

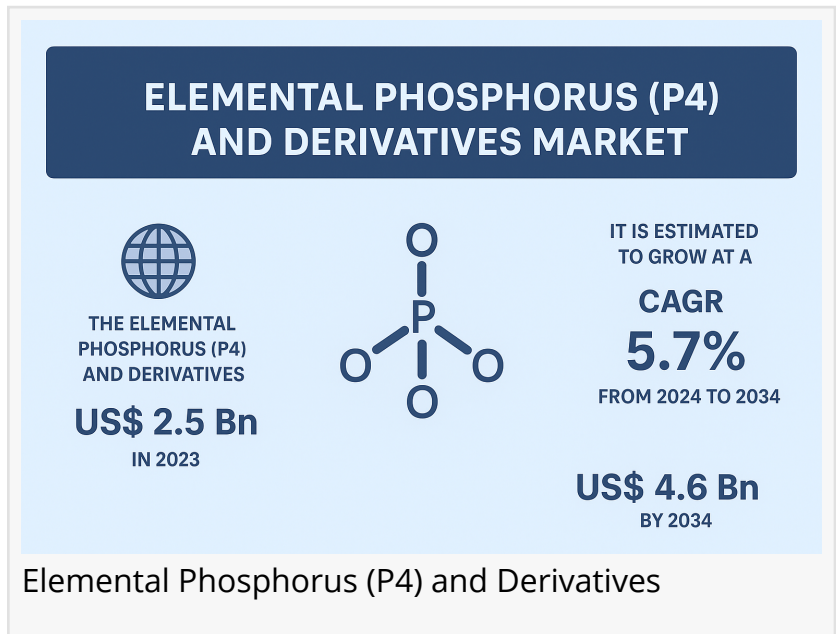
Elemental Phosphorus (P4) and Derivatives Market to Reach USD 4.6 Bn by 2034, Expanding at a CAGR of 5.7% | TMR

Rising demand in agriculture, growing adoption of lithium-ion battery technology, and increasing applications in industrial chemicals drive steady market.

WILMINGTON, DE, UNITED STATES,
September 19, 2025 /

EINPresswire.com/ -- The global [elemental phosphorus \(P4\) and derivatives market](#) is set for significant growth over the next decade. Valued at US\$ 2.5 billion in 2023, the market is projected to expand at a compound annual growth rate (CAGR) of 5.7%

from 2024 to 2034, surpassing US\$ 4.6 billion by the end of 2034. Rising consumption of phosphorus in agriculture, increasing need for high-performance lithium-ion batteries, and demand across multiple industrial sectors are the primary drivers fueling this expansion.



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The elemental phosphorus (P4) and derivatives market is expanding steadily, fueled by increasing applications in agriculture, chemicals, and flame retardants.”

*Transparency Market
Research*

Market Overview

Elemental phosphorus (P4) and its derivatives play a vital role across a wide range of industries, from agriculture to energy storage. Major derivatives include phosphoric acid, phosphorus pentoxide (P2O5), phosphoryl chloride, polyphosphoric acid (PPA), and phosphorus sulfides (P2S5). These compounds are essential for fertilizers, pesticides, flame retardants, detergents, pharmaceuticals, lubricants, and lithium-ion batteries.

Agriculture remains the largest consumer segment, with phosphorus-based fertilizers and pesticides crucial for ensuring high-yield crops. In parallel, the rapid growth of energy storage

and electric vehicle markets is driving adoption of phosphorus in lithium-iron phosphate (LiFePO₄) cathodes. Industrial applications—including plastics, textiles, water treatment, and flame retardants—further support market expansion.

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Analysts' Viewpoint

According to analysts at Transparency Market Research, the elemental phosphorus and derivatives market is witnessing strong demand momentum in Asia Pacific, driven by agricultural needs, industrial expansion, and population growth. Globally, the market benefits from two simultaneous megatrends: the push for higher agricultural productivity and the transition to clean energy storage technologies.

While opportunities abound, challenges such as environmental concerns, raw material dependency, and price volatility remain key issues. Nevertheless, ongoing innovation in phosphorus-based fertilizers, sustainable water treatment, and advanced lithium-ion batteries is expected to create significant long-term growth avenues.

Key Drivers of Market Growth

1. Rising Demand for Phosphorus in Agriculture

The growing global population has intensified the need for higher-yield crops, driving the use of phosphorus-based fertilizers and pesticides. Depletion of soil phosphorus and the adoption of precision farming are boosting demand for advanced phosphorus compounds. Sustainable farming initiatives and the development of improved phosphate fertilizers are further supporting this trend.

2. Increasing Demand for Lithium-Ion Battery Technology

Elemental phosphorus and its derivatives are critical in lithium-iron phosphate (LiFePO₄) batteries, valued for their safety, stability, and long lifecycle. With the expansion of electric vehicles and grid-scale energy storage, phosphorus-based cathode materials are becoming increasingly important. Their superior thermal stability and low risk of thermal runaway make them essential for future battery technologies.

3. Expanding Applications Across Industries

Phosphorus derivatives are extensively used in flame retardants, lubricants, water treatment, pharmaceuticals, and plastic additives. Growing industrialization in Asia Pacific and Latin America

is expected to further accelerate demand across these applications.

Segment Analysis

By Type

Elemental Phosphorus (P4)

Derivatives: Phosphoric Acid, Phosphoryl Chloride, Phosphorus Pentoxide (P2O5), Polyphosphoric Acid (PPA), Phosphorus Sulfides (P2S5), Others

By Application

Food

Pharmaceuticals

Detergents

Flame Retardant

Lubricant Additive

Plastic Additive

Pesticide (leading application segment)

Metal Extraction

Li-ion Batteries

Others

The pesticide segment holds a prominent share, given the essential role of phosphorus-based pesticides in modern agriculture and pest management. Li-ion batteries are emerging as a fast-growing segment due to demand from EVs and renewable energy storage.

Regional Insights

Asia Pacific dominates with 41% share, led by China, India, and Southeast Asia. Large agricultural bases and strong industrial growth drive regional demand. China remains the largest producer due to abundant phosphate rock reserves.

Europe (24% share) is driven by advanced agriculture and sustainable water treatment solutions.

North America (19% share) benefits from precision agriculture and industrial applications.

Latin America (5.2%) sees demand from large agricultural economies, while Middle East & Africa (3.1%) show growth in water treatment and emerging industries.

Key Players and Industry Leaders

The market is moderately fragmented, with both global and regional players competing through R&D, acquisitions, and product innovation. Key companies include:

Italmatch Chemicals S.p.A.

Israel Chemicals Limited

Bayer AG

UPL

Lanxess AG

Clariant AG

Hefei TNJ Chemical Industry Co., Ltd.

Sichuan Jinguang Industrial Group Co., Ltd.

Aditya Birla Chemicals (India) Ltd.

Yunnan Phosphate Haikou Co., Ltd.

Kazphosphate

Prayon

Guizhou Kailin Holdings (Group) Co., Ltd.

These companies focus on agricultural chemicals, specialty phosphates, flame retardants, and Li-ion battery applications to capture market growth.

Recent Developments

Sumitomo Corporation (Oct 2023): Signed joint research agreement with Tohoku University to develop new production technology for yellow phosphorus for semiconductors.

University of Illinois Urbana-Champaign (Nov 2023): Field-tested struvite-based ammonium phosphate fertilizer, promoting nutrient recycling and sustainable crop yields.

EuroChem (Mar 2024): Inaugurated phosphate fertilizer production facility in Brazil, featuring closed-loop water systems and clean energy integration.

Opportunities and Challenges

Opportunities: Expansion of precision agriculture, rise in EV battery production, sustainable water treatment, and increased demand in Asia Pacific.

Challenges: Environmental concerns related to phosphorus mining, price volatility, and reliance on subsidies in some regions.

Market Trends

Integration of phosphorus compounds in LiFePO_4 cathodes for safe, stable energy storage

Development of sustainable fertilizers for precision agriculture

Increasing use of phosphorus derivatives in flame retardants and specialty chemicals

Strong growth of Asia Pacific as a global production hub

Future Outlook

The elemental phosphorus (P_4) and derivatives market is poised for consistent growth through 2034. Driven by rising agricultural needs, the shift toward sustainable fertilizers, and growing demand for safe energy storage systems, phosphorus will remain integral to global industrial and agricultural sectors. Companies investing in eco-friendly production technologies and advanced applications are expected to secure a competitive advantage in the coming decade.

Why Buy This Report?

Market forecasts through 2034 with CAGR analysis

In-depth drivers, restraints, and opportunities

Segmentation by type, application, and region

Company profiles and competitive landscape analysis

Coverage of emerging technologies and regional trends

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