

Global Whole-cell Chiral Catalysis Market 2026 by Manufacturers, Regions, Type and Application, Forecast to 2032

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Abstracts

According to our (Global Info Research) latest study, the global Whole-cell Chiral Catalysis market size was valued at US\$ 145 million in 2025 and is forecast to a readjusted size of US\$ 421 million by 2032 with a CAGR of 16.4% during review period.

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 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 is a detailed and comprehensive analysis for global Whole-cell Chiral Catalysis market. Both quantitative and qualitative analyses are presented by manufacturers, by region & country, by Type and by Application. As the market is constantly changing, this report explores the competition, supply and demand trends, as well as key factors that contribute to its changing demands across many markets. Company profiles and product examples of selected competitors, along with market share estimates of some of the selected leaders for the year 2025, are provided.

Key Features:

Global Whole-cell Chiral Catalysis market size and forecasts, in consumption value (\$ Million), sales quantity (kg), and average selling prices (US\$/kg), 2021-2032

Global Whole-cell Chiral Catalysis market size and forecasts by region and country, in consumption value (\$ Million), sales quantity (kg), and average selling prices (US\$/kg), 2021-2032

Global Whole-cell Chiral Catalysis market size and forecasts, by Type and by Application, in consumption value (\$ Million), sales quantity (kg), and average selling

prices (US\$/kg), 2021-2032

Global Whole-cell Chiral Catalysis market shares of main players, shipments in revenue (\$ Million), sales quantity (kg), and ASP (US\$/kg), 2021-2026

The Primary Objectives in This Report Are:

To determine the size of the total market opportunity of global and key countries

To assess the growth potential for Whole-cell Chiral Catalysis

To forecast future growth in each product and end-use market

To assess competitive factors affecting the marketplace

This report profiles key players in the global Whole-cell Chiral Catalysis market based on the following parameters - company overview, sales quantity, revenue, 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.

Market Segmentation

Whole-cell Chiral Catalysis market is split by Type and by Application. For the period 2021-2032, the growth among segments provides accurate calculations and forecasts for consumption value by Type, and by Application in terms of volume and value. This analysis can help you expand your business by targeting qualified niche markets.

Market segment by Type

E. coli

Yeast

Fungi

Others

Market segment by Reaction

Bioreduction

Transamination

Dynamic Resolution

Enzyme Cascade

Biocatalytic Oxidation

Market segment by Application

Pharmaceuticals

Agrochemicals

Major players covered

Codexis

Novozymes

DSM-Firmenich

WuXi AppTec

Asymchem

Lonza

Prozomix

Enzymaster

Market segment by region, regional analysis covers

North America (United States, Canada, and Mexico)

Europe (Germany, France, United Kingdom, Russia, Italy, and Rest of Europe)

Asia-Pacific (China, Japan, Korea, India, Southeast Asia, and Australia)

South America (Brazil, Argentina, Colombia, and Rest of South America)

Middle East & Africa (Saudi Arabia, UAE, Egypt, South Africa, and Rest of Middle East & Africa)

The content of the study subjects, includes a total of 15 chapters:

Chapter 1, to describe Whole-cell Chiral Catalysis product scope, market overview, market estimation caveats and base year.

Chapter 2, to profile the top manufacturers of Whole-cell Chiral Catalysis, with price, sales quantity, revenue, and global market share of Whole-cell Chiral Catalysis from 2021 to 2026.

Chapter 3, the Whole-cell Chiral Catalysis competitive situation, sales quantity, revenue, and global market share of top manufacturers are analyzed emphatically by landscape contrast.

Chapter 4, the Whole-cell Chiral Catalysis breakdown data are shown at the regional level, to show the sales quantity, consumption value, and growth by regions, from 2021 to 2032.

Chapter 5 and 6, to segment the sales by Type and by Application, with sales market share and growth rate by Type, by Application, from 2021 to 2032.

Chapter 7, 8, 9, 10 and 11, to break the sales data at the country level, with sales

quantity, consumption value, and market share for key countries in the world, from 2021 to 2026. and Whole-cell Chiral Catalysis market forecast, by regions, by Type, and by Application, with sales and revenue, from 2027 to 2032.

Chapter 12, market dynamics, drivers, restraints, trends, and Porters Five Forces analysis.

Chapter 13, the key raw materials and key suppliers, and industry chain of Whole-cell Chiral Catalysis.

Chapter 14 and 15, to describe Whole-cell Chiral Catalysis sales channel, distributors, customers, research findings and conclusion.

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