

Global Polyhydroxyalkanoate (PHA) Production, Demand and Key Producers, 2022-2028

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Abstracts

Polyhydroxyalkanoate (PHA) is a storage material for carbon and energy sources in microorganisms. When carbon sources are abundant and other nutrients (N/P/S, etc.) are insufficient, they will be synthesized in different microorganisms. PHA synthesis the main costs are the substrate cost in the fermentation stage and the cost of downstream extraction and purification.

The diversity of PHA monomer structure is mainly different from the difference in the side chain group on the C-3 position, in which the monomer with 3-5 carbon atoms is short-chain PHA (SCL PHA), and the number of carbon atoms above 6 is medium and long chain. PHA (MCL PHA). In the general structural formula of PHA, R can be an alkenyl group, a benzene ring, an alkyl group, etc., usually m is 1, and n represents the degree of polymerization, which determines the molecular weight of the polymer. Poly-3-hydroxybutyric acid (PHB) with a methyl side chain is the most common. Poly-3-hydroxybutyric acid (PHB) has thermoplasticity like polypropylene and has brittleness and poor thermal stability; polyhydroxybutyric acid-co-hydroxyvaleric acid copolymer (PHBV) has more good strength, hardness, greater elasticity, lower melting point. Short-chain PHA presents a hard crystal; medium- and long-chain PHA is a thermoplastic elastomer with good flexibility, low hardness, slow crystallization rate, and the melting temperature is mostly kept in the range of 39-61 °C; short-chain medium- and long-chain copolymerization The PHA (SCL-MCL PHA), by adjusting the monomer ratio, obtains a copolymerized PHA material that combines the excellent properties of short-chain and medium-long chains. PHA synthesis methods include microbial fermentation (wild bacteria method, recombinant engineering bacteria method), transgenic plant method, activated sludge method, and microbial fermentation method are the main ways of biosynthesizing PHA at present. The microorganisms that synthesize PHA are mainly divided into three categories: pure bacteria, engineering

bacteria and mixed bacteria. In the process of biosynthesizing PHA, there are disadvantages such as high sterilization cost, high consumption of fresh water, and easy contamination by discontinuous fermentation, resulting in lower competitiveness of industrial biotechnology compared with chemical processes.

There are two methods of synthesis of PHA: biosynthesis and chemical synthesis.

Biosynthesis:

?Bacterial synthesis method: Different microorganisms can convert different fermentation substrates into PHA under suitable conditions.

? Genetic engineering method: introduce the relevant enzymes of *Alcaligenes eutrophicus* bacteria that synthesize PHB into oil plants to obtain transgenic plants, and clone and synthesize PHB from the cells or plastids of these transgenic plants. The genetic method saves the separation and purification steps of PHB and bacteria in the bacterial method, which can reduce the synthesis cost, but the low yield and the difficulty of purification seriously restrict the large-scale production and application of PHA.

?Activated sludge method: Activated sludge is a bacterial mass containing a large number of active microorganisms and a small number of impurities and contains a large amount of biologically active substances and organic substances. The specific process is taking the remaining activated sludge from the sewage plant and put it into the SBR reactor. After the sludge is in good condition, the color changes from brown to light yellow, and the activity is stable, it enters the next cycle of domestication process, and finally discharges a batch of the activated sludge rich in PHA can be extracted by PHA, and then a new batch of excess sludge can be added again and repeat steps 1 to 3 to obtain high-yield PHA sludge in batches.

Chemical synthesis method:

?the bond between the carbonyl group in the lactone ring and the oxygen atom is broken, and there are few racemates in the product.

?the bond between the α -carbon atom and the oxygen atom in the lactone ring is broken, and the enantiomer can be racemized.

According to the number of carbon atoms in the PHA monomer, PHA can be divided into two categories:

1. According to the number of carbon atoms in the PHA monomer, PHA can be divided into two categories

?Short chain: the number of carbon atoms is 3-5, such as PHB, PHV.

?Medium and long chain: the number of carbon atoms is 6-14, such as PHHx, PHO

2. According to the different types of monomers, PHA can be divided into two categories

?Homopolymer, the number of monomers is 1, such as PHB, PHV.

?Copolymer, the number of monomers is greater than or equal to 2, such as PHBHHx, PHBV

At present, the main ones commercialized on the market are PHB, PHBV, P34HB, and PHBHHx

This report studies the global Polyhydroxyalkanoate (PHA) production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Polyhydroxyalkanoate (PHA), and provides market size (US\$ million) and Year-over-Year (YoY) Growth, considering 2021 as the base year. This report explores demand trends and competition, as well as details the characteristics of Polyhydroxyalkanoate (PHA) that contribute to its increasing demand across many markets.

The global Polyhydroxyalkanoate (PHA) market size is expected to reach \$ 338.2 million by 2028, rising at a market growth of 9.7% CAGR during the forecast period (2022-2028).

Highlights and key features of the study

Global Polyhydroxyalkanoate (PHA) total production and demand, 2017-2028, (Tons)

Global Polyhydroxyalkanoate (PHA) total production value, 2017-2028, (USD Million)

Global Polyhydroxyalkanoate (PHA) production by region & country, production, value, CAGR, 2017-2028, (USD Million) & (Tons)

Global Polyhydroxyalkanoate (PHA) consumption by region & country, CAGR, 2017-2028 & (Tons)

U.S. VS China: Polyhydroxyalkanoate (PHA) domestic production, consumption, key domestic manufacturers and share

Global Polyhydroxyalkanoate (PHA) production by manufacturer, production, price, value and market share 2017-2022, (USD Million) & (Tons)

Global Polyhydroxyalkanoate (PHA) production by Type, production, value, CAGR, 2017-2028, (USD Million) & (Tons)

Global Polyhydroxyalkanoate (PHA) production by Application production, value, CAGR, 2017-2028, (USD Million) & (Tons)

This reports profiles key players in the global Polyhydroxyalkanoate (PHA) market based on the following parameters – headquarters, production locations, products portfolio, Polyhydroxyalkanoate (PHA) revenue, sales, average price and gross margin, recent developments.

This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals, COVID-19 and Russia-Ukraine War Influence.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Polyhydroxyalkanoate (PHA) market

Detailed Segmentation:

Each section contains quantitative market data including market by value (US\$ Millions), volume (production, consumption) & (Tons) and average price (US\$/Ton) by manufacturer, by Type, and by Application. Data is given for the years 2017-2028 by year with 2021 as the base year, 2022 as the estimate year, and 2028 as the forecast year.

Global Polyhydroxyalkanoate (PHA) Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Global Polyhydroxyalkanoate (PHA) Market, Segmentation by Type

PHB-Poly(3-hydroxybutyrate)

PHBV-poly(3-hydroxybutyrate-co-3-hydroxyvalerate)

P34HB-poly(3-hydroxybutyrate-co-4-hydroxybutyrate)

PHBHHxpoly(3-hydroxybutyrate-co-3-hydroxyhexanoate)

Global Polyhydroxyalkanoate (PHA) Market, Segmentation by Application

Packaging

Biomedical Implant

Agricultural

Food Services

Others

Companies Profiled:

Danimer Scientific

Kaneka

Navigate Corporation

Tian'an Biopolymer

Biomer

Shenzhen Ecomann Technology

RWDC Industries

Newlight Technologies

CJ CheilJedang

PHB Industrial S.A.

Mango Materials

Key Questions Answered

1. How big is the global Polyhydroxyalkanoate (PHA) market?
2. What is the demand of the global Polyhydroxyalkanoate (PHA) market?
3. What is the year over year growth of the global Polyhydroxyalkanoate (PHA) market?
4. What is the production and production value of the global Polyhydroxyalkanoate (PHA) market?
5. Who are the key producers in the global Polyhydroxyalkanoate (PHA) market?
6. What are the growth factors driving the market demand?

Contents

1 SUPPLY SUMMARY

- 1.1 Polyhydroxyalkanoate (PHA) Introduction
- 1.2 World Polyhydroxyalkanoate (PHA) Supply & Forecast
 - 1.2.1 World Polyhydroxyalkanoate (PHA) Production Value (2017 & 2021 & 2028)
 - 1.2.2 World Polyhydroxyalkanoate (PHA) Production (2017-2028)
 - 1.2.3 World Polyhydroxyalkanoate (PHA) Pricing Trends (2017-2028)
- 1.3 World Polyhydroxyalkanoate (PHA) Production by Region
 - 1.3.1 World Polyhydroxyalkanoate (PHA) Production Value by Region (2017-2028)
 - 1.3.2 World Polyhydroxyalkanoate (PHA) Production by Region (2017-2028)
 - 1.3.3 World Polyhydroxyalkanoate (PHA) Average Price by Region (2017-2028)
 - 1.3.4 North America Polyhydroxyalkanoate (PHA) Production (2017-2028)
 - 1.3.5 Europe Polyhydroxyalkanoate (PHA) Production (2017-2028)
 - 1.3.6 China Polyhydroxyalkanoate (PHA) Production (2017-2028)
 - 1.3.7 Japan Polyhydroxyalkanoate (PHA) Production (2017-2028)
- 1.4 Market Drivers, Restraints and Trends
 - 1.4.1 Polyhydroxyalkanoate (PHA) Market Drivers
 - 1.4.2 Factors Affecting Demand
 - 1.4.3 Polyhydroxyalkanoate (PHA) Major Market Trends
- 1.5 Influence of COVID-19 and Russia-Ukraine War
 - 1.5.1 Influence of COVID-19
 - 1.5.2 Influence of Russia-Ukraine War

2 DEMAND SUMMARY

- 2.1 World Polyhydroxyalkanoate (PHA) Demand (2017-2028)
- 2.2 World Polyhydroxyalkanoate (PHA) Consumption by Region
 - 2.2.1 World Polyhydroxyalkanoate (PHA) Consumption by Region (2017-2022)
 - 2.2.2 World Polyhydroxyalkanoate (PHA) Consumption Forecast by Region (2023-2028)
- 2.3 United States Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.4 China Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.5 Europe Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.6 Japan Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.7 South Korea Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.8 ASEAN Polyhydroxyalkanoate (PHA) Consumption (2017-2028)
- 2.9 India Polyhydroxyalkanoate (PHA) Consumption (2017-2028)

3 WORLD POLYHYDROXYALKANOATE (PHA) MANUFACTURERS COMPETITIVE ANALYSIS

- 3.1 World Polyhydroxyalkanoate (PHA) Production Value by Manufacturer (2017-2022)
- 3.2 World Polyhydroxyalkanoate (PHA) Production by Manufacturer (2017-2022)
- 3.3 World Polyhydroxyalkanoate (PHA) Average Price by Manufacturer (2017-2022)
- 3.4 Polyhydroxyalkanoate (PHA) Company Evaluation Quadrant
- 3.5 Industry Rank and Concentration Rate (CR)
 - 3.5.1 Global Polyhydroxyalkanoate (PHA) Industry Rank of Major Manufacturers
 - 3.5.2 Global Concentration Ratios (CR4) for Polyhydroxyalkanoate (PHA) in 2021
 - 3.5.3 Global Concentration Ratios (CR8) for Polyhydroxyalkanoate (PHA) in 2021
- 3.6 Polyhydroxyalkanoate (PHA) Market: Overall Company Footprint Analysis
 - 3.6.1 Polyhydroxyalkanoate (PHA) Market: Region Footprint
 - 3.6.2 Polyhydroxyalkanoate (PHA) Market: Company Product Type Footprint
 - 3.6.3 Polyhydroxyalkanoate (PHA) 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: Polyhydroxyalkanoate (PHA) Production Value Comparison
 - 4.1.1 United States VS China: Polyhydroxyalkanoate (PHA) Production Value Comparison (2017 & 2021 & 2028)
 - 4.1.2 United States VS China: Polyhydroxyalkanoate (PHA) Production Value Market Share Comparison (2017 & 2021 & 2028)
- 4.2 United States VS China: Polyhydroxyalkanoate (PHA) Production Comparison
 - 4.2.1 United States VS China: Polyhydroxyalkanoate (PHA) Production Comparison (2017 & 2021 & 2028)
 - 4.2.2 United States VS China: Polyhydroxyalkanoate (PHA) Production Market Share Comparison (2017 & 2021 & 2028)
- 4.3 United States VS China: Polyhydroxyalkanoate (PHA) Consumption Comparison
 - 4.3.1 United States VS China: Polyhydroxyalkanoate (PHA) Consumption Comparison (2017 & 2021 & 2028)

4.3.2 United States VS China: Polyhydroxyalkanoate (PHA) Consumption Market Share Comparison (2017 & 2021 & 2028)

4.4 United States Polyhydroxyalkanoate (PHA) Key Producers and Market Share, 2017-2022

4.4.1 Major Manufacturer of Polyhydroxyalkanoate (PHA) in United States, Company Headquarters and Production Place (States, Country)

4.4.2 United States Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022)

4.4.3 United States Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022)

4.5 China Polyhydroxyalkanoate (PHA) Key Producers and Market Share, 2017-2022

4.5.1 Major Manufacturer of Polyhydroxyalkanoate (PHA) in China, Company Headquarters and Production Place (Province, Country)

4.5.2 China Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022)

4.5.3 China Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022)

4.6 Rest of World Polyhydroxyalkanoate (PHA) Key Producers and Market Share, 2017-2022

4.6.1 Major Manufacturer of Polyhydroxyalkanoate (PHA) in Rest of World, Company Headquarters and Production Place (State, Country)

4.6.2 Rest of World Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022)

4.6.3 Rest of World Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022)

5 MARKET ANALYSIS BY TYPE

5.1 World Polyhydroxyalkanoate (PHA) Market Size Overview by Type: 2017 VS 2021 VS 2028

5.2 Segment Introduction by Type

5.2.1 PHB-Poly(3-hydroxybutyrate)

5.2.2 PHBV-poly(3-hydroxybutyrate-co-3-hydroxyvalerate)

5.2.3 P34HB-poly(3-hydroxybutyrate-co-4-hydroxybutyrate)

5.2.4 PHBHHxpoly(3-hydroxybutyrate-co-3-hydroxyhexanoate)

5.3 Market Segment by Type

5.3.1 World Polyhydroxyalkanoate (PHA) Production by Type (2017-2028)

5.3.2 World Polyhydroxyalkanoate (PHA) Production Value by Type (2017-2028)

5.3.3 World Polyhydroxyalkanoate (PHA) Average Price by Type (2017-2028)

6 MARKET ANALYSIS BY APPLICATION

6.1 World Polyhydroxyalkanoate (PHA) Market Size Overview by Application: 2017 VS 2021 VS 2028

6.2 Segment Introduction by Application

6.2.1 Packaging

6.2.2 Biomedical Implant

6.2.3 Agricultural

6.2.4 Food Services

6.2.5 Others

6.3 Market Segment by Application

6.3.1 World Polyhydroxyalkanoate (PHA) Production by Application (2017-2028)

6.3.2 World Polyhydroxyalkanoate (PHA) Production Value by Application (2017-2028)

6.3.3 World Polyhydroxyalkanoate (PHA) Average Price by Application (2017-2028)

7 COMPANY PROFILES

7.1 Danimer Scientific

7.1.1 Danimer Scientific Details

7.1.2 Danimer Scientific Major Business

7.1.3 Danimer Scientific Polyhydroxyalkanoate (PHA) Product and Services

7.1.4 Danimer Scientific Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.1.5 Danimer Scientific Recent Developments/Updates

7.1.6 Danimer Scientific Competitive Strengths & Weaknesses

7.2 Kaneka

7.2.1 Kaneka Details

7.2.2 Kaneka Major Business

7.2.3 Kaneka Polyhydroxyalkanoate (PHA) Product and Services

7.2.4 Kaneka Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.2.5 Kaneka Recent Developments/Updates

7.2.6 Kaneka Competitive Strengths & Weaknesses

7.3 Nafigate Corporation

7.3.1 Nafigate Corporation Details

7.3.2 Nafigate Corporation Major Business

7.3.3 Nafigate Corporation Polyhydroxyalkanoate (PHA) Product and Services

7.3.4 Nafigate Corporation Polyhydroxyalkanoate (PHA) Production, Price, Value,

Gross Margin and Market Share (2017-2022)

7.3.5 Nafigate Corporation Recent Developments/Updates

7.3.6 Nafigate Corporation Competitive Strengths & Weaknesses

7.4 Tian'an Biopolymer

7.4.1 Tian'an Biopolymer Details

7.4.2 Tian'an Biopolymer Major Business

7.4.3 Tian'an Biopolymer Polyhydroxyalkanoate (PHA) Product and Services

7.4.4 Tian'an Biopolymer Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.4.5 Tian'an Biopolymer Recent Developments/Updates

7.4.6 Tian'an Biopolymer Competitive Strengths & Weaknesses

7.5 Biomer

7.5.1 Biomer Details

7.5.2 Biomer Major Business

7.5.3 Biomer Polyhydroxyalkanoate (PHA) Product and Services

7.5.4 Biomer Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.5.5 Biomer Recent Developments/Updates

7.5.6 Biomer Competitive Strengths & Weaknesses

7.6 Shenzhen Ecomann Technology

7.6.1 Shenzhen Ecomann Technology Details

7.6.2 Shenzhen Ecomann Technology Major Business

7.6.3 Shenzhen Ecomann Technology Polyhydroxyalkanoate (PHA) Product and Services

7.6.4 Shenzhen Ecomann Technology Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.6.5 Shenzhen Ecomann Technology Recent Developments/Updates

7.6.6 Shenzhen Ecomann Technology Competitive Strengths & Weaknesses

7.7 RWDC Industries

7.7.1 RWDC Industries Details

7.7.2 RWDC Industries Major Business

7.7.3 RWDC Industries Polyhydroxyalkanoate (PHA) Product and Services

7.7.4 RWDC Industries Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)

7.7.5 RWDC Industries Recent Developments/Updates

7.7.6 RWDC Industries Competitive Strengths & Weaknesses

7.8 Newlight Technologies

7.8.1 Newlight Technologies Details

7.8.2 Newlight Technologies Major Business

- 7.8.3 Newlight Technologies Polyhydroxyalkanoate (PHA) Product and Services
- 7.8.4 Newlight Technologies Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)
- 7.8.5 Newlight Technologies Recent Developments/Updates
- 7.8.6 Newlight Technologies Competitive Strengths & Weaknesses
- 7.9 CJ CheilJedang
 - 7.9.1 CJ CheilJedang Details
 - 7.9.2 CJ CheilJedang Major Business
 - 7.9.3 CJ CheilJedang Polyhydroxyalkanoate (PHA) Product and Services
 - 7.9.4 CJ CheilJedang Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)
 - 7.9.5 CJ CheilJedang Recent Developments/Updates
 - 7.9.6 CJ CheilJedang Competitive Strengths & Weaknesses
- 7.10 PHB Industrial S.A.
 - 7.10.1 PHB Industrial S.A. Details
 - 7.10.2 PHB Industrial S.A. Major Business
 - 7.10.3 PHB Industrial S.A. Polyhydroxyalkanoate (PHA) Product and Services
 - 7.10.4 PHB Industrial S.A. Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)
 - 7.10.5 PHB Industrial S.A. Recent Developments/Updates
 - 7.10.6 PHB Industrial S.A. Competitive Strengths & Weaknesses
- 7.11 Mango Materials
 - 7.11.1 Mango Materials Details
 - 7.11.2 Mango Materials Major Business
 - 7.11.3 Mango Materials Polyhydroxyalkanoate (PHA) Product and Services
 - 7.11.4 Mango Materials Polyhydroxyalkanoate (PHA) Production, Price, Value, Gross Margin and Market Share (2017-2022)
 - 7.11.5 Mango Materials Recent Developments/Updates
 - 7.11.6 Mango Materials Competitive Strengths & Weaknesses

8 RAW MATERIAL AND INDUSTRY CHAIN

- 8.1 Raw Material of Polyhydroxyalkanoate (PHA) and Key Manufacturers
- 8.2 Polyhydroxyalkanoate (PHA) Manufacturing Costs
- 8.3 Polyhydroxyalkanoate (PHA) Production Process
- 8.4 Polyhydroxyalkanoate (PHA) Industrial Chain

9 DISTRIBUTION CHANNEL ANALYSIS

9.1 Distribution Channel Breakdown for Polyhydroxyalkanoate (PHA) Shipments (%): 2017-2028

9.1.1 Direct Channel

9.1.2 Indirect Channel

9.2 Polyhydroxyalkanoate (PHA) Typical Distributors

9.3 Polyhydroxyalkanoate (PHA) Typical Customers

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 Polyhydroxyalkanoate (PHA) Production Value by Region (2017, 2022 and 2028) & (USD Million)

Table 2. World Polyhydroxyalkanoate (PHA) Production Value by Region (2017-2022) & (USD Million)

Table 3. World Polyhydroxyalkanoate (PHA) Production Value by Region (2023-2028) & (USD Million)

Table 4. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Region (2017-2022)

Table 5. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Region (2023-2028)

Table 6. World Polyhydroxyalkanoate (PHA) Production by Region (2017-2022) & (Tons)

Table 7. World Polyhydroxyalkanoate (PHA) Production by Region (2023-2028) & (Tons)

Table 8. World Polyhydroxyalkanoate (PHA) Production Market Share by Region (2017-2022)

Table 9. World Polyhydroxyalkanoate (PHA) Production Market Share by Region (2023-2028)

Table 10. World Polyhydroxyalkanoate (PHA) Average Price by Region (2017-2022) & (US\$/Ton)

Table 11. World Polyhydroxyalkanoate (PHA) Average Price by Region (2023-2028) & (US\$/Ton)

Table 12. Polyhydroxyalkanoate (PHA) Major Market Trends

Table 13. World Polyhydroxyalkanoate (PHA) Consumption Growth Rate Forecast by Region (2017 & 2021 & 2028) & (Tons)

Table 14. World Polyhydroxyalkanoate (PHA) Consumption by Region (2017-2022) & (Tons)

Table 15. World Polyhydroxyalkanoate (PHA) Consumption Forecast by Region (2023-2028) & (Tons)

Table 16. World Polyhydroxyalkanoate (PHA) Production Value by Manufacturer (2017-2022) & (USD Million)

Table 17. Production Value Market Share of Key Polyhydroxyalkanoate (PHA) Producers in 2021

Table 18. World Polyhydroxyalkanoate (PHA) Production by Manufacturer (2017-2022) & (Tons)

Table 19. Production Market Share of Key Polyhydroxyalkanoate (PHA) Producers in 2021

Table 20. World Polyhydroxyalkanoate (PHA) Average Price by Manufacturer (2017-2022) & (US\$/Ton)

Table 21. Global Polyhydroxyalkanoate (PHA) Company Evaluation Quadrant

Table 22. World Polyhydroxyalkanoate (PHA) Industry Rank of Major Manufacturers, Based on Production Value in 2021

Table 23. Head Office and Polyhydroxyalkanoate (PHA) Production Site of Key Manufacturer

Table 24. Polyhydroxyalkanoate (PHA) Market: Company Product Type Footprint

Table 25. Polyhydroxyalkanoate (PHA) Market: Company Product Application Footprint

Table 26. Polyhydroxyalkanoate (PHA) Competitive Factors

Table 27. Polyhydroxyalkanoate (PHA) New Entrant and Capacity Expansion Plans

Table 28. Polyhydroxyalkanoate (PHA) Mergers & Acquisitions Activity

Table 29. United States VS China Polyhydroxyalkanoate (PHA) Production Value Comparison, (2017 & 2021 & 2028) & (USD Million)

Table 30. United States VS China Polyhydroxyalkanoate (PHA) Production Comparison, (2017 & 2021 & 2028) & (Tons)

Table 31. United States VS China Polyhydroxyalkanoate (PHA) Consumption Comparison, (2017 & 2021 & 2028) & (Tons)

Table 32. Major Manufacturer of Polyhydroxyalkanoate (PHA) in United States, Company Headquarters and Production Place (States, Country)

Table 33. United States Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022) & (USD Million)

Table 34. United States Polyhydroxyalkanoate (PHA) Production Value Market Share by Domestic Manufacturer, (2017-2022)

Table 35. United States Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022) & (Tons)

Table 36. United States Polyhydroxyalkanoate (PHA) Production Market Share by Domestic Manufacturer, (2017-2022)

Table 37. Major Manufacturer of Polyhydroxyalkanoate (PHA) in China, Company Headquarters and Production Place (Province, Country)

Table 38. China Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022) & (USD Million)

Table 39. China Polyhydroxyalkanoate (PHA) Production Value Market Share by Domestic Manufacturer, (2017-2022)

Table 40. China Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022) & (Tons)

Table 41. China Polyhydroxyalkanoate (PHA) Production Market Share by Domestic

Manufacturer, (2017-2022)

Table 42. Major Manufacturer of Polyhydroxyalkanoate (PHA) in Rest of World, Company Headquarters and Production Place (State, Country)

Table 43. Rest of World Polyhydroxyalkanoate (PHA) Production Value by Domestic Manufacturer, (2017-2022) & (USD Million)

Table 44. Rest of World Polyhydroxyalkanoate (PHA) Production Value Market Share by Domestic Manufacturer, (2017-2022)

Table 45. Rest of World Polyhydroxyalkanoate (PHA) Production by Domestic Manufacturer, (2017-2022) & (Tons)

Table 46. Rest of World Polyhydroxyalkanoate (PHA) Production Market Share by Domestic Manufacturer, (2017-2022)

Table 47. World Polyhydroxyalkanoate (PHA) Production Value by Type, (USD Million), 2017 & 2021 & 2028

Table 48. World Polyhydroxyalkanoate (PHA) Production by Type (2017-2022) & (Tons)

Table 49. World Polyhydroxyalkanoate (PHA) Production by Type (2023-2028) & (Tons)

Table 50. World Polyhydroxyalkanoate (PHA) Production Value by Type (2017-2022) & (USD Million)

Table 51. World Polyhydroxyalkanoate (PHA) Production Value by Type (2023-2028) & (USD Million)

Table 52. World Polyhydroxyalkanoate (PHA) Average Price by Type (2017-2022) & (US\$/Ton)

Table 53. World Polyhydroxyalkanoate (PHA) Average Price by Type (2023-2028) & (US\$/Ton)

Table 54. World Polyhydroxyalkanoate (PHA) Production Value by Application, (USD Million), 2017 & 2021 & 2028

Table 55. World Polyhydroxyalkanoate (PHA) Production by Application (2017-2022) & (Tons)

Table 56. World Polyhydroxyalkanoate (PHA) Production by Application (2023-2028) & (Tons)

Table 57. World Polyhydroxyalkanoate (PHA) Production Value by Application (2017-2022) & (USD Million)

Table 58. World Polyhydroxyalkanoate (PHA) Production Value by Application (2023-2028) & (USD Million)

Table 59. World Polyhydroxyalkanoate (PHA) Average Price by Application (2017-2022) & (US\$/Ton)

Table 60. World Polyhydroxyalkanoate (PHA) Average Price by Application (2023-2028) & (US\$/Ton)

Table 61. Danimer Scientific Basic Information, Manufacturing Base and Competitors

Table 62. Danimer Scientific Major Business

Table 63. Danimer Scientific Polyhydroxyalkanoate (PHA) Product and Services

Table 64. Danimer Scientific Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 65. Danimer Scientific Recent Developments/Updates

Table 66. Danimer Scientific Competitive Strengths & Weaknesses

Table 67. Kaneka Basic Information, Manufacturing Base and Competitors

Table 68. Kaneka Major Business

Table 69. Kaneka Polyhydroxyalkanoate (PHA) Product and Services

Table 70. Kaneka Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 71. Kaneka Recent Developments/Updates

Table 72. Kaneka Competitive Strengths & Weaknesses

Table 73. Nafigate Corporation Basic Information, Manufacturing Base and Competitors

Table 74. Nafigate Corporation Major Business

Table 75. Nafigate Corporation Polyhydroxyalkanoate (PHA) Product and Services

Table 76. Nafigate Corporation Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 77. Nafigate Corporation Recent Developments/Updates

Table 78. Nafigate Corporation Competitive Strengths & Weaknesses

Table 79. Tian'an Biopolymer Basic Information, Manufacturing Base and Competitors

Table 80. Tian'an Biopolymer Major Business

Table 81. Tian'an Biopolymer Polyhydroxyalkanoate (PHA) Product and Services

Table 82. Tian'an Biopolymer Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 83. Tian'an Biopolymer Recent Developments/Updates

Table 84. Tian'an Biopolymer Competitive Strengths & Weaknesses

Table 85. Biomer Basic Information, Manufacturing Base and Competitors

Table 86. Biomer Major Business

Table 87. Biomer Polyhydroxyalkanoate (PHA) Product and Services

Table 88. Biomer Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 89. Biomer Recent Developments/Updates

Table 90. Biomer Competitive Strengths & Weaknesses

Table 91. Shenzhen Ecomann Technology Basic Information, Manufacturing Base and Competitors

Table 92. Shenzhen Ecomann Technology Major Business

Table 93. Shenzhen Ecomann Technology Polyhydroxyalkanoate (PHA) Product and Services

Table 94. Shenzhen Ecomann Technology Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 95. Shenzhen Ecomann Technology Recent Developments/Updates

Table 96. Shenzhen Ecomann Technology Competitive Strengths & Weaknesses

Table 97. RWDC Industries Basic Information, Manufacturing Base and Competitors

Table 98. RWDC Industries Major Business

Table 99. RWDC Industries Polyhydroxyalkanoate (PHA) Product and Services

Table 100. RWDC Industries Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 101. RWDC Industries Recent Developments/Updates

Table 102. RWDC Industries Competitive Strengths & Weaknesses

Table 103. Newlight Technologies Basic Information, Manufacturing Base and Competitors

Table 104. Newlight Technologies Major Business

Table 105. Newlight Technologies Polyhydroxyalkanoate (PHA) Product and Services

Table 106. Newlight Technologies Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 107. Newlight Technologies Recent Developments/Updates

Table 108. Newlight Technologies Competitive Strengths & Weaknesses

Table 109. CJ CheilJedang Basic Information, Manufacturing Base and Competitors

Table 110. CJ CheilJedang Major Business

Table 111. CJ CheilJedang Polyhydroxyalkanoate (PHA) Product and Services

Table 112. CJ CheilJedang Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 113. CJ CheilJedang Recent Developments/Updates

Table 114. CJ CheilJedang Competitive Strengths & Weaknesses

Table 115. PHB Industrial S.A. Basic Information, Manufacturing Base and Competitors

Table 116. PHB Industrial S.A. Major Business

Table 117. PHB Industrial S.A. Polyhydroxyalkanoate (PHA) Product and Services

Table 118. PHB Industrial S.A. Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 119. PHB Industrial S.A. Recent Developments/Updates

Table 120. Mango Materials Basic Information, Manufacturing Base and Competitors

Table 121. Mango Materials Major Business

Table 122. Mango Materials Polyhydroxyalkanoate (PHA) Product and Services

Table 123. Mango Materials Polyhydroxyalkanoate (PHA) Production (Tons), Price (US\$/Ton), Production Value (USD Million), Gross Margin and Market Share (2017-2022)

Table 124. Polyhydroxyalkanoate (PHA) Raw Material

Table 125. Key Manufacturers of Polyhydroxyalkanoate (PHA) Raw Materials

Table 126. Polyhydroxyalkanoate (PHA) Typical Distributors

Table 127. Polyhydroxyalkanoate (PHA) Typical Customers

List Of Figures

LIST OF FIGURES

Figure 1. Polyhydroxyalkanoate (PHA) Picture

Figure 2. World Polyhydroxyalkanoate (PHA) Production Value: 2017 & 2021 & 2028, (USD Million)

Figure 3. World Polyhydroxyalkanoate (PHA) Production Value and Forecast (2017-2028) & (USD Million)

Figure 4. World Polyhydroxyalkanoate (PHA) Production (2017-2028) & (Tons)

Figure 5. World Polyhydroxyalkanoate (PHA) Average Price (2017-2028) & (US\$/Ton)

Figure 6. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Region (2017-2028)

Figure 7. World Polyhydroxyalkanoate (PHA) Production Market Share by Region (2017-2028)

Figure 8. North America Polyhydroxyalkanoate (PHA) Production (2017-2028) & (Tons)

Figure 9. Europe Polyhydroxyalkanoate (PHA) Production (2017-2028) & (Tons)

Figure 10. China Polyhydroxyalkanoate (PHA) Production (2017-2028) & (Tons)

Figure 11. Japan Polyhydroxyalkanoate (PHA) Production (2017-2028) & (Tons)

Figure 12. Polyhydroxyalkanoate (PHA) Market Drivers

Figure 13. Factors Affecting Demand

Figure 14. World Polyhydroxyalkanoate (PHA) Demand (2017-2028) & (Tons)

Figure 15. World Polyhydroxyalkanoate (PHA) Consumption Market Share by Region (2017-2028)

Figure 16. United States Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 17. China Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 18. Europe Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 19. Japan Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 20. South Korea Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 21. ASEAN Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 22. India Polyhydroxyalkanoate (PHA) Consumption (2017-2028) & (Tons)

Figure 23. Producer Shipments of Polyhydroxyalkanoate (PHA) by Manufacturer Revenue (\$MM) and Market Share (%): 2021

Figure 24. Global Four-firm Concentration Ratios (CR4) for Polyhydroxyalkanoate (PHA) Markets in 2021

Figure 25. Global Four-firm Concentration Ratios (CR8) for Polyhydroxyalkanoate (PHA) Markets in 2021

Figure 26. United States VS China: Polyhydroxyalkanoate (PHA) Production Value Market Share Comparison (2017 & 2021 & 2028)

Figure 27. United States VS China: Polyhydroxyalkanoate (PHA) Production Market Share Comparison (2017 & 2021 & 2028)

Figure 28. United States VS China: Polyhydroxyalkanoate (PHA) Consumption Market Share Comparison (2017 & 2021 & 2028)

Figure 29. Key Producers and Market Share of Polyhydroxyalkanoate (PHA) in United States

Figure 30. Key Producers and Market Share of Polyhydroxyalkanoate (PHA) in China

Figure 31. Key Producers and Market Share of Polyhydroxyalkanoate (PHA) in Rest of World

Figure 32. World Polyhydroxyalkanoate (PHA) Production Value by Type, (USD Million), 2017 & 2021 & 2028

Figure 33. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Type in 2021

Figure 34. PHB-Poly(3-hydroxybutyrate)

Figure 35. PHBV-poly(3-hydroxybutyrate-co-3-hydroxyvalerate)

Figure 36. P34HB-poly(3-hydroxybutyrate-co-4-hydroxybutyrate)

Figure 37. PHBHHxpoly(3-hydroxybutyrate-co-3-hydroxyhexanoate)

Figure 38. World Polyhydroxyalkanoate (PHA) Production Market Share by Type (2017-2028)

Figure 39. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Type (2017-2028)

Figure 40. World Polyhydroxyalkanoate (PHA) Average Price by Type (2017-2028) & (US\$/Ton)

Figure 41. World Polyhydroxyalkanoate (PHA) Production Value by Application, (USD Million), 2017 & 2021 & 2028

Figure 42. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Application in 2021

Figure 43. Packaging

Figure 44. Biomedical Implant

Figure 45. Agricultural

Figure 46. Food Services

Figure 47. Others

Figure 48. World Polyhydroxyalkanoate (PHA) Production Market Share by Application (2017-2028)

Figure 49. World Polyhydroxyalkanoate (PHA) Production Value Market Share by Application (2017-2028)

Figure 50. World Polyhydroxyalkanoate (PHA) Average Price by Application

(2017-2028) & (US\$/Ton)

Figure 51. Manufacturing Cost Structure Analysis of Polyhydroxyalkanoate (PHA) in 2021

Figure 52. Manufacturing Process Analysis of Polyhydroxyalkanoate (PHA)

Figure 53. Polyhydroxyalkanoate (PHA) Industrial Chain

Figure 54. Distribution Channel Breakdown for Polyhydroxyalkanoate (PHA) Shipments (%): 2017-2028

Figure 55. Direct Channel Pros & Cons

Figure 56. Indirect Channel Pros & Cons

Figure 57. Methodology

Figure 58. Research Process and Data Source

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