio-based degradable rubber segment.

Agreed-upon terms:

- Establish an Academy Innovation Centre, headed by the Professor Zhang Liqun, as their long-term cooperation base.
- With core supports from the Academician Innovation Centre and BUCT, integrate academic advantages in green chemistry, chemicals and materials, and rubber materials studies; and develop all-dimensional cooperative programmes that will enable bio-based degradable rubber materials in the production of gloves, tyres and shoes.
- Specific co-development contents including (but not limited to):
  - 10,000 t/a bio-based degradable polyester production line construction project;
  - Degradable and bio-based gloves development;
  - Degradable safety shoes development.

Prof. Zhang Liqun, leader of the Center of Advanced Elastomer Materials (CAEM) of BUCT, has long committed to the advanced rubber material field. His team has created two China's first synthetic rubber types with proprietary intellectual property rights—bio-based degradable polyester rubber and bio-based itaconate rubber.

Founded in 2004, HANVO Safety is a world's leading safety gloves manufacturer, with business focus on functional safety gloves and export trade primarily to America, Europe, Japan.

Land Biological to upgrade succinic acid capacity

On 16 March, Shandong Land Biological Technology Co., Ltd. (Land Biological)'s succinic acid (SA) technological upgrade and transformation project was publicised for the second time with the environmental impact report draft for public opinion.

Project overview

- Construction nature: Technological upgrade and transformation
- Location: Advanced Manufacturing Industry Park of Yangkou Town, Weifang City, Shandong Province
- Total investment: USD5.76 million (RMB40 million), USD312,824 (RMB2.17 million) of which for environmental protection, accounting for 5.43%
- Construction and production plan:
  - The project is to technologically upgrade the operating 120,000 t/a SA project in the site without occupying new area, including adding new MVR centrifugal fan, heater, separator, centrifugal extractor and other production equipment, which are to produce 8,000 t/a disodium succinate by mixing coarse crystal of SA and 50% liquid alkali, with the supports of the built equipment.
  - In addition, it is to optimise the production of strains and extend the fermentation cycle to improve the purity of SA from 99.5% to 99.7%. So after this upgrade project, the SA capacity here will be changed from 120,000 t/a to 30,000 t/a.
- Working system: 288 currently employed personnel working for four shifts and three 8-hour running system (300 hour each year)
- Planned date to enter production: Dec. 2023

Land Biological was registered on 27 August, 2012 with a capital of RMB220 million. In 2015, it brought 20 years of right to use the patented strain technology developed by Tianjin Institute of Industrial Biotechnology, Chinese Academy of Sciences. This technology uses genetically engineered strain (*Escherichia coli*) which has showed the rate of producing acid reaching 8g/L.h and the conversion rate of sugar to acid up to 102%; and its application generates costs 20% lower than the traditional petrochemical process. *Escherichia coli* is a globally recognised strain with high efficiency in the conversion of sugar to acid.

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