
exo-Cellulase

High activity enzyme blend for digesting cellulosic feedstocks



BIOFUEL



FRUIT PROCESSING



BREWING



GRAIN DIGESTION



IMPROVED YIELDS



BULK OPTION

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1. Product Overview

exo-Cellulase catalyses the sequential hydrolysis of cellulose chains from the ends, releasing glucose or cellobiose units. Its key benefits include efficient conversion of cellulose-rich materials into fermentable sugars, making it highly valuable for biofuel production, biorefineries, and biomass valorisation. In industrial applications, exo-Cellulase is often used in combination with endo-Cellulases and β -glucosidases to achieve complete cellulose saccharification, enhancing overall enzymatic efficiency. Additionally, it finds applications in the textile industry for fiber softening and bio-polishing, in animal feed to improve digestibility of plant-based ingredients, and in food processing to increase yield and clarity in fruit and vegetable juices. By facilitating the controlled breakdown of cellulose, exo-Cellulase contributes to sustainable bioprocessing, cost-effective biomass utilization, and improved product quality across multiple sectors.

2. Product Characteristics

Parameter	Specification
Enzyme Class	EC 3.2.1.91 (exoglucanases)
Source	<i>Aspergillus niger</i> (non-GM strain)
Appearance	Brown liquid
Activity	>9,500 U / g
Density	1.1-1.20 g per mL
Temperature Range	15–60 °C (operational)
Optimal Temperature	50–55 °C
pH Range	3.5 – 8.0
Optimal pH	4.5 – 5.5
Shelf Life	12 months (sealed, recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

An exo-cellulase (also called a cellobiohydrolase) is an enzyme that hydrolyses cellulose by progressively cleaving cellobiose or glucose units from the ends of cellulose chains. It binds to the accessible reducing or non-reducing ends of the β -1,4-linked glucan chains within crystalline or amorphous regions of cellulose. Many exo-cellulases possess a carbohydrate-binding module (CBM) that anchors the enzyme to the cellulose surface, increasing substrate affinity and local concentration. The catalytic domain forms a tunnel-shaped active site that threads a single cellulose chain and enables processive cleavage, meaning the enzyme remains attached while performing multiple successive hydrolytic reactions. Catalysis typically occurs via a retaining or inverting mechanism involving two key acidic residues (commonly glutamate or aspartate) that act as a proton

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donor and nucleophile or base, facilitating cleavage of the β -1,4-glycosidic bond. The primary product is usually cellobiose, which can then be further hydrolysed to glucose by β -glucosidase, completing the synergistic degradation of cellulose.

3.2 Kinetics:

The reaction kinetics of a high-activity cellulase blend are driven by rapid substrate accessibility, efficient catalytic turnover, and minimized product inhibition, enabling fast and sustained biomass hydrolysis. Endoglucanases initiate the reaction by quickly disrupting crystalline cellulose regions, increasing surface area and accelerating initial reaction rates. Exoglucanases then exhibit high processivity, continuously releasing cellobiose units with minimal detachment from the substrate, which enhances catalytic efficiency under industrial conditions. Meanwhile, β -glucosidases maintain optimal kinetics by rapidly converting cellobiose into glucose, preventing the inhibitory buildup that otherwise slows enzyme activity. Together, these complementary kinetic profiles produce a steep initial hydrolysis rate, sustained sugar release, and overall improved conversion efficiency—key factors in reducing enzyme dosage requirements and increasing throughput in biofuel production.

3.3 Inhibitors:

- Heavy metals (Hg^{2+} , Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 65 deg. C
- High chelator concentrations (EDTA)

4. Applications

- **Lignocellulosic biomass hydrolysis.** Converting agricultural residues, forestry waste, and energy crops into fermentable sugars.
- **Pretreatment enhancement.** Improving digestibility of pretreated biomass by reducing cellulose crystallinity and fiber rigidity.
- **Simultaneous saccharification and fermentation (SSF).** Enabling efficient one-pot conversion of cellulose to ethanol or other biofuels.
- **High-solids biomass processing.** Maintaining hydrolysis efficiency even at elevated solids loadings to boost reactor productivity.
- **Enzyme recycling and immobilisation systems.** Supporting cost reduction strategies through stable and reusable enzyme activity.
- **Biomass deconstruction in advanced biofuel pathways.** Feeding downstream biorefineries producing renewable diesel, jet fuel, or biochemicals.
- **Pilot and commercial-scale bioreactor optimisation.** Increasing throughput and reducing enzyme dosage in industrial bioconversion systems.

5. Handling & Storage

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5.1 Storage Conditions

- Store at 4–25 °C in sealed containers
- Avoid direct sunlight and freezing
- Keep away from acids, oxidizing agents, and heavy metals

5.2 Stability on Storage

- Activity loss ~1–5% per month at room temperature
- Refrigeration improves stability

5.3 Safety Information

- Non-toxic and biodegradable
- May cause allergic reactions via inhalation or skin contact
- Use protective clothing, gloves, goggles
- Avoid aerosol formation

Refer to product MSDS for complete safety details.

6. Packaging Options

- 0.1 L, 1 L, 10 L, 25 L (1000 kg totes available upon request)

7. Quality Control Specifications

Test	Specification
Activity assay	≥ labelled activity
Density (liquid)	1.1–1.2 g / mL
Moisture (powder)	≤ 8%
Microbial load	Total plate count ≤ 50,000 CFU / g
Pathogens	<i>Salmonella</i> negative, <i>E. coli</i> negative

9. Shelf Life

- **Liquid:** 12 months, store in original container, sealed, in cool conditions.

10. Disclaimer

This technical data sheet provides general information. Application testing is recommended to determine optimal use conditions.