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Global Whole-cell Chiral Catalysis Supply, Demand and Key Producers, 2026-2032

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Abstracts

The global Whole-cell Chiral Catalysis market size is expected to reach $ 421 million by 2032, rising at a market growth of 16.4% CAGR during the forecast period (2026-2032).

Whole-cell chiral catalysis refers to the use of intact living or non-living cells, such as bacteria, yeast, or fungi, as catalytic systems to perform highly enantioselective transformations without isolating or purifying individual enzymes. The catalytic function relies not only on the stereoselectivity of intracellular enzymes but also on integrated cellular systems, including cofactor regeneration (e.g., NADH/NADPH cycling), membrane transport mechanisms, and multi-enzyme cascade pathways. As such, it represents a self-sustained catalytic platform with built-in energy and cofactor recycling. Compared to isolated enzyme catalysis, whole-cell systems offer advantages such as eliminating the need for external cofactors, enhanced operational stability, and suitability for large-scale fermentation processes, while facing challenges including substrate transport limitations, competing metabolic pathways, and reduced controllability of selectivity. It is therefore considered a scale-oriented and process-integrated branch of biocatalytic chiral synthesis.

Whole-cell chiral catalysis utilizes engineered microorganisms such as E. coli or yeast to perform enantioselective transformations through intracellular enzymes like ketoreductases (KREDs) and transaminases (TAs), relying on endogenous cofactor regeneration and multi-enzyme cascade systems, essentially functioning as a chiral reaction module embedded within fermentation processes. Structurally, bioreduction and transamination dominate with approximately 80% share, while dynamic resolution and multi-enzyme cascades account for about 20%. The cost structure is significantly lower than isolated enzymes, with an equivalent catalytic cost of approximately $80–200/kg (based on cell preparations), though it is not typically sold as a

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standardized product, resulting in a blended gross margin of around 40–50%. Applications are highly concentrated in pharmaceutical intermediates, accounting for about 80%, primarily for large-scale production of chiral alcohols and amines and process cost reduction, with agrochemicals accounting for about 20%. The upstream includes fermentation media and strain engineering, the midstream focuses on strain optimization and fermentation scale-up, and downstream integration is fully embedded within CDMO and pharmaceutical manufacturing processes. The industry exhibits a pattern of fragmented technology providers and highly concentrated process integrators, where companies such as Codexis provide strain engineering capabilities, while CDMOs like WuXi AppTec, Asymchem, and Lonza control implementation decisions. Overall, whole-cell catalysis is in a rapid penetration phase driven by cost pressures and green chemistry demands, offering clear economic advantages over isolated enzyme catalysis but constrained by substrate transport limitations, competing metabolic pathways, and selectivity control challenges, thereby remaining primarily at the intermediate stage rather than final API synthesis; key uncertainties lie in the advancement of metabolic engineering and process control to expand into more complex transformations.

This report studies the global Whole-cell Chiral Catalysis production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Whole-cell Chiral Catalysis and provides market size (US$ million) and Year-over-Year (YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of Whole-cell Chiral Catalysis that contribute to its increasing demand across many markets.

Highlights and key features of the study
Global Whole-cell Chiral Catalysis total production and demand, 2021-2032, (kg)
Global Whole-cell Chiral Catalysis total production value, 2021-2032, (USD Million)
Global Whole-cell Chiral Catalysis production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (kg), (based on production site)
Global Whole-cell Chiral Catalysis consumption by region & country, CAGR, 2021-2032 & (kg)
U.S. VS China: Whole-cell Chiral Catalysis domestic production, consumption, key domestic manufacturers and share
Global Whole-cell Chiral Catalysis production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (kg)
Global Whole-cell Chiral Catalysis production by Type, production, value, CAGR,

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2021-2032, (USD Million) & (kg)
Global Whole-cell Chiral Catalysis production by Application, production, value, CAGR, 2021-2032, (USD Million) & (kg)

This report profiles key players in the global Whole-cell Chiral Catalysis market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include Codexis, Novozymes, DSM-Firmenich, WuXi AppTec, Asymchem, Lonza, Prozomix, Enzymaster, etc.

This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Whole-cell Chiral Catalysis market

Detailed Segmentation:

Each section contains quantitative market data including market by value (US$ Millions), volume (production, consumption) & (kg) and average price (US$/kg) by manufacturer, by Type, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

Global Whole-cell Chiral Catalysis Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

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Rest of World

Global Whole-cell Chiral Catalysis Market, Segmentation by Type:

E. coli

Yeast

Fungi

Others

Global Whole-cell Chiral Catalysis Market, Segmentation by Reaction:

Bioreduction

Transamination

Dynamic Resolution

Enzyme Cascade

Biocatalytic Oxidation

Global Whole-cell Chiral Catalysis Market, Segmentation by Application:

Pharmaceuticals

Agrochemicals

Companies Profiled:

Codexis

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Novozymes

DSM-Firmenich

WuXi AppTec

Asymchem

Lonza

Prozomix

Enzymaster

Key Questions Answered:
1. How big is the global Whole-cell Chiral Catalysis market?
2. What is the demand of the global Whole-cell Chiral Catalysis market?
3. What is the year over year growth of the global Whole-cell Chiral Catalysis market?
4. What is the production and production value of the global Whole-cell Chiral Catalysis market?
5. Who are the key producers in the global Whole-cell Chiral Catalysis market?
6. What are the growth factors driving the market demand?

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