

Bio-based Material Quarterly Newsletter

Q4 2021

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Bio-based Materials Quarterly Newsletter



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Headline

On 29 Oct., the MIIT published a drafted Directory for Key New Materials to solicit public opinions, some bio-based materials listed. Moreover, some provinces introduced policies related to promoting bio-based materials and developing the bio-based materials industry chain.

In Oct., Jindan Technology and Kingfa released their Q3 2021 report. Jindan Technology saw a significant YoY increase in revenue and smaller YoY growth in net profit, while Kingfa reported a sharp YoY decrease in net profit.

On 24 Sept., Hisun Biomaterials publicised its IPO prospectus (application draft) proposing to go public on the SSE STAR Market.

Updates on BBKA Biochemical's operation: the 100,000 t/a PLA project has been declared along with the signings of a strategic cooperation framework agreement with Guofeng Plastic and a cooperation agreement for PLA chemical closed-loop recycling technology project with Sichuan University—a great advance in the development of degradable materials industry.

Many domestic companies have invested in PLA projects. Since late Sept., two players have started construction work and three are advancing the project process.

In Nov., the EIA report of the 25,000 t/a PHA industrialisation project (phase I: 5,000 t/a) of Bluepha's wholly-owned subsidiary, Lansu Biomaterial, was published before approval. Meanwhile, Bluepha has signed a cooperation agreement with Thailand-based Thai Wah, tapping into the PHA market in Southeast Asia.

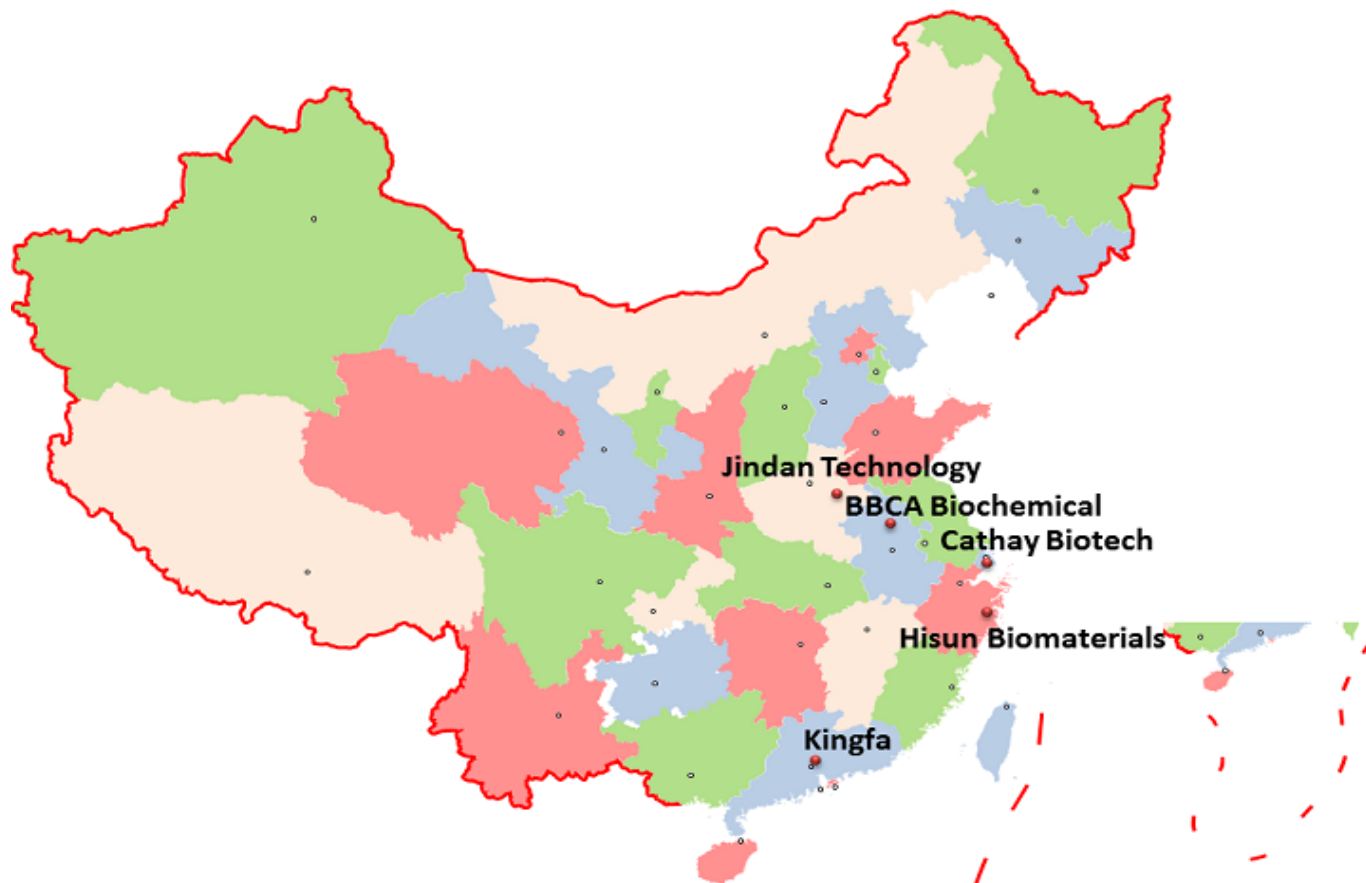
On 7 Dec., Cathay Biotech announced to change the implementation site and subject of its investment project, the "Bio-based Polyamide Engineering Technology Research Center". On 28 Oct., the company released financial report with dramatic increases in sales and net profit in Q1-Q3.

On 24 Sept., COFCO Tech announced a proposal to invest and build a 30,000 t/a lactide project. On 28 Oct., the company reported satisfactory growth in its operating revenue and net profit in Q1-Q3.

In Q4, the EIA report of Xinjiang Tianlu's 10,000 t/a biomass cellulose fibre project and Shandong Yanquan's 20,000 t/a nanocellulose project were published respectively.

Zhongyuan Dahua Group will soon complete the world's first 1,000 t/a straw sugar-based EG pilot project (in DLEG process), with all main equipment installed in place. Upon operation, the project will produce 746.80 t/a of EG and 194.40 t/a of PG, the byproduct.







Editor's Note

Welcome to the Bio-based Material Quarterly Newsletter Q4 2021.

Policy

The Chinese MIIT published a drafted *Directory for Key New Materials* to solicit public opinions, some bio-based materials listed. Moreover, some provinces introduced policies related to promoting bio-based materials and developing the bio-based materials industry chain.

Market dynamics

Hisun Biomaterials publicised its IPO prospectus (application draft) proposing to go public on the SSE STAR Market.

BBCA Biochemical completed the declaration for its 100,000 t/a PLA project along with the signings of a strategic cooperation framework agreement with Guofeng Plastic and a cooperation agreement for PLA chemical closed-loop recycling technology project with Sichuan University.

Since late Sept., 2 PLA producers have started construction of their PLA project and 3 are advancing the project process.

In Q1-Q3, Cathay Biotech, COFCO Tech, and Jindan Technology reported increased revenue and net profit, while Kingfa saw decreased net profit.

Enterprise

Bluepha's 25,000 t/a PHA industrialisation project, Xinjiang Tianlu's 10,000 t/a cellulose fibre project, and Shandong Yanquan's 20,000 t/a nanocellulose project were published recently.

COFCO Tech launched a 30,000 t/a lactide project to produce PLA raw materials.

Cathay Biotech revised the implementation location and subject of its "Bio-based Polyamide Engineering Technology Research Center" investment project.

Zhongyuan Dahua Group will soon complete the 1,000 t/a straw sugar-based EG pilot project.

Price

In Q3, prices of bio-based materials such as PLA and PHA mostly trended upwards and then downwards.

The USD/CNY exchange rate in this newsletter is USD1.00=CNY6.3693 on 1 Dec., 2021, sourced from the People's Bank of China.

Unless otherwise specified, all the prices mentioned in this newsletter will include the VAT.





Governmental Direction

Part bio-based materials included in MIIT's Directory for Key New Materials

Summary: On 29 Oct., the MIIT published a drafted Directory for Key New Materials to solicit public opinions, some bio-based materials listed. Moreover, some provinces introduced policies related to promoting bio-based materials and developing the bio-based materials industry chain.

On 29 Oct., the Ministry of Industry and Information Technology of the People's Republic of China (MIIT) issued a consultation paper of the *Directory for Guiding the Exemplary Application of the First Batch of Key New Materials (2021)* (hereafter referring to Directory for Key New Materials), which includes bio-based eucommia ulmoides gum (EUG), castor oil-based epoxy resin, bio-based polyamide resin, polylactic acid (PLA), and bio-based biodegradable polyester rubber.



TABLE 1: Basic information on bio-based materials

No.	Name of material	Performance requirement	Application area
1	Bio-based EUG	Purity: 90%-99%, Mooney viscosity: 50-130 (ML(1+4) 125°C) Tensile strength: 20-30 MPa	Aerospace equipment, marine engineering equipment and hi-tech ships, biomedical and high-performance medical equipment, advanced rail transportation equipment
2	Castor oil-based epoxy resin	Epoxy value: 0.2-0.4eq/100g Viscosity: (mPa·s at 25) ≤2,000	New-generation information technology industry, power equipment
3	Bio-based polyamide resin	Solubility of full ethanol (or ester): ≤170 min	/
4	PLA	Resin: <ul style="list-style-type: none"> • glass transition temperature (GTT) ≥ 55; • melting point ≥ 125; • tensile strength ≥ 45 MPa; • notched impact strength ≥ 1kJ/m² Biaxially stretched film: <ul style="list-style-type: none"> • longitudinal tensile strength ≥ 100 MPa; • transverse tensile strength ≥ 90 MPa; • light transmittance > 90%,; • haze ≤ 4%; • thermal shrinkage ≤ 10%; • films after degradation are in line with DB46/T 505-2020 General Requirements for Biodegradable Plastic Products. 	Biomedical and high-performance medical equipment
5	Bio-based biodegradable polyester rubber	Molecular weight ≥ 70,000; Soil degradation rate > 70%; Gel content < 10%	Energy-saving & environmental protection, energy-saving and new energy vehicles
6	Bio-based plasticizers	100% replacement of phthalate plasticizers; Anti-aging performance >1200h (ASTMG-154); Environmental indicators are authenticated by the EU REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) to be green, safe, and non-toxic.	Biomedical and high-performance medical equipment

Source:MIIT

On 16 Jan., 2020, the National Development and Reform Commission (NDRC) and the Ministry of Ecology and Environment (MEE) issued the *Opinions on Further Strengthening the Control of Plastic Pollution*. In response to the national policy, many cities and provinces introduced an implementation plan to kick off the plastic ban campaign and corresponding policies related to biodegradable materials to



promote the development of the biodegradable materials industry. At the same time, as bio-based materials are eco-friendly degradable materials, provinces are increasing efforts to develop a wide range of bio-based materials not limiting to the listed bio-based materials in the Directory for Key New Materials, and aim to promote the bio-based materials industry.

On 21 July, the General Office of Shanghai Municipal People's Government released a *Notice on Strategic Plan for Emerging Industries and Pioneer Industries Development in Shanghai during the "14th Five-Year Plan" Period (2021–2025)*. In prioritising key strategic materials regarding biomedical materials, it highlights the promotion of the R&D and application & popularisation of degradable PLA materials, orthopedic implant materials, degradable biomedical magnesium alloys, scintillation crystal materials, carbon fibers, and composite materials, and the acceleration in key technological breakthroughs such as 3D bioprinting, material surface biofunctionalisation and modification.

On the same day, the Department of Science and Technology of Guangdong Province published a *Notice on Organising the Declaration of Major Special Projects of "Green Bio-manufacturing" in the Guangdong Provincial Key Areas R&D Program for 2021-2022*. The Direction 10 Part of the declaration guideline specifies research contents of the R&D and application of massive green bio-manufacturing technology for degradable high-polymer plastics.

Specific research contents are indicated as follows:

- Set up a strain production control system for the efficient use of crops, and study the optimal producing strains with high utilisation rate and high synthesis rate
- Build a low-consumption and high-efficient fermentation production model for different key raw materials from PHA, PBS, and PLA
- Determine the optimum PHA, PBS, and PLA fermentation process conditions by studying the relationship between key parameters in the fermentation process and the performance of PHA, PBS, and PLA
- Analyse the change rule in the quality performance of PHA, PBS, and PLA under different separation and extraction systems, and create a green separation and purification method for PHA, PBS, and PLA

Through the research mentioned above, Guangdong Province has created new technologies, methods, and processes for producing PHA, PBS, and PLA suitable for localized raw materials in the province, and has established an industrial production line for bio-based fully biodegradable PHA, PBS, or PLA.

On 4 Nov., the Development and Reform Commission of Anhui Province released a revised version *Several Policies for Supporting the Development of the Biobased New Materials Industry*. It upholds the R&D and implementation of innovative industrialisation projects in the fields of new biobased bionic structural materials, biobased high-polymer materials, biobased material additives, biobased composite materials, innovative and efficient utilisation of natural biological materials, etc. to speed up breaking technical bottlenecks and realise industrialisation production.





Market Dynamics

Jindan Technology and Kingfa's Q3 2021 report

Summary: In Oct., Jindan Technology and Kingfa released their Q3 2021 report. Jindan Technology saw a significant YoY increase in revenue and smaller YoY growth in net profit, while Kingfa reported a sharp YoY decrease in net profit.

On 21 Oct., **Henan Jindan Lactic Acid Technology Co., Ltd.** (Jindan Technology) released its Q3 business report:

- Q3:
 - Revenue: USD55.74 million (RMB355.02 million), up 43.10% YoY
 - Net profit attributable to shareholders: USD6.41 million (RMB40.81 million), up 7.99% YoY
- Q1-Q3:
 - Revenue: USD0.16 billion (RMB1.01 billion), up 40.58% YoY
 - Main factors in the growth:
 - After the 200,000 t/a starch project was put into production in late Q3 2020, the company had new products of starch and corn byproducts and gained increased earnings compared to the same period last year
 - Sales volume and selling prices of lactic acid series products rose YoY
 - Net profit attributable to shareholders: USD17.45 million (RMB111.135 million), up 7.71% YoY

Jindan Technology introduced in Nov. that it has the independent industrial production capacity of lactide, and such production technology is based on 2 key innovative techniques developed by Nanjing University. Both parties had signed a comprehensive cooperation agreement at the beginning of the collaboration, making specific provisions for various important cooperation contents.

Moreover, on 23 Nov., the environmental impact assessment (EIA) report of Jindan Technology's 60,000 t/a biodegradable polyester and related products project was approved and publicised.

Project details are indicated as follows:

- Total investment: USD47.10 million (RMB300 million)
- Production process:
 - Mainly use PTA, AA, and BDO as raw materials to produce PBAT through esterification, polycondensation, and other reactions
 - Use PBAT, PLA, starch, etc. to produce biodegradable plastics and related products (60,000 t/a of PBAT – of which 38,000 t/a will be sold as biodegradable raw materials, 16,500 t/a applied as raw materials for biodegradable modified materials, and 5,500 t/a as raw materials for biodegradable modified material products)
- Construction cycle: 18 months

On 25 Oct., **Kingfa SCI. & TECH. Co., Ltd.** (Kingfa) reported its operating data for Q3 2021:

- Q3:
 - Revenue: USD1.62 billion (RMB10.31 billion), up 11.18% YoY
 - Net profit attributable to shareholders: USD23.52 million (RMB149.83 million), down 89.16% YoY
- Q1-Q3:
 - Revenue: USD4.65 billion (RMB29.59 billion), up 12.95% YoY
 - Net profit attributable to shareholders: USD0.27 billion (RMB1.73 billion), down 54.38% YoY





- Main factors in the sharply decreased net profit:
- Soaring costs due to significantly and rapidly rising prices of major raw and auxiliary materials for the company's key products
- Dramatically decreased profits of medical and health products when domestic COVID-19 pandemic was effectively controlled, and prices of pandemic-proof protective supplies returned to normal

Kingfa's modified plastics and new materials segments continued to be buoyant in Q3. Performance of the new materials segment (including fully biodegradable plastics, specialty engineering plastics, carbon fiber, and composite materials) in Q3:

- Sales: USD94.20 million/RMB599.96 million
 - Fully biodegradable plastics: 17,500 tonnes
 - Specialty engineering plastics: 4,700 tonnes

In terms of bio-based materials, PA10T product of specialty engineering plastics, Kingfa has successfully developed a solid-phase suspension polymerisation technology by water-level dispersive media to realise the world's first industrialisation of bio-based high temperature resistant polyamide PA10T. Moreover, as scheduled, the enterprise was also advancing its 30,000 t/a PLA project, which is expected to be put into operation in Q4 2021.

Hisun Biomaterials' IPO prospectus

Summary: On 24 Sept., Hisun Biomaterials publicised its IPO prospectus (application draft) proposing to go public on the SSE STAR Market.

On 24 Sept., Zhejiang Hisun Biomaterials Co., Ltd. (Hisun Biomaterials) publicised its IPO prospectus (application draft) proposing to list on the Science and Technology Innovation Board of the Shanghai Stock Exchange (SSE STAR Market) with a public offering of up to 50.67 million shares. It aims to raise USD208.17 million (RMB1.33 billion) for its 150,000 t/a polylactic acid (PLA) project and R&D centre construction project.

Details of the two projects to be funded are indicated as follows:

- 150,000 t/a PLA project:
 - Estimated total investment: USD194.33 million (RMB1.24 billion)
 - Objective: Increase the company's existing PLA production capacity and expand the existing product line to provide strong support for its sustainable development
- R&D centre construction project:
 - Estimated total investment: USD13.84 million (RMB88.12 million)
 - Objective: Raise the company's R&D strength and level, shorten the project development cycle, and pick up R&D-to-product conversion rate

The new offering shares in IPO will be no less than 25% of the total share capital after this issue. The total share capital of Hisun Biomaterials after issue will not exceed 202.68 million shares.



**Company background**

Hisun Biomaterials currently produces 35,000 t/a of PLA with core technology of pure PLA manufacturing and compound modification and has realised the scale production and sale of different types of PLAs.

In 2018–2020, the enterprise was on the rise:

- Compound annual growth rate (CAGR) of operating revenue: 7.36%
- CAGR of net profit attributable to ordinary shareholders: 86.78%, showing a fast growing profitability
- Gross profit margin: 16.76% in 2018 rising to 25.98% in 2020
- Revenues of main business (sales of primary products such as PLA and PLA powders) in 2018-2020 and Q1 2021 remained prominent, accounting for over 98% of the company's total revenue.

Hisun Biomaterials' business performance in 2020:

- Operating revenue: USD41.24 million (RMB262.66 million), up 13.27% YoY
- Net profit attributable to owners of the parent company: USD4.77 million (RMB30.38 million), up 201.97% YoY
- Drivers for the revenue and net profit increase:
 - China issued the *Opinions on Further Strengthening the Control of Plastic Pollution* at the beginning of 2020, which activated the domestic end market of PLA products represented by single-use plastic tableware and bags.
 - Due to the low PLA production under lactide shortages, the domestic PLA market faced deeper undersupply and soaring prices, pushing up the company's revenue significantly

TABLE 2: Production capacity, production, sales volume, and operating revenue of Hisun Biomaterials' major products

Year	Product	Production capacity (t/a)	Production (tonne)	Capacity utilisation rate	Sales-to-production ratio	Operating revenue (million USD)
Q1 2021	Pure PLA	6,900	5,539	80.27%	80.00%	11.81
	Compound modified PLA	4,875	2,170	44.52%	93.87%	7.58
2020	Pure PLA	15,500	10,172	65.62%	89.87%	0.18
	Compound modified PLA	19,500	6,802	34.88%	102.14%	21.95
2019	Pure PLA	15,000	10,286	68.57%	101.95%	13.21
	Compound modified PLA	14,500	8,177	56.40%	101.23%	22.25
2018	Pure PLA	15,000	11,939	79.59%	104.45%	18.64
	Compound modified PLA	9,500	6,810	71.68%	97.66%	16.83

Source: Hisun Biomaterials





R&D focus

From 2018 to 2020, Hisun Biomaterials has been increasing R&D investment. Though the total invested amount took up less than 5% of its operating revenue, notable results over the years can be seen in core technologies covering all key processes in PLA production:

- Its full-process commercial production line for PLA with independent intellectual property rights covers the whole industrialisation process of "lactic acid-lactide-PLA" including the "Two Steps" (microwave heating and conventional heating in the ring-opening polymerization (ROP) of lactide)".
- Moreover, the company has achieved high yield of high optical-purity PLA with support of its core technologies in production stages such as dehydration and esterification of lactic acid, cyclisation, purification and refinement of lactide, and chain extension for PLA.

As of the signing date of this prospectus, Hisun Biomaterials owns 23 invention patents (2 utility model patents and 1 design patent) and has mastered 7 core technologies.



TABLE 3: Seven core technologies developed by Hisun Biomaterials

No.	Name	Patents obtained	Maturity	Applicable processes
1	Multi-effect Continuous Evaporation Technology	-	Mass production	Dehydration and esterification
2	Self-developed Efficient Catalysis Technology for Cyclisation	"Uses of Stannous Benzoate as Catalyst"; "New Synthesis Methods for Stannous Benzoate"	Mass production	Cyclisation
3	Vacuum Production Technology	"A High Vacuum System for the Continuous Production of Materials with High Melting Points"	Mass production	Cyclisation and chain extension
4	Coupling Separation and Purification	"A Separation Method for Meso-lactide"	Mass production	Purification and refining
5	PLA Compound Modification Technology	-	Mass production	Chain extension
6	Structural Phase Change and Crystallisation Performance Control Technology for PLA Compound Modification	"A PLA Resin Composition with Rapid Crystallisation Capacity"; "A High-strength Thermal Resistant PLA Composition"; "A Thermal Resistant PLA Resin Composition for Biodegradable Films and the Related Preparation Method", etc.	Mass production	Compound modification
7	Molding and Scale Preparation Technology for Special Materials Of High-performance PLA Products	"A Thermal Resistant PLA Resin Composition for Biodegradable Films and the Related Preparation Method"; "A PLA Resin Composition for Blowing Transparent Heat-resistant Bottles"	Technical demonstration	Molding of finished products

Source: Hisun Biomaterials

BBCA Biochemical progressing PLA industry

Summary: Updates on BBCA Biochemical's operation: the 100,000 t/a PLA project has been declared along with the signings of a strategic cooperation framework agreement with Guofeng Plastic and a cooperation agreement for PLA chemical closed-loop recycling technology project with Sichuan University—a great advance in the development of degradable materials industry.

Anhui BBCA Biochemical Co., Ltd. (BBCA Biochemical) principally engages in the biochemical, biomaterial, and bioenergy industries with current key focus on the biomaterial area. It has finished the phase I constructions of the 150,000 t/a lactic acid project and the 100,000 t/a polylactic acid (PLA) project separately which are equipped with the raw material pre-treatments, thermoelectric devices, and environmental workshop and have entered production. This capacity gives BBCA Biochemical the edge in the whole PLA industrial chain.



In addition to actively increasing its PLA production capacity, the enterprise is developing PLA applications and PLA recycling.

Filings of the 180,000 t/a lactic acid project and 100,000 t/a PLA project

On 10 Dec., Shandong BBCA Biotechnology Co., Ltd. (BBCA Biotechnology) and Shandong BBCA Biomaterial Co., Ltd. (BBCA Biomaterial) completed the declaration of their 180,000 t/a lactic acid project and 100,000 t/a PLA project respectively. Both two subsidiaries were established on 8 Dec., with 90% shares and 51% shares held by BBCA Biochemical separately.

Basic information about these two projects is indicated as follows:

- 180,000 t/a lactic acid project:
 - Construction entity: BBCA Biotechnology
 - Construction schedule: proposed to begin in 2022 and complete in 2024
 - Total investment: USD150.72 million (RMB960 million)
 - Location: Binhai Economic Development Zone, Weifang City, Shandong Province
- 100,000 t/a PLA project:
 - Construction entity: BBCA Biomaterial
 - Construction schedule: proposed to begin in 2022 and complete in 2024
 - Total investment: USD120.89 million (RMB770 million)
 - Location: Binhai Economic Development Zone, Weifang City, Shandong Province

Strategic cooperation framework agreement with Guofeng Plastic

On 10 Dec., BBCA Biochemical settled the strategic cooperation framework agreement with Anhui Guofeng Plastic Industry Co. Ltd. (Guofeng Plastic) to strengthen R&D on degradable film materials, high-end chemicals, and other technologies, explore new business development models, and promote the application of degradable materials and industrial development.

According to the agreement, based on their respective strengths in the fields of degradable PLA materials and biaxially oriented PLA film materials, BBCA Biochemical and Guofeng Plastic will carry out comprehensive cooperation:

- Set up a joint subject group that focuses on the technology R&D and industrial construction, especially the production and application of PLA and other bio-based materials with regards to biaxially oriented products, cost control over degradable film materials processing; and new premium bio-chemical materials.
- Select and invest in degradable film material-related projects centred around industrial development and technological needs. Series of R&D, pilot tests, and industrialisation work will be launched.

PLA chemical closed-loop recycling technology project with Sichuan University

On 28 Sept., BBCA Biochemical and Sichuan University held a signing ceremony for the PLA chemical closed-loop recycling technology project which runs based on the "PLA chemical closed-loop recycling technology" developed by the team led by academician Wang Yuzhong. According to agreement, BBCA Biochemical funds the academician team with over USD15.70 million (RMB100 million) to industrialise this achievement.

PLA's high T_c (crystallization temperature) features a harsh environment for depolymerising and recovering the polymerisation monomer, plus optical isomers contained in lactide making it difficult to produce lactide monomer with high optical purity—such processes have





long been a challenge in China. After long-term basic research, Wang Yuzhong's academician team has achieved a recovery rate and optical purity of lactide, by depolymerising and recovering PLA, that have broken the record levels of similar technologies in the global, making PLA a bio-based, recyclable, easily recovered and degradable high polymer material, or in short, a low-carbon and eco-friendly material.

Progress of several PLA projects in China

Summary: Many domestic companies have invested in PLA projects. Since late Sept., two players have started construction work and three are advancing the project process.

With stricter environmental policies at home and abroad and China's "plastic limit" and "plastic ban" orders under steady promotion, the downstream market for polylactic acid (PLA) is expanding rapidly worldwide, propelling major PLA producers and outsiders to launch their PLA production projects. Since late Sept., 2 Chinese companies have started their PLA project and 3 are under the project propulsion process.

Pliith Biotechnology Co., Ltd. (Pliith Biotechnology)

On 25 Sept., Pliith Biotechnology held a groundbreaking ceremony for its 75,000 t/a L-lactic acid & 50,000 t/a PLA intelligent plant construction project (Phase I of the 350,000 t/a PLA project) at the Sanshan Economic Development Zone of Wuhu City, Anhui Province.

Information about the 350,000 t/a PLA project

- Total investment: USD1.35 billion (RMB8.60 billion)
 - Phase I:
 - Investment: USD0.31 billion (RMB2 billion)
 - Planned construction work: an intelligent plant with 75,000 t/a L-lactic acid and 50,000 t/a PLA capacity
 - Phase II:
 - Investment: USD1.04 billion (RMB6.60 billion)
 - Planned construction content: a 300,000 t/a PLA project

Zhejiang Yongtai Technology Co., Ltd. (Yongtai Technology)

On 5 Oct., Yongtai Technology entered into an intention agreement with Togtoh County, Hohhot City, Inner Mongolia Autonomous Region over an 100,000 t/a PLA production project. Established on 26 Feb., 2007 and with a registered capital of USD15.70 million (RMB100 million), Yongtai Technology is engaged in equity investment and sale of chemical products, coal and coal products, mechanical equipment, metal materials, etc.

Jiangxi Keyuan Bio-Material Co., Ltd. (Jiangxi Keyuan)

On 8 Oct., the initial environmental impact assessment (EIA) report of the 200,000 t/a lactic acid & 130,000 t/a PLA project of Jiangxi Keyuan was publicised.





Details of the 200,000 t/a lactic acid & 130,000 t/a PLA project:

- Production process: use starch, glucose, calcium hydroxide, liquid alkali, hydrochloric acid and sulfuric acid as raw materials to produce lactic acid and PLA products and byproducts (industrial-grade lactic acids and gypsum)
- Production scale (over two phases):
 - Phase I: 100,000 t/a of lactic acids, 40,000 t/a of PLA, 100,000 t/a of gypsum
 - Phase II: 100,000 t/a of lactic acid, 90,000 t/a of PLA, 100,000 t/a of gypsum

Shandong Tongbang New Materials Technology Co., Ltd. (Shandong Tongbang)

On 22 Oct., a commencement ceremony for the Shandong Tongbang New Materials Industrial Park project was held in Haiyang City, Shandong Province. Related Construction Land Planning Permit was approved on 13 Sept.

Details of the Shandong Tongbang New Materials Industrial Park project :

- Investor: Ma'anshan Tong-Jie-Liang Biomaterials Co., Ltd. (Ma'anshan Tong-Jie-Liang Biomaterials)
- Technology source: Tongji University
- Construction entity: Shandong Tongbang, Ma'anshan Tong-Jie-Liang Biomaterials' subsidiary
- Total investment: USD0.60 billion (RMB3.80 billion)
- Construction content: production lines for lactic acid (300,000 t/a), PLA (200,000 t/a), and PLA fibre (100,000 t/a)
- Scheduled capacity (over two-phased construction)
 - Phase I: 100,000 t/a of PLA and 50,000 t/a of PLA fibre, expected to enter operation in April 2022
 - Phase II: 100,000 t/a of PLA and 50,000 t/a of PLA fibre, expected to enter operation in Oct. 2023

Jiangsu Shengpuli New Material Technology Co., Ltd. (Jiangsu Shengpuli)

On 2 Dec., the EIA report of the 55,000 t/a PLA project of Jiangsu Shengpuli was released to solicit public opinions.

Details of the 55,000 t/a PLA projec:

- Construction nature: New construction
- Construction location: High-tech Industrial Development Zone, Suqian City, Jiangsu Province
- Investment: USD94.2 million (RMB600 million)
- Construction content: two PLA production lines, supporting equipment, etc.
- Production process: Lactic acids—Lactide—PLA
- Production scale: 5,000 t/a of PLA (phase I) and 50,000 t/a (phase II)

Founded on 9 April, 2021 and with a registered capital of USD3.14 million (RMB20 million), Jiangsu Shengpuli mainly sells bio-based materials and develops new material technology, bio-chemical product technology, etc.





Company Development

EIA report of Bluepha's 25,000 t/a PHA industrialisation project published

Summary: In Nov., the EIA report of the 25,000 t/a PHA industrialisation project (phase I: 5,000 t/a) of Bluepha's wholly-owned subsidiary, Lansu Biomaterial, was published before approval. Meanwhile, Bluepha has signed a cooperation agreement with Thailand-based Thai Wah, tapping into the PHA market in Southeast Asia.

On 3 Nov., the environmental impact assessment (EIA) report of the 25,000 t/a biodegradable new material polyhydroxyalkanoate (PHA) industrialisation project (phase I: 5,000 t/a) of Jiangsu Lansu Biomaterial Co., Ltd. (Lansu Biomaterial) was publicised. The whole project will be built over two phases with a total investment of USD81.75 million (RMB520.66 million).

Details of the phase I project are indicated as follows:

- Project nature: New construction
- Construction unit: Lansu Biomaterial
- Construction location: Yanhai Industrial Park of Binhai Economic Development Zone, Jiangsu Province
- Land area: 86,600 m²
- Total investment: USD28.26 million (RMB180 million), including environmental investment of USD2.365 million (RMB15 million, =8.30% of the total investment)
- No. of employees: 130 new employees
- Working system: 3 shifts, 8 hours per shift, 335 days per year totalling 8,040 hours per year (the processes of bacteria cultivation and initial stage of fermentation (nutrient medium introduction) last for 8,040 hours and the product fermentation, extraction, and granulation processes for 7,920 hours)
- Construction period: One year
- Scheduled capacity: 5,000 t/a of PHA

Established in April 2021 and with a registered capital of USD15.70 million (RMB100 million), Lansu Biomaterial is a wholly-owned subsidiary of Beijing Bluepha Microbiology Technology Co., Ltd. (Bluepha) and principally specialises in bio-based materials manufacturing.

Founded in Oct. 2016 and with a registered capital of USD5.29 million (RMB33.67 million), Bluepha is a leader in molecular and material innovation based on synthetic biotechnology and is dedicated to design, develop, manufacture, and sell novel bio-based molecules and materials.

Bluepha announced on its homepage that on 8 Nov., it has established a strategic partnership with Thai Wah Public Company Limited (Thai Wah), a listed company in Thailand. The two parties join forces to seek PHA business opportunities in Southeast Asia, and further explore the potential application of PHA to promote low-carbon economy particularly through combining PHA and cassava-based materials.

Thai Wah is a leading starch and starch-related food and materials developer in Southeast Asia and is the No. 1 cassava exporter in Thailand. The combination of Bluepha's technology platform and Thai Wah's starch resources is expected to significantly accelerate





PHA's access to Southeast Asia, bringing brand new solutions to bio-based materials production to local end-consumers.

Cathay Biotech to revise implementation location and subject of bio-based polyamide investment project

Summary: On 7 Dec., Cathay Biotech announced to change the implementation site and subject of its investment project, the "Bio-based Polyamide Engineering Technology Research Center". On 28 Oct., the company released financial report with dramatic increases in sales and net profit in Q1-Q3.

On 7 Dec., Cathay Biotech Inc. (Cathay Biotech) announced that to settle project implementation needs, strengthen corporate competitive advantages, and better integrate various resources such as talents, technologies and equipment, it proposed to change three items of its investment project "Bio-based Polyamide Engineering Technology Research Center". Details changes are indicated as follows:

- Implementation site: change from "Jining New Material Industrial Park, Jinxiang County, Shandong Province" to "Minhang District, Shanghai Municipality"
- Implementation subject: change from wholly-owned subsidiary "Cathay (Jinxiang) Biomaterials Co. Ltd. (Cathay Jinxiang)" to wholly-owned subsidiary "Cathay (Shanghai) Biotechnology Co., Ltd."
- Total investment: improve from USD32.64 million (RMB207.89 million) to USD69.38 million (RMB441.92 million)—notably, funds raised by share issuing will remain USD32.64 million (RMB207.89 million), and the rest will be from the company's self-raised funds

In 2020, Cathay Biotech collected a total of USD0.87 billion (RMB5.56 billion) from public offering of 41,668,198 shares; after deducting issue expenses (excluding VAT) of USD44.06 million (RMB280.62 million), the net fund raised was USD0.83 billion (RMB5.28 billion).

According to the prospectus, this fund would be used in the project mentioned above, other two as well.

TABLE 4: Details of three investment projects and plans for funds use, million USD

No.	Investment project	Total investment	Amount of funds to be used
1	Cathay Jinxiang: 40,000 t/a Bio-based Sebacic Acid Project	268.64	268.64
2	Bio-based Polyamide Engineering Technology Research Center	69.38	32.64
3	Cathay (Wusu) Biotechnology Co., Ltd.: 30,000 t/a Long-chain Dibasic Acid & 20,000 t/a Long-chain Polyamide Project	233.49	122.46
Total		571.51	423.74

Source: Cathay Biotech

Cathay Jinxiang's 40,000 t/a bio-based sebacic acid project commenced in early 2021 at the Shanxi Industrial Park and is expected to have trial production in 2022. Conversely, the "Bio-based Polyamide Engineering Technology Research Center" project and Cathay (Wusu) Biotechnology Co., Ltd.'s 30,000 t/a long-chain dibasic acid & 20,000 t/a long-chain polyamide project have not yet begun construction.

On 28 Oct., Cathay Biotech issued its Q3 business report:





- Q3:
 - Revenue: USD97.10 million (RMB618.48 million), up 72.37% YoY
 - Net profit attributable to shareholders: USD25.68 million (RMB163.58 million), up 42.41% YoY
- Q1-Q3:
 - Revenue: USD0.26 billion (RMB1.63 billion), up 41.70% YoY
 - Net profit attributable to shareholders: USD76.93 million (RMB489.99 million), up 52.50% YoY

Both the revenue and net profit during Q1-Q3 rose significantly. The main factor in the revenue rise was that Cathay Biotech saw more sales from its expansion in the long-chain dibasic acid market. Particularly in Q3, after its subsidiary Cathay (Wusu) Biomaterials Co., Ltd. put its 100,000 t/a bio-based polyamide production line into operation, Cathay Biotech gained increased sales; sales from the long-chain dibasic acid business also rose compared to a year earlier.

COFCO Tech to build 30,000 t/a lactide project

Summary: On 24 Sept., COFCO Tech announced a proposal to invest and build a 30,000 t/a lactide project. On 28 Oct., the company reported satisfactory growth in its operating revenue and net profit in Q1-Q3.

On 24 Sept., COFCO Biotechnology Co., Ltd. (COFCO Tech) announced a plan to invest and build a 30,000 t/a lactide project in a bid to improve the integrity, systematism and economical efficiency of its biodegradable materials business and open up the whole industrial chain of biodegr

Project details are indicated as follows:

- Total investment: USD92.15 million (RMB586.94 million), including construction investment of USD84.24 million (RMB536.57 million)
- Location: Wukeshu Economic and Technological Development Zone, Yushu City, Jilin Province
- Construction content: one 90 t/d lactide processing production line, comprehensive material warehouses, raw material tank area, finished product tank area, fire-fighting water station, and other ancillary facilities, etc.
- Construction period: 24 months
- Scheduled capacity: 30,000 t/a of lactide

Lactide is an intermediate of synthetic polylactic acid (PLA). Since water is not produced during the polymerisation process, lactide-based PLA production enables precise control of the molecular weight of PLA, which is now the world's mainstream high-quality PLA production process. Under the current global supply shortage of lactide, especially in H2 2019, supplier Total Corbion PLA B.V. gradually switched its lactide sale to internal use only—that means no producer in the gobal market can now provide a mass sale of lactide. In this case, the industry players should work fast to form a complete PLA industry chain and push the business forward in order to address the supply bottleneck of lactide.

At present, COFCO Tech can produce starch/starch sugar, lactic acid, lactide, and PLA and has successfully industrialised PLA application in Changchun City, Jilin Province, accumulating rich production experience. Regarding lactide production, COFCO Tech has overcome a series of technical problems such as low production efficiency, high system viscosity, and strong corrosiveness. As of late





Sept., the enterprise owned 70+ invention patents (including 41 authorised ones and 30+ in the approval process) in the production and application areas for the PLA whole industrial chain.

On 28 Oct., COFCO Tech released its Q3 business report:

- Revenue: USD951.43 million (RMB6.07 billion), up 29.51% YoY
- Net profit attributable to shareholders: USD36.88 million (RMB234.91 million), up 39.55% YoY

Its Q1-Q3 performance was also reported:

- Revenue: USD2.83 billion (RMB18.06 billion), up 29.11% YoY
- Net profit attributable to shareholders: USD147.71 million (RMB940.84 million), up 76.27% YoY
- Key driver for the growths: following a diversified procurement model for raw materials, the company successfully reduced its raw material costs, while product prices went up compared to Q1-Q3 2020, resulting in increased gross profit

Xinjiang Tianlu's cellulose fibre project and Shandong Yanquan's nanocellulose project

Summary: In Q4, the EIA report of Xinjiang Tianlu's 10,000 t/a biomass cellulose fibre project and Shandong Yanquan's 20,000 t/a nanocellulose project were published respectively.

Xinjiang Tianlu New Material Technology Co., Ltd. (Xinjiang Tianlu)

On 27 Oct., the Bureau of Ecology and Environment of the Xinjiang Production and Construction Corps (XPCC) reviewed and publicised the environmental impact assessment (EIA) document for Xinjiang Tianlu's 10,000 t/a biomass cellulose fibre project.

Details of the 10,000 t/a biomass cellulose fibre project:

- Project nature: New construction
- Location: Dabanshan Industrial Park, Economic and Technological Development Zone of Tumushuke City, the Xinjiang Uygur Autonomous Region
- Total investment: USD121.75 million (RMB775.46 million), including environmental investments of USD11.83 million (RMB75.36 million)
- Construction works:
 - Main works: raw liquor workshop, acid station, continuous spinning workshop, etc.
 - Ancillary works: air pressure refrigeration station, desalted water station, carbon disulfide storage, finished product warehouse, etc.
- Raw materials:
 - Primary: cotton pulp
 - Auxiliary: sulphuric acid, 45% sodium hydroxide solution, zinc sulfate of carbon disulfide and oil agent, etc.
- Labour capacity: 650 personnel, following four shifts and three running systems, 8,000 working hours per year (about 333 days)
- Production scale: 10,000 t/a of cellulose viscose filament yarn and 3,344 t/a of byproduct Yuanming powder (commonly refers to anhydrous sodium sulfate)

Established on 30 March, 2020 and with a registered capital of USD78.50 million (RMB500 million), Xinjiang Tianlu specialises in the manufacture, dyeing and finishing, and other deep processing and sale of cellulose fibres, synthetic fibres, yarns, threads and textiles, and the manufacture and sale of cotton pulp, etc.



Shandong Yanquan New Materials Co., Ltd. (Shandong Yanquan)

On 2 Dec., the Dongying Municipal Bureau of Ecology and Environment approved and published the EIA report of Shandong Yanquan New Materials Co., Ltd. (Shandong Yanquan)'s 20,000 t/a nanocellulose project.

Details of the 20,000 t/a nanocellulose project:

- Nature of construction: New construction
- Location: Kenli Economic Development Zone, Dongying City, Shandong Province
- Floor area: 7,700 m²
- Total investment: USD13.35 million (RMB85.00 million), including environmental protection investments of USD0.99 million (RMB6.30 million)
- Construction works: 1 wood fibre production line, 1 nanofibrillated cellulose (NFC) production line, and 1 nanocrystalline cellulose (NCC) production line
- Labour capacity: 40 personnel, 300 working days per year, under one shift system (8 hours per shift (2,400 h/a)
- Production scale: 8,000 t/a of wood fibre, 6,000 t/a of NFC, and 6,000 t/a of NCC

TABLE 5: Main raw and auxiliary materials of the 20,000 t/a nanocellulose project

No.	Name of raw material	Annual consumption (t)	Source
1	Wood chips	7,000	Purchased
2	Coniferous wood fibre	1,060	Purchased + self-produced
3	Broadleaf wood fibre	760	Purchased + self-produced
4	Cotton linter	300	Purchased
5	Poplar sawdust	150	Purchased
6	Acrylamide aqueous solution (30%)	1,000	Purchased
7	Dimethyldiallylammonium chloride (DMAAC)	300	Purchased
8	Methacryloyloxyethyl trimethyl ammonium chloride (DMC)	200	Purchased
9	Itaconic acid	200	Purchased

Source:Shandong Yanquan



TABLE 6: Product scheme of the 20,000 t/a nanocellulose project

Production line		Capacity (t/a)	Note
Wood cellulose production line		8,000	Enter the subsequent production line
NFC production line	Water-dispersible NFC	5,170	/
	Filamentous NFC	830	/
NCC production line	Ionic-type NCC	5,500	/
	NCC crystals	500	/
Total		20,000	/

Source: Shandong Yanquan

Founded in July 2021 and with a registered capital of USD1.57 million (RMB10 million), Shandong Yanquan has developed a series of NFC and NCC products, which can be used to produce membrane materials and pharmaceutical capsules, improve the efficiency of paper fibres, seal oil wells, etc. At present, the enterprise has made 90%+ of its core products and technologies independent and owned related independent intellectual property rights.

Zhongyuan Dahua Group to complete 1,000 t/a straw sugar-based EG pilot project

Summary: Zhongyuan Dahua Group will soon complete the world's first 1,000 t/a straw sugar-based EG pilot project (in DLEG process), with all main equipment installed in place. Upon operation, the project will produce 746.80 t/a of EG and 194.40 t/a of PG, the byproduct.

Recently, Henan Zhongyuan Dahua Group Co., Ltd. (Zhongyuan Dahua Group) is about to complete the construction of a 1,000 t/a straw sugar-based ethylene glycol (EG) pilot project (in the DLEG process). All main equipment were in place, leaving some final works such as pre-fabrication of pipes, piping and installation of electrical instruments to be concluded. The project was approved in Oct. 2019 and started construction in April 2021.

Project details are shown as follows:

- Construction nature: Expansion
- Construction entity: Zhongyuan Dahua Group
- Construction site: Puyang Economic and Technological Industrial Cluster, Puyang City, Henan Province
- Land area: 2,600 m²
- Total investment: USD3.29 million (RMB20.98 million), including environmental investments of USD0.42 million (RMB2.70 million)
- Production process: DLEG process—with hydrogen and aqueous solutions of biomass straw sugar as raw materials, produce crude EG by catalytic conversion under high temperature and high pressure in a kettle reactor. Then superior EG products and byproducts (industrial-grade propylene glycol (PG)) are to be obtained from the crude products through rectification process
- Product scheme: EG (746.80 t/a) and byproduct PG (194.40 t/a)
- Working system: 10 employees under 4 shifts and 3 runs, 8,000 hours per year





Major purposes of the pilot test:

- Open up the production flow for straw sugar-based EG
- Determine process amplification parameters and address amplification risks
- Compile a process package for straw sugar-based EG production up to 10,000 t/a
- Provide technical support for the large-scale industrial application of biomass-based EG technology

Originated by Chinese scientists, DLEG process uses cellulose or straw sugar as raw materials to produce EG and PG under catalyst in one step. In 2008, led by Zhang Tao, the research group of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (DICP) achieved the 1st catalytic process of preparing EG directly from cellulose, which has opened up a new pathway for the catalytic conversion of cellulose to energy chemicals. The kilogram-scale experiment of biomass EG has been proved successful and applied for relevant patent technologies by now.

The 1,000 t/a straw sugar-based EG pilot project is jointly developed by DICP, in cooperation with Zhongke Boyijin (Zhengzhou) New Energy Co., Ltd., Henan General Research Institute of Energy, Zhongyuan Dahua Group, and East China Engineering Science and Technology Co., Ltd., with the pilot scale-up design. It is expected to see approximately 60%-80% of produces being EG through the catalytic conversion of biomass such as purchased straw sugar solution. After pilot tests, the developers will join hands to compile, authorise, and permit a technological process package for 10,000 t/a biomass-based EG production, and produce and sell supporting catalyst products to create an industrial chain of biomass-based EG from original biomass to polyester products.

Founded in 1995 and with a registered capital of USD0.43 billion (RMB2.76 billion), Zhongyuan Dahua Group is a large state-owned industrial enterprise, with production facilities of synthetic ammonia (300,000 t/a), urea (520,000 t/a), methanol (300,000 t/a), and melamine (54,000 t/a).



Price Update

TABLE 7: Average market prices of major raw materials of bio-based materials in China, Oct.-Dec. 2021

No.	Product	Price, USD/t
1	Sugarcane	86.35
2	Corn	394.23
3	Wheat	429.10
4	Bagasse	43.33
5	Corn cob	116.50
6	Wheat straw	58.09
7	Corn stover	65.16

Source:CCM

TABLE 8: Average ex-works prices of major bio-based materials in China, Oct.-Dec. 2021

No.	Product	Price, USD/t	Remark
1	PHA (Polyhydroxyalkanoates)	9,281	Films
2	PBS (Polybutylene succinate)	6,734	Extrusion grade and injection molding
3	PPC (Propylene carbonate)	3,621	Injection molding
4	PLA (Polylactic acid)	3,999	Injection molding
5	PVA (Polyvinyl alcohol)	3,559	Flocculent
6	Starch-based material	3,140	Film molding
7	PTT (Polytrimethylene terephthalate)	3,292	Fiber

Source:CCM



Brief News

GS Biotech completes tens of millions of RMB in angel financing

In mid-Nov., GS Biotech completed angle financing of up to tens of millions of RMB, with leading investors Matrix Partners China and 5Y Capital and co-investor Yael Capital. The funds will be mainly used for further R&D of 5-Hydroxymethylfurfural (HMF) and its downstream derivatives, production base construction, and application promotion in end markets.

At its inception, GS Biotech has received a strategic investment from Tech Capital.

Founded on 30 July, 2021 and with a registered capital of USD0.20 million (RMB1.26 million), GS Biotech specialises in the design and development of furan bio-based materials, focusing on R&D of the bio-based compound HMF. Using HMF as a platform compound, a series of HMF derivatives are generated through oxidation, hydrogenation, esterification, and other reactions to produce end products such as polyesters, oils, and fragrances. GS Biotech's core team members are all from the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, with nearly 20 years of industrialisation experience and foundation in catalytic conversion of biomass and design & development of furan-based materials.

It is reported that GS Biotech has successfully achieved the low-cost continuous production of HMF, laying a solid foundation for subsequent large-scale industrialisation. Meanwhile, the team has also broken the whole technical chain from "HMF" to "derivative monomers" to "end products", which will be applied and promoted in the high-performance bio-based polyester materials, bio-based oil products, surfactants, pharmaceutical intermediates, feed additives fields. GS Biotech disclosed a plan to build production bases in Zhejiang and Jiangsu provinces in 2022 to create a full set of industrial demonstration R&D platforms and build production capacity of 10,000 t/a of HMF and 1,000 t/a of HMF derivatives.

Changhong Polymer to build fully biodegradable thermoplastic industrialisation project

In Nov., Ningbo Changhong Polymer Scientific & Technical Inc. (Changhong Polymer) announced a reply on the *Feedback of Application Documents for Public Convertible Bonds Issuance* from the China Securities Regulatory Commission (CSRC).

In mid-Sept., Changhong Polymer released the *Plan for Public Convertible Bonds Issuance* to raise funds of ≤USD106.76 million (RMB 680 million) for the secondary investment in the 600,000 t/a fully biodegradable thermoplastic industrialisation project (Phase I).

Details of the project:

- Construction entity: Zhejiang Changhong Biomaterials Co., Ltd. (Changhong Polymer's wholly-owned subsidiary)
- Construction location: Shengzhou City, Shaoxing City, Zhejiang Province
- Total investment: USD237.94 million
- Proposed funds: USD106.76 million
- Design capacity: 180,000 t/a of degradable plastics
- Estimated construction cycle: 9 months
- Project objectives:





- Expand a new biodegradable plastics business segment to optimise the product structure and improve the industrial layout. Changhong Polymer now has a relatively homogeneous business structure, which is based on SBS and focuses on the R&D, production, and sales of styrene-based thermoplastic elastomers (TPES)
- Determine Changhong Polymer's regional development advantages in Zhejiang Province and increase its regional market competitiveness
- Enhance the corporate profitability under scale effects since polybutylene adipate terephthalate (PBAT) biodegradable plastics have considerable profitability
- Raise brand influence in the industry

In late Oct. 2020, Changhong Polymer signed an investment agreement with Shengzhou Municipal People's Government for the fully-biodegradable new materials industrial park project.

Project details:

- Total investment: approximately USD785 million (RMB5 billion)
- Planned land use: 14.20 ha
- Construction cycle: 5 years in 2 phases
- Product scheme: 600,000 t/a of PBAT, PBS, PBT, and other flexible biodegradable material

Huaibei Chuangxin's 5,000 t/a bio-based butanedioic acid project

On 1 Dec., the environmental impact assessment (EIA) report of Huaibei Chuangxin Biological New Materials Co., Ltd. (Huaibei Chuangxin)'s 5,000 t/a bio-based butanedioic acid project was published for the first time.

Project details:

- Nature of construction: new construction
- Construction location: New District, Huaibei High-tech Zone, Anhui Province
- Floor area: 40,000 m²; Overall floorage: 45,079.20 m²
- Construction work:
 - Build workshops for fermentation, extraction, refining, etc., together with auxiliary and public utilities such as circulation system, storage tanks, power supply and distribution, etc.
 - Purchase about 200+ sets of batching tanks, fermentation tanks, centrifuges, decolourisation pumps, and other production facilities
- Production scale: 5,000 t/a of bio-based butanedioic acids

Established on 17 May, 2021 and with a registered capital of USD7.85 million (RMB50 million), Huaibei Chuangxin is engaged in the manufacturing and sale of bio-based and eco-environmental materials and the R&D for bio-based materials and related polymerisation technology, and optimisation of the fermentation process, etc.

Shanxi Hengli and Zhengzhou University sign long carbon chain diamines technology transfer contract

According to the homepage of Zhengzhou University, on 17 Sept., the university signed a technology transfer contract with Shanxi Hengli New Material Co., Ltd. (Shanxi Hengli), a subsidiary of Shanghai Zhongneng Enterprise Development (Group) Co., Ltd. (Zhongneng Group), for long carbon chain diamines, long carbon chain, and heat-resistant nylon, with a transfer fee of up to USD6.28 million (RMB40





million).

It is reported that the "long carbon chain and heat-resistant nylon production technology" was accomplished by Professor Liu Minying of Zhengzhou University, which has been supported by the National 863 Program for the 12th Five-Year Plan Period, the "13th Five-Year Plan" Key R&D Program, and other sci-tech projects. Since 2017, Zhongneng Group has been focused on strategic emerging industries and has selected the specialised field of bio-based long carbon chain polyamide (including high temperature resistant one) as one of its important projects to accelerate industrial transformation. With this technological achievement, Zhongneng Group plans to invest around USD1.57 billion (RMB10 billion) to build a 200,000 t/a long carbon chain and heat-resistant nylon production line during the 14th Five-Year Plan Period, making China a world-class industrial base for the production and processing of special polyamides. Moreover, Zhongneng Group will also set up a research institute with Zhengzhou University to expand, deepen and broaden the product range of long carbon chain and heat-resistant nylon, which will be mainly used in aerospace, automobile, new energy, electronic appliances, medical and other fields.

Established on 23 March, 2021 and with a registered capital of USD0.35 billion (RMB2.25 billion), Shanxi Hengli is mainly engaged in the manufacturing and sale of bio-based materials and synthetic materials, and R&D of bio-based materials technology, etc.

Arkema to build polyamide 11 powders plant in China

According to press release on 11 Oct., in parallel with its major project to increase global capacity of bio-based polyamide 11 by 50% in Singapore, Arkema would construct a polyamide 11 powders plant on its Changshu platform in China, scheduled to come on stream in Q1 2023. The project is included in the EUR450 million exceptional capital expenditure envelope dedicated to polyamide expansion in Asia, expected to further support the growing demand for advanced bio-circular materials in Asia.

Arkema's Rilsan[®] polyamide 11 powders, currently produced in France entirely from renewable castor beans, have superior properties and performance in terms of toughness, durability, lightweight and processing versatility. The powders are used in very demanding applications and provide innovative solutions for fast-growing markets driven by megatrends such as durable home appliances, energy-efficient transport, and advanced additive manufacturing (3D printing) primarily for consumer, industrial, and aerospace markets.

Arkema China is headquartered in Shanghai, and the Chinese market is Arkema's 2nd largest national market. Arkema has 10 industrial sites and 2 R&D centers in China, including the Changshu platform, its No.1 industrial platform worldwide.

Realsun Chemical approved for IPO on SZSE ChiNext Market

According to an announcement from the Shenzhen Stock Exchange (SZSE) on 10 Dec., Zhejiang Realsun Chemical Co., Ltd. (Realsun Chemical) was approved for IPO on the ChiNext Market after the IPO application was accepted on 11 Dec., 2020. Realsun Chemical intends to make a public offering of no more than (including) 27 million shares of RMB ordinary shares (A shares) for USD115.61 million (RMB736.36 million) in 2 projects.



TABLE 9: Investment projects of Realsun Chemical

No.	Project name	Project site	Project investment, USD million	Investment from raised funds, USD million
1	526,000 t/a electronic & specialty chemicals renovation project (phase I)	Cangzhou City, Hebei Province	57.37	57.37
2	Ultra-pure electronic chemicals & biodegradable new materials and other new projects (phase I)	Taizhou City, Zhejiang Province	55.10	55.10
Total			112.47	112.47

Source: Realsun Chemical

Overview of the ultra-pure electronic chemicals & biodegradable new materials and other new projects (phase I):

- Implementation subject: Realsun Chemical
- Construction location: Toumen Port Economic Development Zone, Linhai City, Taizhou City, Zhejiang Province
- Land use: Realsun Chemical's self-owned land
- Production capacity:
 - 30,000 t/a of semiconductor chip specialty electronic chemicals NMP and 3,000 t/a of pharmaceutical-grade NMP
 - 30,000 t/a of biodegradable polydiacid dibasic alcohol ester (PBS series, including 3,000 t/a of polybutylene succinate (PBS), 3,000 t/a of modified polybutylene terephthalate (PBT) and 24,000 tonnes/year of modified polybutylene terephthalate PBT, and 24,000 t/a of polybutylene adipate terephthalate (PBAT)), 2,357 t/a of byproduct tetrahydrofuran
 - 2,000 t/a of cosmetic-grade 1,2-hexanediol (HDO) and 950 t/a of pharmaceutical-grade HDO 11 t/a of low-K organic liquid source octamethylcyclotetrasiloxane (OMCTS), etc.
- Estimated construction period: 2 years, with product production starting in the 3rd year and full production in the 5th year

Hongye Biological Technology's bio-based material monomer project

On 26 Nov., Hongye Biological Technology Co., Ltd. (Hongye Biological Technology) publicised its bio-based material monomer project's environmental impact assessment (EIA) report.

Project details are indicated as follows:

- Type of construction: new construction
- Construction location: Biomass Energy Industrial Park, Nanle County, Puyang City, Henan Province
- Total investment: USD36.11 million (RMB230 million)
- Construction works: to build and install hydrogenation reactor, high-pressure hydrogenation kettle, reactor, absorption tower, distillation tower, methane-based hydrogen production unit, etc., in 2 phases
- Process route: to use furfural (the company has a set of 20,000 t/a furfural production facility) as the primary raw material to synthesise furfural downstream products through hydrogenation, decarbonisation, esterification, distillation, and other processes

TABLE 10: Product scheme of the bio-based material monomer project

Project	Product	Production capacity	Unit
Phase I	Furfuryl alcohol	150,000	t/a
	2-methylfuran	10,000	t/a
	2-methyltetrahydrofuran	5,000	t/a
	Hydrogen	6,000	m ³ /h
Phase II	Furan	5,000	t/a
	Acetylfuran	2,000	t/a
	DTHFP	1,000	t/a
	Tetrahydrofurfuryl alcohol	1,000	t/a
	Tetrahydrofurfuryl acrylate	1,000	t/a
	Furoic acid	2,000	t/a
	2-Tetrahydrofuroic acid	100	t/a
	Furoic acid ester	100	t/a
	Furoyl chloride	100	t/a

Source: Hongye Biological Technology

Back on 31 Aug., Hongye Biological Technology published the EIA report of its 300,000 t/a biodegradable polyester material PBS (flexible) project. With a proposed investment of USD0.27 billion (RMB1.70 billion), the project will use terephthalic acid, adipic acid, 1,4-butanediol, 1,4-succinic acid, and other raw materials to produce 100,000 t/a of PBS, 200,000 t/a of PBAT, and byproduct THF through the polymerisation process.

Established on 18 Dec., 2008 and with a registered capital of USD30.74 million (RMB195.79 million), Hongye Biological Technology is principally engaged in the production and sale of chemical products, the sale of agricultural and sideline products, technology services and development, etc.

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