

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

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,

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

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

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?

Contents

1 SUPPLY SUMMARY

- 1.1 Whole-cell Chiral Catalysis Introduction
- 1.2 World Whole-cell Chiral Catalysis Supply & Forecast
 - 1.2.1 World Whole-cell Chiral Catalysis Production Value (2021 & 2025 & 2032)
 - 1.2.2 World Whole-cell Chiral Catalysis Production (2021-2032)
 - 1.2.3 World Whole-cell Chiral Catalysis Pricing Trends (2021-2032)
- 1.3 World Whole-cell Chiral Catalysis Production by Region (Based on Production Site)
 - 1.3.1 World Whole-cell Chiral Catalysis Production Value by Region (2021-2032)
 - 1.3.2 World Whole-cell Chiral Catalysis Production by Region (2021-2032)
 - 1.3.3 World Whole-cell Chiral Catalysis Average Price by Region (2021-2032)
 - 1.3.4 North America Whole-cell Chiral Catalysis Production (2021-2032)
 - 1.3.5 Europe Whole-cell Chiral Catalysis Production (2021-2032)
 - 1.3.6 China Whole-cell Chiral Catalysis Production (2021-2032)
 - 1.3.7 Japan Whole-cell Chiral Catalysis Production (2021-2032)
- 1.4 Market Drivers, Restraints and Trends
 - 1.4.1 Whole-cell Chiral Catalysis Market Drivers
 - 1.4.2 Factors Affecting Demand
 - 1.4.3 Whole-cell Chiral Catalysis Major Market Trends

2 DEMAND SUMMARY

- 2.1 World Whole-cell Chiral Catalysis Demand (2021-2032)
- 2.2 World Whole-cell Chiral Catalysis Consumption by Region
 - 2.2.1 World Whole-cell Chiral Catalysis Consumption by Region (2021-2026)
 - 2.2.2 World Whole-cell Chiral Catalysis Consumption Forecast by Region (2027-2032)
- 2.3 United States Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.4 China Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.5 Europe Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.6 Japan Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.7 South Korea Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.8 ASEAN Whole-cell Chiral Catalysis Consumption (2021-2032)
- 2.9 India Whole-cell Chiral Catalysis Consumption (2021-2032)

3 WORLD MANUFACTURERS COMPETITIVE ANALYSIS

- 3.1 World Whole-cell Chiral Catalysis Production Value by Manufacturer (2021-2026)

- 3.2 World Whole-cell Chiral Catalysis Production by Manufacturer (2021-2026)
- 3.3 World Whole-cell Chiral Catalysis Average Price by Manufacturer (2021-2026)
- 3.4 Whole-cell Chiral Catalysis Company Evaluation Quadrant
- 3.5 Industry Rank and Concentration Rate (CR)
 - 3.5.1 Global Whole-cell Chiral Catalysis Industry Rank of Major Manufacturers
 - 3.5.2 Global Concentration Ratios (CR4) for Whole-cell Chiral Catalysis in 2025
 - 3.5.3 Global Concentration Ratios (CR8) for Whole-cell Chiral Catalysis in 2025
- 3.6 Whole-cell Chiral Catalysis Market: Overall Company Footprint Analysis
 - 3.6.1 Whole-cell Chiral Catalysis Market: Region Footprint
 - 3.6.2 Whole-cell Chiral Catalysis Market: Company Product Type Footprint
 - 3.6.3 Whole-cell Chiral Catalysis Market: Company Product Application Footprint
- 3.7 Competitive Environment
 - 3.7.1 Historical Structure of the Industry
 - 3.7.2 Barriers of Market Entry
 - 3.7.3 Factors of Competition
- 3.8 New Entrant and Capacity Expansion Plans
- 3.9 Mergers, Acquisition, Agreements, and Collaborations

4 UNITED STATES VS CHINA VS REST OF THE WORLD

- 4.1 United States VS China: Whole-cell Chiral Catalysis Production Value Comparison
 - 4.1.1 United States VS China: Whole-cell Chiral Catalysis Production Value Comparison (2021 & 2025 & 2032)
 - 4.1.2 United States VS China: Whole-cell Chiral Catalysis Production Value Market Share Comparison (2021 & 2025 & 2032)
- 4.2 United States VS China: Whole-cell Chiral Catalysis Production Comparison
 - 4.2.1 United States VS China: Whole-cell Chiral Catalysis Production Comparison (2021 & 2025 & 2032)
 - 4.2.2 United States VS China: Whole-cell Chiral Catalysis Production Market Share Comparison (2021 & 2025 & 2032)
- 4.3 United States VS China: Whole-cell Chiral Catalysis Consumption Comparison
 - 4.3.1 United States VS China: Whole-cell Chiral Catalysis Consumption Comparison (2021 & 2025 & 2032)
 - 4.3.2 United States VS China: Whole-cell Chiral Catalysis Consumption Market Share Comparison (2021 & 2025 & 2032)
- 4.4 United States Based Whole-cell Chiral Catalysis Manufacturers and Market Share, 2021-2026
 - 4.4.1 United States Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (States, Country)

4.4.2 United States Based Manufacturers Whole-cell Chiral Catalysis Production Value (2021-2026)

4.4.3 United States Based Manufacturers Whole-cell Chiral Catalysis Production (2021-2026)

4.5 China Based Whole-cell Chiral Catalysis Manufacturers and Market Share

4.5.1 China Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (Province, Country)

4.5.2 China Based Manufacturers Whole-cell Chiral Catalysis Production Value (2021-2026)

4.5.3 China Based Manufacturers Whole-cell Chiral Catalysis Production (2021-2026)

4.6 Rest of World Based Whole-cell Chiral Catalysis Manufacturers and Market Share, 2021-2026

4.6.1 Rest of World Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (State, Country)

4.6.2 Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production Value (2021-2026)

4.6.3 Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production (2021-2026)

5 MARKET ANALYSIS BY TYPE

5.1 World Whole-cell Chiral Catalysis Market Size Overview by Type: 2021 VS 2025 VS 2032

5.2 Segment Introduction by Type

5.2.1 E. coli

5.2.2 Yeast

5.2.3 Fungi

5.2.4 Others

5.3 Market Segment by Type

5.3.1 World Whole-cell Chiral Catalysis Production by Type (2021-2032)

5.3.2 World Whole-cell Chiral Catalysis Production Value by Type (2021-2032)

5.3.3 World Whole-cell Chiral Catalysis Average Price by Type (2021-2032)

6 MARKET ANALYSIS BY REACTION

6.1 World Whole-cell Chiral Catalysis Market Size Overview by Reaction: 2021 VS 2025 VS 2032

6.2 Segment Introduction by Reaction

6.2.1 Bioreduction

- 6.2.2 Transamination
- 6.2.3 Dynamic Resolution
- 6.2.4 Enzyme Cascade
- 6.2.5 Biocatalytic Oxidation
- 6.3 Market Segment by Reaction
 - 6.3.1 World Whole-cell Chiral Catalysis Production by Reaction (2021-2032)
 - 6.3.2 World Whole-cell Chiral Catalysis Production Value by Reaction (2021-2032)
 - 6.3.3 World Whole-cell Chiral Catalysis Average Price by Reaction (2021-2032)

7 MARKET ANALYSIS BY APPLICATION

- 7.1 World Whole-cell Chiral Catalysis Market Size Overview by Application: 2021 VS 2025 VS 2032
- 7.2 Segment Introduction by Application
 - 7.2.1 Pharmaceuticals
 - 7.2.2 Agrochemicals
- 7.3 Market Segment by Application
 - 7.3.1 World Whole-cell Chiral Catalysis Production by Application (2021-2032)
 - 7.3.2 World Whole-cell Chiral Catalysis Production Value by Application (2021-2032)
 - 7.3.3 World Whole-cell Chiral Catalysis Average Price by Application (2021-2032)

8 COMPANY PROFILES

- 8.1 Codexis
 - 8.1.1 Codexis Details
 - 8.1.2 Codexis Major Business
 - 8.1.3 Codexis Whole-cell Chiral Catalysis Product and Services
 - 8.1.4 Codexis Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)
 - 8.1.5 Codexis Recent Developments/Updates
 - 8.1.6 Codexis Competitive Strengths & Weaknesses
- 8.2 Novozymes
 - 8.2.1 Novozymes Details
 - 8.2.2 Novozymes Major Business
 - 8.2.3 Novozymes Whole-cell Chiral Catalysis Product and Services
 - 8.2.4 Novozymes Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)
 - 8.2.5 Novozymes Recent Developments/Updates
 - 8.2.6 Novozymes Competitive Strengths & Weaknesses

8.3 DSM-Firmenich

8.3.1 DSM-Firmenich Details

8.3.2 DSM-Firmenich Major Business

8.3.3 DSM-Firmenich Whole-cell Chiral Catalysis Product and Services

8.3.4 DSM-Firmenich Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.3.5 DSM-Firmenich Recent Developments/Updates

8.3.6 DSM-Firmenich Competitive Strengths & Weaknesses

8.4 WuXi AppTec

8.4.1 WuXi AppTec Details

8.4.2 WuXi AppTec Major Business

8.4.3 WuXi AppTec Whole-cell Chiral Catalysis Product and Services

8.4.4 WuXi AppTec Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.4.5 WuXi AppTec Recent Developments/Updates

8.4.6 WuXi AppTec Competitive Strengths & Weaknesses

8.5 Asymchem

8.5.1 Asymchem Details

8.5.2 Asymchem Major Business

8.5.3 Asymchem Whole-cell Chiral Catalysis Product and Services

8.5.4 Asymchem Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.5.5 Asymchem Recent Developments/Updates

8.5.6 Asymchem Competitive Strengths & Weaknesses

8.6 Lonza

8.6.1 Lonza Details

8.6.2 Lonza Major Business

8.6.3 Lonza Whole-cell Chiral Catalysis Product and Services

8.6.4 Lonza Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.6.5 Lonza Recent Developments/Updates

8.6.6 Lonza Competitive Strengths & Weaknesses

8.7 Prozomix

8.7.1 Prozomix Details

8.7.2 Prozomix Major Business

8.7.3 Prozomix Whole-cell Chiral Catalysis Product and Services

8.7.4 Prozomix Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.7.5 Prozomix Recent Developments/Updates

8.7.6 Prozomix Competitive Strengths & Weaknesses

8.8 Enzymaster

8.8.1 Enzymaster Details

8.8.2 Enzymaster Major Business

8.8.3 Enzymaster Whole-cell Chiral Catalysis Product and Services

8.8.4 Enzymaster Whole-cell Chiral Catalysis Production, Price, Value, Gross Margin and Market Share (2021-2026)

8.8.5 Enzymaster Recent Developments/Updates

8.8.6 Enzymaster Competitive Strengths & Weaknesses

9 INDUSTRY CHAIN ANALYSIS

9.1 Whole-cell Chiral Catalysis Industry Chain

9.2 Whole-cell Chiral Catalysis Upstream Analysis

9.2.1 Whole-cell Chiral Catalysis Core Raw Materials

9.2.2 Main Manufacturers of Whole-cell Chiral Catalysis Core Raw Materials

9.3 Midstream Analysis

9.4 Downstream Analysis

9.5 Whole-cell Chiral Catalysis Production Mode

9.6 Whole-cell Chiral Catalysis Procurement Model

9.7 Whole-cell Chiral Catalysis Industry Sales Model and Sales Channels

9.7.1 Whole-cell Chiral Catalysis Sales Model

9.7.2 Whole-cell Chiral Catalysis Typical Distributors

10 RESEARCH FINDINGS AND CONCLUSION

11 APPENDIX

11.1 Methodology

11.2 Research Process and Data Source

11.3 Disclaimer

List Of Tables

LIST OF TABLES

Table 1. World Whole-cell Chiral Catalysis Production Value by Region (2021, 2025 and 2032) & (USD Million)

Table 2. World Whole-cell Chiral Catalysis Production Value by Region (2021-2026) & (USD Million)

Table 3. World Whole-cell Chiral Catalysis Production Value by Region (2027-2032) & (USD Million)

Table 4. World Whole-cell Chiral Catalysis Production Value Market Share by Region (2021-2026)

Table 5. World Whole-cell Chiral Catalysis Production Value Market Share by Region (2027-2032)

Table 6. World Whole-cell Chiral Catalysis Production by Region (2021-2026) & (kg)

Table 7. World Whole-cell Chiral Catalysis Production by Region (2027-2032) & (kg)

Table 8. World Whole-cell Chiral Catalysis Production Market Share by Region (2021-2026)

Table 9. World Whole-cell Chiral Catalysis Production Market Share by Region (2027-2032)

Table 10. World Whole-cell Chiral Catalysis Average Price by Region (2021-2026) & (US\$/kg)

Table 11. World Whole-cell Chiral Catalysis Average Price by Region (2027-2032) & (US\$/kg)

Table 12. Whole-cell Chiral Catalysis Major Market Trends

Table 13. World Whole-cell Chiral Catalysis Consumption Growth Rate Forecast by Region (2021 & 2025 & 2032) & (kg)

Table 14. World Whole-cell Chiral Catalysis Consumption by Region (2021-2026) & (kg)

Table 15. World Whole-cell Chiral Catalysis Consumption Forecast by Region (2027-2032) & (kg)

Table 16. World Whole-cell Chiral Catalysis Production Value by Manufacturer (2021-2026) & (USD Million)

Table 17. Production Value Market Share of Key Whole-cell Chiral Catalysis Producers in 2025

Table 18. World Whole-cell Chiral Catalysis Production by Manufacturer (2021-2026) & (kg)

Table 19. Production Market Share of Key Whole-cell Chiral Catalysis Producers in 2025

Table 20. World Whole-cell Chiral Catalysis Average Price by Manufacturer

(2021-2026) & (US\$/kg)

Table 21. Global Whole-cell Chiral Catalysis Company Evaluation Quadrant

Table 22. World Whole-cell Chiral Catalysis Industry Rank of Major Manufacturers, Based on Production Value in 2025

Table 23. Head Office and Whole-cell Chiral Catalysis Production Site of Key Manufacturer

Table 24. Whole-cell Chiral Catalysis Market: Company Product Type Footprint

Table 25. Whole-cell Chiral Catalysis Market: Company Product Application Footprint

Table 26. Whole-cell Chiral Catalysis Competitive Factors

Table 27. Whole-cell Chiral Catalysis New Entrant and Capacity Expansion Plans

Table 28. Whole-cell Chiral Catalysis Mergers & Acquisitions Activity

Table 29. United States VS China Whole-cell Chiral Catalysis Production Value Comparison, (2021 & 2025 & 2032) & (USD Million)

Table 30. United States VS China Whole-cell Chiral Catalysis Production Comparison, (2021 & 2025 & 2032) & (kg)

Table 31. United States VS China Whole-cell Chiral Catalysis Consumption Comparison, (2021 & 2025 & 2032) & (kg)

Table 32. United States Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (States, Country)

Table 33. United States Based Manufacturers Whole-cell Chiral Catalysis Production Value, (2021-2026) & (USD Million)

Table 34. United States Based Manufacturers Whole-cell Chiral Catalysis Production Value Market Share (2021-2026)

Table 35. United States Based Manufacturers Whole-cell Chiral Catalysis Production (2021-2026) & (kg)

Table 36. United States Based Manufacturers Whole-cell Chiral Catalysis Production Market Share (2021-2026)

Table 37. China Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (Province, Country)

Table 38. China Based Manufacturers Whole-cell Chiral Catalysis Production Value, (2021-2026) & (USD Million)

Table 39. China Based Manufacturers Whole-cell Chiral Catalysis Production Value Market Share (2021-2026)

Table 40. China Based Manufacturers Whole-cell Chiral Catalysis Production, (2021-2026) & (kg)

Table 41. China Based Manufacturers Whole-cell Chiral Catalysis Production Market Share (2021-2026)

Table 42. Rest of World Based Whole-cell Chiral Catalysis Manufacturers, Headquarters and Production Site (State, Country)

Table 43. Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production Value, (2021-2026) & (USD Million)

Table 44. Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production Value Market Share (2021-2026)

Table 45. Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production, (2021-2026) & (kg)

Table 46. Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production Market Share (2021-2026)

Table 47. World Whole-cell Chiral Catalysis Production Value by Type, (USD Million), 2021 & 2025 & 2032

Table 48. World Whole-cell Chiral Catalysis Production by Type (2021-2026) & (kg)

Table 49. World Whole-cell Chiral Catalysis Production by Type (2027-2032) & (kg)

Table 50. World Whole-cell Chiral Catalysis Production Value by Type (2021-2026) & (USD Million)

Table 51. World Whole-cell Chiral Catalysis Production Value by Type (2027-2032) & (USD Million)

Table 52. World Whole-cell Chiral Catalysis Average Price by Type (2021-2026) & (US\$/kg)

Table 53. World Whole-cell Chiral Catalysis Average Price by Type (2027-2032) & (US\$/kg)

Table 54. World Whole-cell Chiral Catalysis Production Value by Reaction, (USD Million), 2021 & 2025 & 2032

Table 55. World Whole-cell Chiral Catalysis Production by Reaction (2021-2026) & (kg)

Table 56. World Whole-cell Chiral Catalysis Production by Reaction (2027-2032) & (kg)

Table 57. World Whole-cell Chiral Catalysis Production Value by Reaction (2021-2026) & (USD Million)

Table 58. World Whole-cell Chiral Catalysis Production Value by Reaction (2027-2032) & (USD Million)

Table 59. World Whole-cell Chiral Catalysis Average Price by Reaction (2021-2026) & (US\$/kg)

Table 60. World Whole-cell Chiral Catalysis Average Price by Reaction (2027-2032) & (US\$/kg)

Table 61. World Whole-cell Chiral Catalysis Production Value by Application, (USD Million), 2021 & 2025 & 2032

Table 62. World Whole-cell Chiral Catalysis Production by Application (2021-2026) & (kg)

Table 63. World Whole-cell Chiral Catalysis Production by Application (2027-2032) & (kg)

Table 64. World Whole-cell Chiral Catalysis Production Value by Application

(2021-2026) & (USD Million)

Table 65. World Whole-cell Chiral Catalysis Production Value by Application

(2027-2032) & (USD Million)

Table 66. World Whole-cell Chiral Catalysis Average Price by Application (2021-2026) & (US\$/kg)

Table 67. World Whole-cell Chiral Catalysis Average Price by Application (2027-2032) & (US\$/kg)

Table 68. Codexis Basic Information, Manufacturing Base and Competitors

Table 69. Codexis Major Business

Table 70. Codexis Whole-cell Chiral Catalysis Product and Services

Table 71. Codexis Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 72. Codexis Recent Developments/Updates

Table 73. Codexis Competitive Strengths & Weaknesses

Table 74. Novozymes Basic Information, Manufacturing Base and Competitors

Table 75. Novozymes Major Business

Table 76. Novozymes Whole-cell Chiral Catalysis Product and Services

Table 77. Novozymes Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 78. Novozymes Recent Developments/Updates

Table 79. Novozymes Competitive Strengths & Weaknesses

Table 80. DSM-Firmenich Basic Information, Manufacturing Base and Competitors

Table 81. DSM-Firmenich Major Business

Table 82. DSM-Firmenich Whole-cell Chiral Catalysis Product and Services

Table 83. DSM-Firmenich Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 84. DSM-Firmenich Recent Developments/Updates

Table 85. DSM-Firmenich Competitive Strengths & Weaknesses

Table 86. WuXi AppTec Basic Information, Manufacturing Base and Competitors

Table 87. WuXi AppTec Major Business

Table 88. WuXi AppTec Whole-cell Chiral Catalysis Product and Services

Table 89. WuXi AppTec Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 90. WuXi AppTec Recent Developments/Updates

Table 91. WuXi AppTec Competitive Strengths & Weaknesses

Table 92. Asymchem Basic Information, Manufacturing Base and Competitors

Table 93. Asymchem Major Business

Table 94. Asymchem Whole-cell Chiral Catalysis Product and Services

Table 95. Asymchem Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg),

Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 96. Asymchem Recent Developments/Updates

Table 97. Asymchem Competitive Strengths & Weaknesses

Table 98. Lonza Basic Information, Manufacturing Base and Competitors

Table 99. Lonza Major Business

Table 100. Lonza Whole-cell Chiral Catalysis Product and Services

Table 101. Lonza Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg),
Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 102. Lonza Recent Developments/Updates

Table 103. Lonza Competitive Strengths & Weaknesses

Table 104. Prozomix Basic Information, Manufacturing Base and Competitors

Table 105. Prozomix Major Business

Table 106. Prozomix Whole-cell Chiral Catalysis Product and Services

Table 107. Prozomix Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg),
Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 108. Prozomix Recent Developments/Updates

Table 109. Prozomix Competitive Strengths & Weaknesses

Table 110. Enzymaster Basic Information, Manufacturing Base and Competitors

Table 111. Enzymaster Major Business

Table 112. Enzymaster Whole-cell Chiral Catalysis Product and Services

Table 113. Enzymaster Whole-cell Chiral Catalysis Production (kg), Price (US\$/kg),
Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 114. Enzymaster Recent Developments/Updates

Table 115. Enzymaster Competitive Strengths & Weaknesses

Table 116. Global Key Players of Whole-cell Chiral Catalysis Upstream (Raw Materials)

Table 117. Global Whole-cell Chiral Catalysis Typical Customers

Table 118. Whole-cell Chiral Catalysis Typical Distributors

List Of Figures

LIST OF FIGURES

- Figure 1. Whole-cell Chiral Catalysis Picture
- Figure 2. World Whole-cell Chiral Catalysis Production Value: 2021 & 2025 & 2032, (USD Million)
- Figure 3. World Whole-cell Chiral Catalysis Production Value and Forecast (2021-2032) & (USD Million)
- Figure 4. World Whole-cell Chiral Catalysis Production (2021-2032) & (kg)
- Figure 5. World Whole-cell Chiral Catalysis Average Price (2021-2032) & (US\$/kg)
- Figure 6. World Whole-cell Chiral Catalysis Production Value Market Share by Region (2021-2032)
- Figure 7. World Whole-cell Chiral Catalysis Production Market Share by Region (2021-2032)
- Figure 8. North America Whole-cell Chiral Catalysis Production (2021-2032) & (kg)
- Figure 9. Europe Whole-cell Chiral Catalysis Production (2021-2032) & (kg)
- Figure 10. China Whole-cell Chiral Catalysis Production (2021-2032) & (kg)
- Figure 11. Japan Whole-cell Chiral Catalysis Production (2021-2032) & (kg)
- Figure 12. Whole-cell Chiral Catalysis Market Drivers
- Figure 13. Factors Affecting Demand
- Figure 14. World Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 15. World Whole-cell Chiral Catalysis Consumption Market Share by Region (2021-2032)
- Figure 16. United States Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 17. China Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 18. Europe Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 19. Japan Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 20. South Korea Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 21. ASEAN Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 22. India Whole-cell Chiral Catalysis Consumption (2021-2032) & (kg)
- Figure 23. Producer Shipments of Whole-cell Chiral Catalysis by Manufacturer Revenue (\$MM) and Market Share (%): 2025
- Figure 24. Global Four-firm Concentration Ratios (CR4) for Whole-cell Chiral Catalysis Markets in 2025
- Figure 25. Global Four-firm Concentration Ratios (CR8) for Whole-cell Chiral Catalysis Markets in 2025
- Figure 26. United States VS China: Whole-cell Chiral Catalysis Production Value Market Share Comparison (2021 & 2025 & 2032)

Figure 27. United States VS China: Whole-cell Chiral Catalysis Production Market Share Comparison (2021 & 2025 & 2032)

Figure 28. United States VS China: Whole-cell Chiral Catalysis Consumption Market Share Comparison (2021 & 2025 & 2032)

Figure 29. United States Based Manufacturers Whole-cell Chiral Catalysis Production Market Share 2025

Figure 30. China Based Manufacturers Whole-cell Chiral Catalysis Production Market Share 2025

Figure 31. Rest of World Based Manufacturers Whole-cell Chiral Catalysis Production Market Share 2025

Figure 32. World Whole-cell Chiral Catalysis Production Value by Type, (USD Million), 2021 & 2025 & 2032

Figure 33. World Whole-cell Chiral Catalysis Production Value Market Share by Type in 2025

Figure 34. E. coli

Figure 35. Yeast

Figure 36. Fungi

Figure 37. Others

Figure 38. World Whole-cell Chiral Catalysis Production Market Share by Type (2021-2032)

Figure 39. World Whole-cell Chiral Catalysis Production Value Market Share by Type (2021-2032)

Figure 40. World Whole-cell Chiral Catalysis Average Price by Type (2021-2032) & (US\$/kg)

Figure 41. World Whole-cell Chiral Catalysis Production Value by Reaction, (USD Million), 2021 & 2025 & 2032

Figure 42. World Whole-cell Chiral Catalysis Production Value Market Share by Reaction in 2025

Figure 43. Bioreduction

Figure 44. Transamination

Figure 45. Dynamic Resolution

Figure 46. Enzyme Cascade

Figure 47. Biocatalytic Oxidation

Figure 48. World Whole-cell Chiral Catalysis Production Market Share by Reaction (2021-2032)

Figure 49. World Whole-cell Chiral Catalysis Production Value Market Share by Reaction (2021-2032)

Figure 50. World Whole-cell Chiral Catalysis Average Price by Reaction (2021-2032) & (US\$/kg)

Figure 51. World Whole-cell Chiral Catalysis Production Value by Application, (USD Million), 2021 & 2025 & 2032

Figure 52. World Whole-cell Chiral Catalysis Production Value Market Share by Application in 2025

Figure 53. Pharmaceuticals

Figure 54. Agrochemicals

Figure 55. World Whole-cell Chiral Catalysis Production Market Share by Application (2021-2032)

Figure 56. World Whole-cell Chiral Catalysis Production Value Market Share by Application (2021-2032)

Figure 57. World Whole-cell Chiral Catalysis Average Price by Application (2021-2032) & (US\$/kg)

Figure 58. Whole-cell Chiral Catalysis Industry Chain

Figure 59. Whole-cell Chiral Catalysis Procurement Model

Figure 60. Whole-cell Chiral Catalysis Sales Model

Figure 61. Whole-cell Chiral Catalysis Sales Channels, Direct Sales, and Distribution

Figure 62. Methodology

Figure 63. Research Process and Data Source

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