TECHNOLOGY FOR PRODUCING DIACYLGLYCEROL

Diacylglycerol is a new-generation healthy oil. It has the effects of inhibiting body fat accumulation, reducing blood lipids, and uric acid. It shares highly universal processing properties and flavors with common edible oils and can be widely applied in various food processing fields, thus showing great market potential.

Diacylglycerol oil is made from edible oils such as soybean oil, rapeseed oil, flaxseed oil, and palm oil. Using lipase, water, glycerol, etc. as the main auxiliary materials, it is produced through processes like lipase-catalyzed reaction, molecular distillation separation, decolorization, and deodorization.

PRODUCT ADVANTAGES

- After consumption, it accumulates very little in the body. It can prevent and improve obesity, type II diabetes, and related complications. Moreover, using diacylglycerol as the daily edible oil can reduce visceral fat.
- It can reduce the lipid content in the blood. Therefore, it can be used to prevent and treat hyperlipidemia and cardiovascular and cerebrovascular diseases that are closely related to hyperlipidemia.
- Diacylglycerol is a natural component of oils and fats and an intermediate product in the body's metabolism of oils and fats, ensuring safe consumption.
- It has good compatibility with common edible oils (their tastes, flavors, and processing properties are remarkably similar), and can replace common edible oils for cooking, frying, and other purposes.
- Diacylglycerol can be used as a multi-functional additive and applied to industries such as food, pharmaceuticals, and cosmetics.

TECHNICAL ADVANTAGES

- It achieves zero increase of harmful substances in the production of diacylglycerol and enables customized production. Products with contents of 40%, 60% and 80% can be produced.
- It realizes industrial transformation: smoothly transforming from small-scale trials to pilot-scale production of 2 tons per day, and then to industrial production of 10 tons per day, and achieving large-scale output of over 100 tons per day.
- Special-purpose enzyme production: It improves the efficiency of enzymatic reactions, significantly reduces production costs, is environmentally friendly, and enables highly efficient conversion.
- It realizes full-process automation, ensuring product purity and quality.

QUALITY STANDARD

Quality indicators of diacylglycerol

Item	Quality indicators	
	Grade 1	Grade 2
Acid value (KOH) / (mg/kg) ≤	1.0	
Insoluble impurities / (%) ≤	0.05	
Moisture and volatile matter/ (%) ≤	0.05	
Peroxide value / (mmol/kg) ≤	5.0	
Monoglyceride content / (%) ≤	1.5	
Diglyceride content / (%)≥	80	40
Among them, 1,3-diglyceride / (%)≥	50	28
Glycidyl esters (calculated as glycidol) / (mg/kg) ≤	1.0	

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TECHNOLOGY FOR PRODUCING ENZYMATIC BIODIESEL

The enzymatic method, a bio-enzyme technology, offers a superior alternative to the traditional chemical method for biodiesel production. It operates under mild reaction conditions, has a wide range of raw material applicability, promotes green environmental protection, and is more cost-effective. The product meets national and EU quality standards, further solidifying its value.

TECHNICAL ADVANTAGES

Wide adaptability of raw materials

The enzymatic method can catalyze both transesterification and esterification reactions simultaneously without the need for pre-deacidification treatment. It can directly process raw materials with high acid values, such as waste cooking oil and acidulated oil, eliminating the complex pretreatment that is essential in the chemical method.

Mild and thorough reaction conditions

The reaction temperature of the bio-enzymatic method is around 40°C, which is mild and much lower than that of the chemical method (catalysis by the acid-base method requires a temperature higher than 90°C). This significantly reduces energy consumption. Meanwhile, the esterification rate can reach 99%, and the transesterification efficiency is over 97%, ensuring a thorough reaction.

Simple product separation

The enzymatic method simplifies the separation process by eliminating the saponification reaction, a common issue in alkali-catalyzed processes. This results in straightforward product layer separation. The glycerol phase produced by this method has fewer impurities, making the refinement and recovery of high-value-added glycerol easier.

Environment -friendly and green process

The enzymatic method is an environmentally friendly and green process that avoids the use of corrosive chemicals, reducing the risk of equipment corrosion and the problem of treating waste acid/alkali solutions. It also eliminates the need for the water-washing step in the chemical method, significantly reducing wastewater discharge and alleviating environmental protection pressure.

Automated and continuous production with low investment

The entire process utilizes a PLC-computer, featuring a fully automated, fully enclosed, and fully continuous operating system.
The investment is at least 20% less than that of the acid-base method.

PRODUCT STANDARD

The biodiesel complies with the EU standard EN14214 and the Chinese national standard GB25199 - 2017 "Biodiesel BD100".




TECHNOLOGY FOR DEEP PRETREATMENT OF WASTE OILS AND FATS

To convert waste oils and fats (such as waste cooking oil, palm acidulated oil, animal fat, swill oil, etc.) into sustainable aviation fuel (SAF), the hydro-treatment route is mainly adopted. The pretreatment of raw materials is the key to the whole process and a difficulty. COFCO ENGINEERING has independently developed a deep pretreatment process for aviation kerosene (SAF) raw materials, which has been applied on a large scale in the domestic aviation kerosene production. This process features mature technology, low production cost, stable and reliable production quality, wide adaptability to raw materials, low equipment investment, high product yield, and low wastewater discharge.

TECHNICAL ADVANTAGES

Strong adaptability

For different raw material sources, by adjusting process parameters, it can adapt to changes in raw material quality and variety. It can efficiently pretreat palm acidulated oil, kitchen waste oil, waste cooking oil, animal and vegetable oils, etc., removing influencing factors such as total metal ions and phosphorus that affect the subsequent hydrogenation process.

High degree of automation

The entire process adopts a fully automated, fully enclosed, and fully continuous operating system controlled by a PLC computer. This reduces the possibility of raw materials and products being contaminated and enhances the reliability of product quality.

Emphasis on energy conservation and environmental protection

The most advanced, complete, and reliable process solutions are adopted. Heat exchange technology is reused, with a focus on energy conservation and environmental protection. This approach reduces emissions, cuts costs, and maximizes corporate profits.

Safe and reliable process equipment

Equipment, pipes, and valve parts in contact with raw material oil and fatty acids are made of 304 stainless steel. Those in contact with acid are made of 316L stainless steel. Heat exchangers are made of stainless steel, and fluor rubber sealing rings are used. The equipment is safe, corrosion-resistant, and has a long service life.

High-quality products

Through the combination of multiple processes, the products meet the requirements of SAF hydrogenation.

PRODUCT STANDARD

Item	Raw material indicators	Achievable indicators
Insoluble impurities/%	0.2	≤0.05
Moisture and volatile substances/%	2.0	≤0.05
Metals/ppm	500	≤10
Phosphorus/ppm	50	≤3


NEW TECHNOLOGIES FOR THE ENZYMATIC PREPARATION OF VITAMIN E AND PHYTOSTEROLS

A new technology that uses lipase as a catalyst to replace the traditional acid-base method for producing natural vitamin E and phytosterols has been developed. This technology addresses the issue of losses of natural vitamin E and phytosterols in the acid-base process, which are caused by the addition of strong acids and bases and high temperatures. It significantly increases the yield of natural vitamin E and phytosterols. Meanwhile, due to the low reaction temperature, energy consumption is notably reduced.

TECHNICAL ADVANTAGES

High yields of vitamin E and sterols

In the actual production process using the enzymatic method, the yield of vitamin E can exceed 85% and the yield of sterols can exceed 90%. These yields are more than 3% higher, respectively, compared to the conventional acid-base process.

Significant reduction in production energy consumption

With the enzymatic method, the overall energy consumption is approximately 25% lower than that of the acid-base method, resin method, supercritical method, and other methods.

The products meet the standards for export to the EU and the United States

Including the removal of hazardous substances (such as benzo(a) pyrene, dioxins, plasticizers, etc.).

Less wastewater discharge and easier to treat

In the original process, acids and bases were used, resulting in high sulfate content in the wastewater, which was very difficult to treat. Moreover, the new process reduces wastewater discharge by more than 35%.

PRODUCT STANDARD

Natural Vitamin E

Items	Indicators
Properties	A brownish - red to red viscous oily liquid
Total VE content	20%—70%
d-(α+β+γ)-V_E Relative content	≥80%
Acid value (mgKOH/g)	≤2.0
Heavy metal, ppm	≤40
Lead, ppm	≤10
Loss on drying%	≤1.0
Ash content%	≤0.1
Optical rotation rate$[\alpha]_D^{20}$	≥+20°

Phytosterol standards

Items	Indicators	
Whiteness ≥	88	
The total content of sterols (g/100g) ≥	95	90
Loss on drying ≤	2.5	
Ash content, (g/100g) ≤	0.3	
Lead (Based on Pb)(mg/kg) ≤	10	
Total arsenic (calculated as As), (mg/kg) ≤	1	
Net content	It shall comply with the provisions of the Measures for the Metrological Supervision and Administration of Commodities with Fixed Quantity Packing.	