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CONTENT

INDUSTRIAL TRANSFORMATION

Driven by Advantages, Aligned with Global Trends

With the rapid development of the global green economy, bio-based materials have become a key driver of industrial transformation. Major countries are rolling out impactful policies to fast-track the substitution of fossil-based materials.

China	Europe	America	Japan
2032	**2030**	**2043**	**2030**
35% bio-replaced petro & coalchemicals	6–12% feedstocks & 30–60% fine chems bio-made	90% plastics & 30% chemicals bio-sourced	25% plastics (2M tons) bio-based

Chemical Leaders Compete to Shape the Industry Landscape

Leading global chemical companies are accelerating investments to drive bio-based materials to scale.

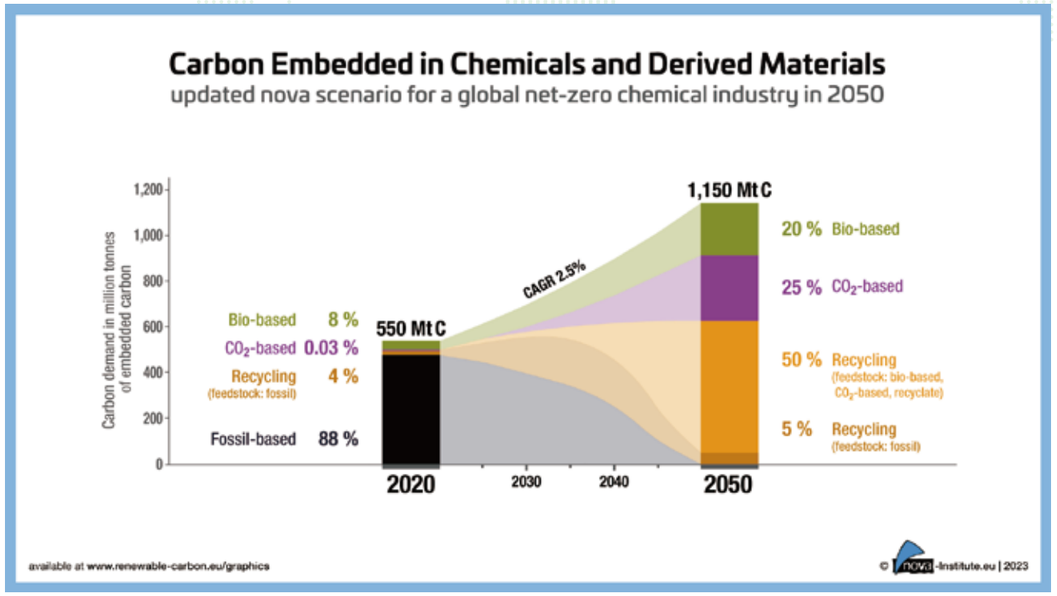
BASF The Chemical Company · Sinopec · DOW · LYB · ExxonMobil · INEOS · WANHUA 万华

Partial Company Showcase

From Packaging to Products, Green Materials Are the Preferred Choice for Consumer Brands

Coca-Cola	Nike	BMW	PRADA	L'ORÉAL	mi
By 2035, renewable materials will account for 35%-40% of primary packaging.	By 2025, 50% of key materials will be sourced from sustainable feedstocks.	By 2030, recycled and renewable materials will comprise 50% of automotive materials.	By 2030, full transition to bio-based or recyclable materials in all products	By 2030, all plastic packaging will come from recycled or bio-based sources.	By 2035, eco-friendly materials will be widely adopted across product lines.

Source: Public brand sustainability goals



> $600 Billion

Biobased materials market gap

25%+20%

Organic Chemicals · Fossil Fuels

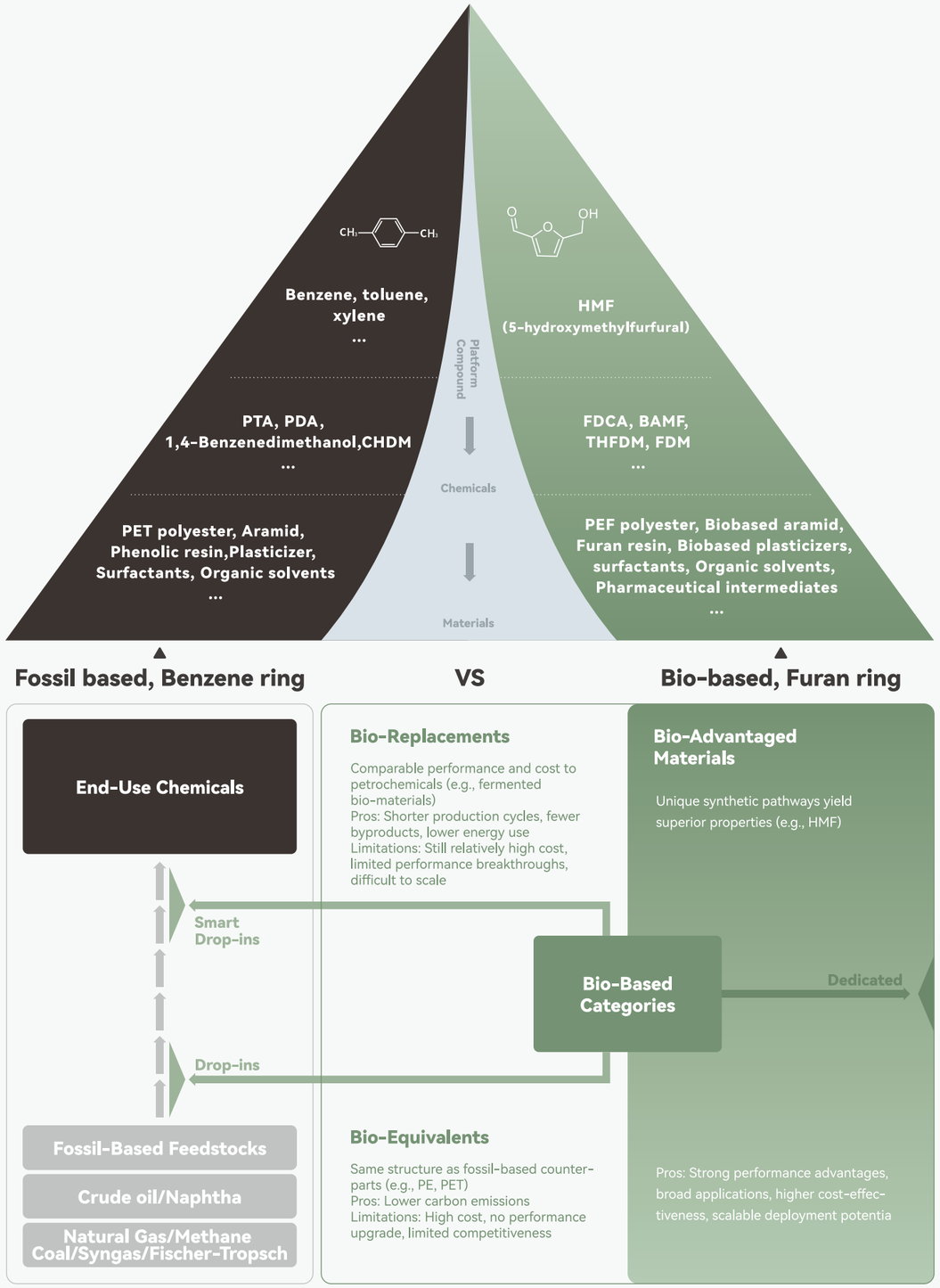
By 2030, biobased product substitution potential

<5%

Current substitution rate

Source: OECD

Policy support, brand transformation, and technological maturity are accelerating the arrival of the bio-based materials era.



5-Hydroxymethylfurfural (HMF)

A Flagship of Bio-Advantaged Materials

Under global carbon neutrality goals, fossil-based materials are falling short in meeting the demands for green, high-performance alternatives. HMF, with its innovative structure, is rising as a hallmark of "bio-advantaged" materials, offering a novel solution to the global materials industry.

ABOUT GS BIOMATS

SINCE 2021

GS Biomats is a pioneer in bio-based material manufacturing, specializing in the innovation and industrialization of furan-based chemicals. Leveraging self-developed continuous flow processes and “Short process”solutions, GS Biomats has achieved industri-al-scale production of key bio-based compounds including 5-hy-droxymethylfurfural (HMF) and furandicarboxylic acid (FDCA). These new materials have been successfully commercialized in packaging, fibers, and aramid sectors. Guided by the mission to "Biomass change lives," GS Biomats aims to deliver high-perfor-mance, multifunctional, and sustainable furan-based materials for global clients.

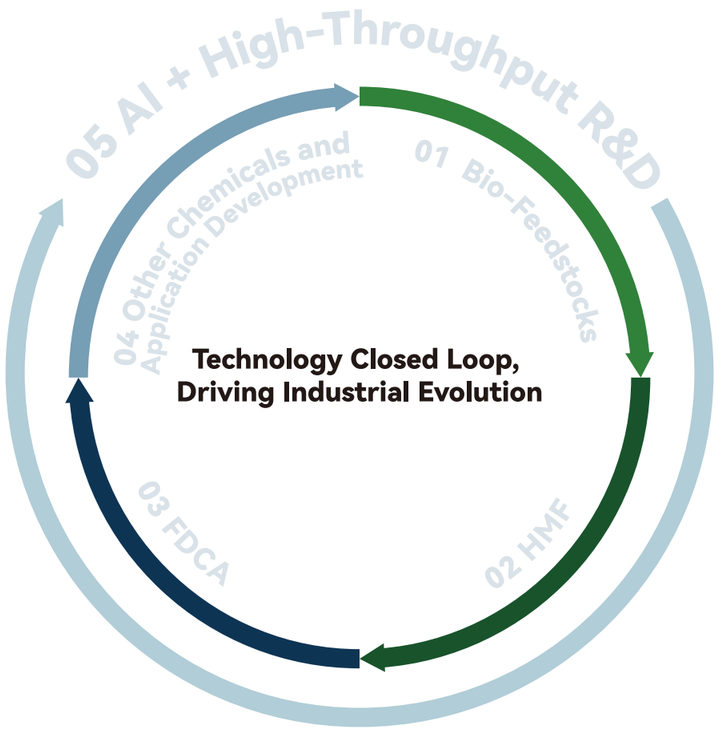
Hangzhou HQ
Operations & Management Center

R&D Center
End-to-end bio-feedstock to application

Lishui Plant
FDCA 400t/a

Taixing Plant
FDCA 10kt/a

CORE TECHNOLOGIES



GS Biomats has built a full-chain innovation system from "bio-feedstock → process → application," combining feedstock iteration, process innovation, and scenario adaptation to form a high-value patent moat. Multiple product categories have already achieved commercial validation, positioning GS Biomats as an industry leader in scaling up bio-based materials.

01

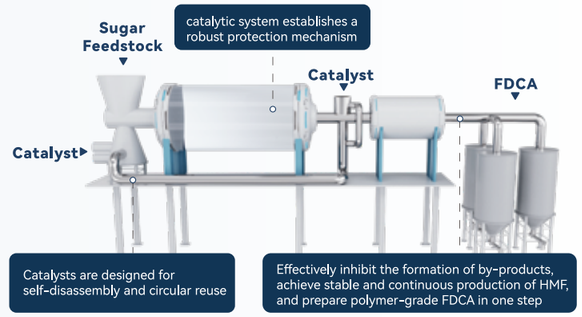
Bio-Feedstocks

Fructose	Commercialized	Gen 1
Syrup blends	In application, cost reduction	Gen 2
Non-food biomass	Pilot stage	Gen 3
Biomass waste	Technology verified	Gen 4

02

SMART Catalysis System

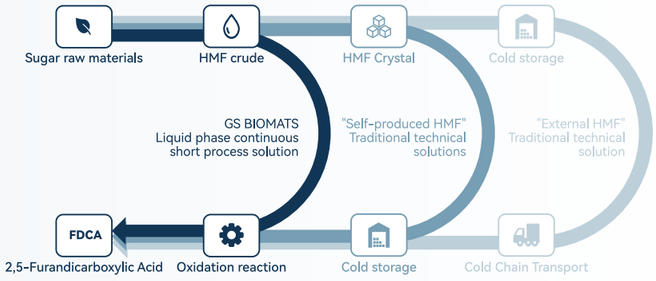
Modular, self-disassembling, and highly efficient catalysts minimize byproducts and enable long-term stable operation in continuous tubular reactors.



03

FDCA Short-Process Technology

Enables direct oxidation of crude HMF into polymer-grade FDCA. Compared to traditional route, the overall cost is reduced by nearly 70%, breaking through the economic barrier of bio-based commercialization and enabling rapid scale-up from lab to 10,000-ton production lines.



04

Other Chemicals and Application Development

Rapid prototyping across diverse application scenarios, with custom development capabilities for client needs.

- **Customized Development of Functional Furan Monomers**
- **Structural Modification and Functional Design**
- **Forecasting of Downstream Applications**
- **More**

05

AI + High-Throughput R&D

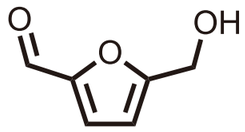
Accelerates catalyst screening, process optimization, and application prediction to build a high-efficiency, intelligent innovation engine.

- **Feedstock Station**
- **Reaction Station**
- **UPLC Analysis Station**

PRODUCT SOLUTIONS

HMF

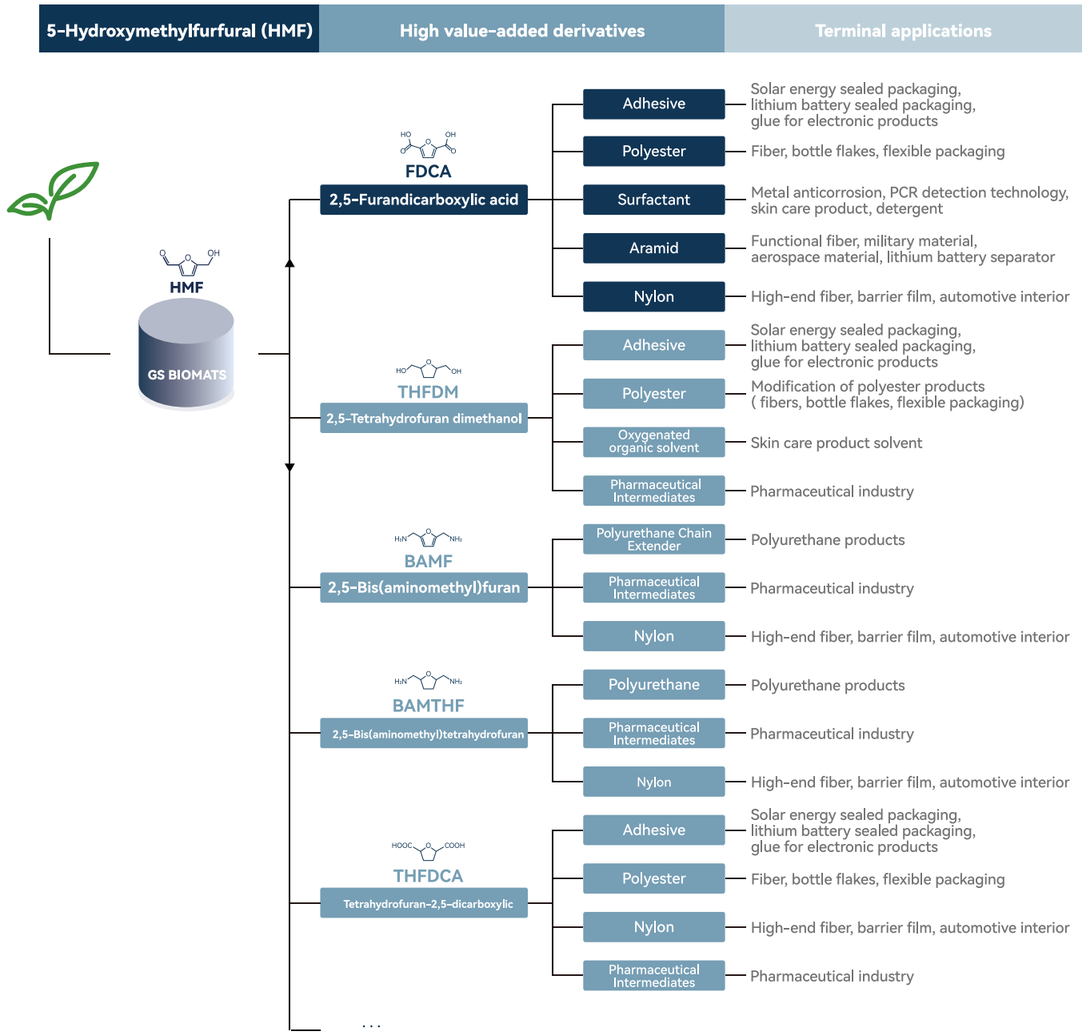
5-hydroxymethylfurfural



5-Hydroxymethylfurfural (HMF) is the only bio-based platform molecule featuring an aromatic-like furan ring. Through hydrogenation, oxidation, esterification and other functional group transformations, HMF enables the synthesis of high-value derivatives such as: 2,5-Furandicarboxylic Acid (FDCA), 2,5-Bis(hydroxymethyl)tetrahydrofuran(THFDM), Dimethyl Furan-2,5-dicarboxylate (FDME), 2,5-Diformylfuran (DFF). These derivatives possess immense market potential in high-performance and sustainable materials.

Physical and Chemical Properties of the Product

CAS No.	67-47-0	**Molecular Formula**	$C_6H_6O_3$
Molecular Weight	126.11	**Melting Point**	28-34℃
Boiling Point	114-116℃ at 1mmHg		
Relative Density	1.243 g/cm³ at 25℃		
Stability	Sensitive to air, light and heat, strong hygroscopicity, sealed storage at low temperature(< 0℃)		



FDCA

2,5-Furandicarboxylic acid

Recognized by the U.S. Department of Energy as one of the “Top 12 Building Block Chemicals for a Green Future”, FDCA features a cyclic structure and reactivity comparable to terephthalic acid (PTA). As the most in-demand furan monomer, FDCA serves as a renewable alternative or complement to aromatic petrochemicals.

Its key polymer—polyethylene 2,5-furandicarboxylate (PEF)—formed by polymerizing FDCA with ethylene glycol, delivers:

- **Exceptional gas barrier properties for packaging**
- **Natural antibacterial, Moisture-Wicking, UV-resistant features for fiber applications.**

FDCA is also a viable monomer for bio-based nylons (PA), aramids (PPA), and elastomers, supporting a wide spectrum of advanced polymer applications.

GS Biomats is a pioneer in the commercialization of FDCA, having achieved the industry’s first 100-ton delivery. In 2024, GS Biomats launched a high-purity FDCA product, with optimized purity, color, and impurity profiles—accelerating downstream adoption.

Physical and Chemical Properties of the Product

CAS No.	3238-40-2	**Molecular Formula**	$C_6H_4O_5$
Molecular Weight	156.09	**Melting Point**	> 310℃
Boiling Point	419.2℃		
Relative Density	1.604 g/cm³ at 25℃		
Stability	Stable at room temperature, place in a cool, dry sealed preservation		

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 100%

REACH
NPS

PRODUCT SOLUTIONS

PRODUCT SOLUTIONS

HIGH-BARRIER PACKAGING

PEF & Composite Materials

- Beer packaging
- Carbonated beverage bottles
- Dairy and juice containers
- Pharmaceutical packaging

Performance Advantages

High Barrier
O_2 Barrier > 7X PET | H_2O Barrier > 2X PET | CO_2 Barrier > 15–20X PET

Heat Resistant
Tg（88℃）>PET（74℃）

Lightweight
60% Higher Modulus & Strength vs. PET

HIGH-TRANSPARENT PACKAGING

PEF & Modified Materials

- Daily chemical packaging
- Food packaging
- rPET packaging
- Electronic product packaging

Performance Advantages

Slow Crystallization
Crystallization Time: 30–60 min (vs. PET: 2–3 min)
Enables thick-walled transparency without whitening

Optimized rPET Compatibility
≤10% PEF Addition in rPET improves barrier & heat resistance
Resolves haze issues in thick-walled rPET applications
Recyclable with PET: compatible with co-recycling and same-line reprocessing

BIO-BASED POLYESTER FIBER

PEF & Modified Materials

- Sports & Outdoor
- Business Casual
- Home Textiles
- Innerwear

Performance Advantages

7A-level Natural Antibacterial
Naturally Mite-Resistant
Moisture-Wicking
UV-Resistant
Low-Temp Dyeability
Soft and skin-friendly

FLAME-RETARDANT ARAMID FIBER

- Firefighter suits
- Chemical Metallurgical Protective Gear
- Industrial Protective Clothing
- Outdoor Technical Apparel

Performance Advantages

Self-extinguishing & Flame Retardant
Lightweight yet High-Strength
Acid & Alkali Resistant
Thermal Stable & Durable
Soft & Dye-Friendly

Other High-Value Applications

Polyurethane electronic adhesive

High bonding strength
High gas barrier
High bio-based ratio

Bio-based surfactants

High CMC value
Strong foaming power
Strong decontamination power

3D printing

Wide adjustable range of mechanics
Strong interlayer bonding ability
Adaptable to rapid prototyping technology

Bio-based coating

Can be applied in polyurethane coatings
Better adhesion
Significantly reduce greenhouse gas emissions

OTHER CHEMICALS

THFDM

2,5-Tetrahydrofurandimethanol

A renewable and multifunctional furan derivative. THFDM serves as a green, low-toxicity, biodegradable solvent and is a precursor for high-performance diesel/gasoline additives and bio-based film-forming aids. Its diverse reactivity opens up a wide application landscape.

Physical and Chemical Properties of the Product

CAS No.	104-80-3	**Molecular Formula**	$C_6H_{12}O_3$
Molecular Weight	132.16	**Melting Point**	< -70℃
Boiling Point	230±5℃		
Relative Density	1.130 g/cm³ at 25℃		
Stability	Easily hygroscopic, sealed and stored at low temperature.		

FDM

2,5-Furandimethanol

FDM ,a rigid, thermally stable bio-based diol ideal for the synthesis of high-performance polyesters and polyurethanes. FDM offers a sustainable alternative to traditional petroleum-based polyols in coatings, resins, and plasticizers—an indispensable monomer in the transition to green materials.

Physical and Chemical Properties of the Product

CAS No.	1883-75-6	**Molecular Formula**	$C_6H_8O_3$
Molecular Weight	128.13	**Melting Point**	74-77℃
Boiling Point	275℃	**Flash Point**	120℃
Relative Density	1.283 g/cm³ at 25℃		
Stability	Sealed and stored at low temperature (2-8 ℃)		

DFF

Furan-2,5-dicarbaldehyde

DFF is an essential bio-furan monomer and precursor for high-performance polymers including polyamides, polyimides, and electronic chemicals. Its aromaticity and high reactivity make it highly promising in green fine chemicals and sustainable polymer synthesis.

Physical and Chemical Properties of the Product

CAS No.	823-82-5	**Molecular Formula**	$C_6H_4O_3$
Molecular Weight	124.0942		
Boiling Point	1276.8±25.0℃		
Relative Density	1.298±0.06 g/cm³		
Stability	Sealed storage (2-8℃) in shade		

FDME

2,5-Furandicarboxylic acid dimethyl ester

FDME is an esterified derivative of FDCA, featuring outstanding chemical and thermal stability. It serves as a versatile intermediate in the production of pharmaceuticals, coatings, resins, and other high-performance materials. As a key monomer in the synthesis of PEF (polyethylene furanoate) via transesterification, FDME provides a critical building block for the development of next-generation, sustainable polyester solutions.

Physical and Chemical Properties of the Product

CAS No.	4282-32-0	**Molecular Formula**	$C_8H_8O_5$
Molecular Weight	184.15	**Melting Point**	112℃
Boiling Point	227.798℃	**Relative Density**	1.244 g/cm³
Stability	Store in a shade, sealed (2-8℃)		

BIOMASS CHANGE LIVES