

Global Promethium-149 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 Promethium-149 market size was valued at US\$ 14.52 million in 2025 and is forecast to a readjusted size of US\$ 26.09 million by 2032 with a CAGR of 7.4% during review period.

In 2025, global Promethium-149 production was approximately 34 grams, with a global average market price of around \$415,000 per gram. That year, total global production capacity for Promethium-149 reached 120 grams, and the industry's average gross profit margin stood at 34%. Promethium-149 (Pm-149) is an artificial radioactive isotope of the rare-earth element promethium; it has an atomic number of 61 and a mass number of 149, classifying it as a lanthanide radionuclide. Promethium has no stable isotopes; all its isotopes are radioactive. While Promethium-147 is the most mature in terms of industrial application, Promethium-149—due to its relatively short half-life (approximately 53 hours)—exists primarily as a nuclear fission product and a short-lived intermediate nuclide in nuclear reaction studies. Promethium-149 is mainly produced via the fission of Uranium-235 or Plutonium-239, though it can also be synthesized artificially through nuclear reactions; it primarily undergoes beta-minus (??) decay to form stable Samarium-149 (¹⁴⁹Sm).

The upstream segment of the Promethium-149 industry chain encompasses nuclear fuel systems, research reactors, high-flux neutron sources, accelerator facilities, target materials, and radiochemical processing equipment. As a fission product, Promethium-149 is primarily generated within fission product chains during the fission of Uranium-235 or Plutonium-239. Consequently, various rare-earth fission products—including Promethium-149—are produced during nuclear reactor operations, spent fuel reprocessing, or high-flux irradiation experiments. Beyond the fission route,

research institutions can also produce promethium isotopes for nuclear data and radiochemical research by subjecting rare-earth targets (such as neodymium or samarium) to neutron capture or charged-particle reactions. Core upstream capabilities center on controlling high-flux irradiation conditions, separating fission products, employing rare-earth element separation technologies, and managing radioactive liquid waste. Due to its short half-life, Promethium-149 production must typically align with nuclear facility operating cycles, making it difficult to maintain long-term stockpiles as is done with long-lived isotopes. The midstream segment of the industry chain comprises national laboratories, nuclear fuel reprocessing facilities, isotope research centers, and radiochemical experimental platforms, which are responsible for isolating and purifying Promethium-149 from complex fission product mixtures. As fission products contain a mixture of radionuclides—such as neodymium, samarium, cesium, strontium, and ruthenium—Promethium-149 (Pm-149) requires separation via techniques like ion exchange, extraction chromatography, and solvent extraction, with its radionuclidic purity verified through gamma-ray spectrometry, beta-ray spectrometry, and mass spectrometry. Key midstream technical challenges include enhancing the efficiency of selective Promethium separation, mitigating interference from isotopic impurities (such as Samarium-149), ensuring radiochemical purity, and enabling the analysis of micro-scale samples. Compared to Promethium-147, Promethium-149 has a shorter half-life; consequently, it is typically produced for immediate use rather than for long-term inventory and sale. Downstream applications primarily involve nuclear physics research institutes, nuclear energy R&D organizations, reactor design agencies, and radiochemistry laboratories. As a characteristic fission product, data regarding the formation patterns, decay characteristics, and yields of Pm-149 are vital for nuclear fuel cycle analysis, reactor neutronics calculations, and the study of fission product behavior. Researchers utilize Pm-149 to investigate fission product distribution, beta decay processes, the refinement of nuclear databases, and the migration behavior of fission nuclides in spent nuclear fuel. Furthermore, since the decay of Pm-149 produces stable Samarium-149 (Sm-149)—an isotope with a high neutron absorption cross-section—the Pm-149/Sm-149 decay chain is also relevant to reactor poison analysis, burnup calculations, and core physics research. Unlike Promethium-147, which finds application in nuclear batteries, thickness gauging, and specialized light sources, Promethium-149 is primarily a research-oriented radionuclide; future demand will remain concentrated in areas such as nuclear data measurement, advanced reactor R&D, nuclear fuel cycle optimization, and fundamental radiochemical research.

The demand for advanced nuclear energy research and fission product analysis is the primary driver behind the development of Promethium-149 (Pm-149). As a typical fission product generated during the fission of nuclear fuels such as Uranium-235 and

Plutonium-239, Pm-149—along with its yield, decay behavior, and decay relationship with Samarium-149—holds significant importance for reactor physics calculations, burnup analysis, and nuclear fuel cycle research. With the advancement of advanced nuclear reactors, small modular reactors (SMRs), fast reactors, and closed fuel cycle technologies, research institutions require more precise fission product databases to optimize core design, improve fuel utilization efficiency, and assess long-term operational safety. Nuclear data related to Pm-149 (such as fission yields, beta-decay parameters, and nuclear reaction cross-sections) help refine nuclear databases and improve simulation accuracy for new reactor types; consequently, scientific demand for this isotope is expected to remain stable.

Advances in nuclear data measurement and radiochemistry techniques are opening up new avenues for research and application involving Pm-149. Since Promethium has no stable isotopes, Pm-149 has long been a key subject for studying the separation of rare-earth fission products, beta-decay processes, and the chemical behavior of lanthanides. Developments in high-resolution gamma-ray spectroscopy, mass spectrometry, and automated radiochemical separation systems enable researchers to detect and isolate trace amounts of Pm-149 with greater precision, thereby advancing technologies in nuclear fuel reprocessing, fission product migration studies, and radioactive waste management. Furthermore, the growing need to understand the long-term evolution of fission products within advanced nuclear fuel cycle systems will drive further research into short-lived fission nuclides, including Pm-149.

On the supply side, the development model will continue to be characterized by "small-batch production and on-demand supply." Unlike isotopes with long-term utility such as Pm-147, Pm-149 has a half-life of only about 53 hours, making large-scale stockpiling impossible; its production relies heavily on the operating cycles of research reactors, nuclear fuel reprocessing facilities, and radiochemical separation capabilities. The future supply system will not evolve into a model of standardized commodity production; instead, it will increasingly adopt an approach characterized by "production at nuclear facilities, separation in laboratories, and supply via research projects." Key areas for technological upgrading in the industry include the design of high-throughput irradiation targets, automated fission product separation, recovery of trace amounts of promethium, high-sensitivity radionuclide detection, and radioactive waste minimization, all aimed at enhancing radionuclide utilization efficiency per unit of reactor operating time.

Report Scope

This report is a detailed and comprehensive analysis for global Promethium-149 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 Promethium-149 market size and forecasts, in consumption value (\$ Million), sales quantity (Gram), and average selling prices (US\$/g), 2021-2032

Global Promethium-149 market size and forecasts by region and country, in consumption value (\$ Million), sales quantity (Gram), and average selling prices (US\$/g), 2021-2032

Global Promethium-149 market size and forecasts, by Type and by Application, in consumption value (\$ Million), sales quantity (Gram), and average selling prices (US\$/g), 2021-2032

Global Promethium-149 market shares of main players, shipments in revenue (\$ Million), sales quantity (Gram), and ASP (US\$/g), 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 Promethium-149

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 Promethium-149 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 ORNL, Rosatom, CIAE, Curium, etc.

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

Promethium-149 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 Segmentation

Market segment by Type

Neutron Irradiation Production

Accelerator Production

Market segment by Product Form

Promethium-149 Radioactive Solution

Promethium-149 Target Material

Promethium-149 Compounds

Market segment by Activity Level

Low Activity

Moderate Activity

High Activity

Market segment by Purity Grade

Nuclear Physics Research Grade

Medical Isotope Research Grade

Metrological Standard Grade

Market segment by Application

Nuclear Medicine

Industrial Tracer

Scientific Research

Major players covered

ORNL

Rosatom

CIAE

Curium

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)

Chapter Outline

Chapter 1, to describe Promethium-149 product scope, market overview, market estimation caveats and base year.

Chapter 2, to profile the top manufacturers of Promethium-149, with price, sales quantity, revenue, and global market share of Promethium-149 from 2021 to 2026.

Chapter 3, the Promethium-149 competitive situation, sales quantity, revenue, and global market share of top manufacturers are analyzed emphatically by landscape contrast.

Chapter 4, the Promethium-149 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 Promethium-149 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 Promethium-149.

Chapter 14 and 15, to describe Promethium-149 sales channel, distributors, customers, research findings and conclusion.

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