

Global Nanoparticles - Metal & Metal Oxides Market In Healthcare Size study, by Type (Gold, Silver, Iron Oxide, Alumina, Gadolinium, Cerium), by Application (In-vivo Imaging, Targeted Drug Delivery, Proton Therapy, In-vitro Assays) and Regional Forecasts 2022-2032

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Abstracts

Global Nanoparticles - Metal & Metal Oxides Market in Healthcare is valued approximately at USD 199.32 billion in 2023 and is expected to grow at a phenomenal CAGR of 13.78% over the forecast period 2024 to 2032. The application of metal and metal oxide nanoparticles in the healthcare sector has witnessed a paradigm shift, redefining how diagnostics, therapeutics, and targeted drug delivery are approached. These nanoscale materials, owing to their unique physicochemical properties—such as high surface area, magnetic responsiveness, and excellent biocompatibility—are increasingly being embedded into the core fabric of medical innovations. From precision oncology to regenerative therapy, the integration of nanoparticles is allowing scientists to blur the boundaries between science fiction and reality.

What sets this market on a compelling growth trajectory is its convergence with next-generation therapies. Gold and silver nanoparticles are being used in in-vivo imaging and photothermal therapy due to their superior optical properties. Meanwhile, iron oxide and gadolinium nanoparticles are becoming the cornerstone of contrast agents in MRI diagnostics. Their ability to accumulate at specific tissue sites makes them indispensable for disease-specific imaging. The market is further fueled by the expanding role of nanoparticles in proton therapy and in-vitro assays, enabling personalized treatment and early-stage diagnosis with previously unattainable precision. As R&D institutions and biotech giants align their efforts toward functionalizing these

nanoparticles for disease-targeted interactions, the competitive landscape is becoming increasingly dynamic.

However, the ascent of this market is not without challenges. One of the primary concerns remains the long-term toxicity and biodistribution of nanoparticles post-administration. Stringent regulatory scrutiny from agencies like the FDA and EMA has slowed down some commercialization pathways, particularly in clinical applications where nanoparticles may interact unpredictably with cellular structures. Moreover, the high cost of nanoparticle synthesis and the complexity in scaling lab-grade prototypes to industrial production levels impose economic bottlenecks. Still, the growing investment in nanotoxicology research and the push toward green synthesis methods are working in tandem to neutralize these concerns.

On the horizon, innovation is thriving. Companies are integrating artificial intelligence and machine learning to model nanoparticle interactions with human tissues, optimizing them for safety and efficacy before real-world testing. Additionally, the emergence of hybrid nanocomposites and multi-metal oxide platforms is opening new frontiers in theranostics—where therapy and diagnostics merge seamlessly into one product. Collaborations between academic institutions and nanotech companies are becoming increasingly vital to expedite the bench-to-bedside transition. Furthermore, the increasing deployment of nanoparticle-based biosensors in point-of-care settings is set to revolutionize patient monitoring and rapid diagnostics in low-resource environments.

Regionally, North America leads the global charge, supported by robust R&D infrastructure, strategic public-private funding, and the presence of major pharmaceutical players adopting nanomedicine platforms. Europe closely follows, with nations like Germany, France, and the UK spearheading clinical research on nanoparticle-based imaging and therapeutic technologies. Asia Pacific, however, is poised to witness the fastest growth rate during the forecast period. With countries such as China, Japan, and South Korea making substantial investments in nano-enabled healthcare, and a flourishing ecosystem of start-ups and academic centers, the region is fast emerging as a key innovation hub. Additionally, government-backed initiatives to modernize healthcare delivery through precision medicine are providing fertile ground for market expansion.

Major market player included in this report are:

Nanobiotix

CytImmune Sciences

American Elements

NanoComposix

Nanosphere Health Sciences

QuantumSphere Inc.

Creative Diagnostics

PlasmaChem GmbH

Cerion LLC

NanoApps Medical Inc.

Nanotherapeutics, Inc.

Micromod Partikeltechnologie GmbH

Sigma-Aldrich Co. LLC (Merck Group)

Malvern Panalytical

Strem Chemicals, Inc.

The detailed segments and sub-segment of the market are explained below:

By Type

Gold

Silver

Iron Oxide

Alumina

Gadolinium

Cerium

By Application

In-vivo Imaging

Targeted Drug Delivery

Proton Therapy

In-vitro Assays

By Region:

North America

U.S.

Canada

Europe

UK

Germany

France

Spain

Italy

Rest of Europe

Asia Pacific

China

India

Japan

Australia

South Korea

Rest of Asia Pacific

Latin America

Brazil

Mexico

Rest of Latin America

Middle East & Africa

Saudi Arabia

South Africa

Rest of Middle East & Africa

Years considered for the study are as follows:

Historical year – 2022

Base year – 2023

Forecast period – 2024 to 2032

Key Takeaways:

Market Estimates & Forecast for 10 years from 2022 to 2032.

Annualized revenues and regional level analysis for each market segment.

Detailed analysis of geographical landscape with country-level analysis of major regions.

Competitive landscape with information on major players in the market.

Analysis of key business strategies and recommendations on future market approach.

Analysis of competitive structure of the market.

Demand side and supply side analysis of the market.

Companies Mentioned

Nanobiotix

CytImmune Sciences

American Elements

NanoComposix

Nanosphere Health Sciences

QuantumSphere Inc.

Creative Diagnostics

PlasmaChem GmbH

Cerion LLC

NanoApps Medical Inc.

Nanotherapeutics, Inc.

Micromod Partikeltechnologie GmbH

Sigma-Aldrich Co. LLC (Merck Group)

Malvern Panalytical

Strem Chemicals, Inc.

Contents

CHAPTER 1. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET IN HEALTHCARE EXECUTIVE SUMMARY

- 1.1. Global Nanoparticles – Metal & Metal Oxides Market In Healthcare Size & Forecast (2022–2032)
- 1.2. Regional Summary
- 1.3. Segmental Summary
 - 1.3.1. By Type
 - 1.3.2. By Application
- 1.4. Key Trends
- 1.5. Recession Impact
- 1.6. Analyst Recommendation & Conclusion

CHAPTER 2. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET IN HEALTHCARE DEFINITION AND RESEARCH ASSUMPTIONS

- 2.1. Research Objective
- 2.2. Market Definition
- 2.3. Research Assumptions
 - 2.3.1. Inclusion & Exclusion
 - 2.3.2. Limitations
 - 2.3.3. Supply-Side Analysis
 - 2.3.3.1. Availability
 - 2.3.3.2. Infrastructure
 - 2.3.3.3. Regulatory Environment
 - 2.3.3.4. Market Competition
 - 2.3.3.5. Economic Viability (Consumer Perspective)
 - 2.3.4. Demand-Side Analysis
 - 2.3.4.1. Regulatory Frameworks
 - 2.3.4.2. Technological Advancements
 - 2.3.4.3. Environmental Considerations
 - 2.3.4.4. Consumer Awareness & Acceptance
- 2.4. Estimation Methodology
- 2.5. Years Considered for the Study
- 2.6. Currency Conversion Rates

CHAPTER 3. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET

Global Nanoparticles - Metal & Metal Oxides Market In Healthcare Size study, by Type (Gold, Silver, Iron Oxide...

DYNAMICS

3.1. Market Drivers

- 3.1.1. Surge in Precision Diagnostics and Targeted Therapeutics
- 3.1.2. Technological Advancements in Nanoparticle Functionalization
- 3.1.3. Rising R&D Expenditure in Nanomedicine

3.2. Market Challenges

- 3.2.1. Concerns Over Nanotoxicity and Biodistribution
- 3.2.2. Stringent Regulatory Hurdles and Approval Delays
- 3.2.3. High Cost and Scale-up Complexities

3.3. Market Opportunities

- 3.3.1. Integration of AI/ML for Nanoparticle Design
- 3.3.2. Expansion in Emerging Healthcare Economies
- 3.3.3. Green and Bio-friendly Synthesis Methods

CHAPTER 4. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET INDUSTRY ANALYSIS

4.1. Porter's Five Forces Model

- 4.1.1. Bargaining Power of Suppliers
- 4.1.2. Bargaining Power of Buyers
- 4.1.3. Threat of New Entrants
- 4.1.4. Threat of Substitutes
- 4.1.5. Competitive Rivalry
- 4.1.6. Futuristic Approach to Porter's Model
- 4.1.7. Porter's Five Forces Impact Analysis

4.2. PESTEL Analysis

- 4.2.1. Political
- 4.2.2. Economic
- 4.2.3. Social
- 4.2.4. Technological
- 4.2.5. Environmental
- 4.2.6. Legal

4.3. Top Investment Opportunities

4.4. Top Winning Strategies

4.5. Disruptive Trends

4.6. Industry Expert Perspective

4.7. Analyst Recommendation & Conclusion

CHAPTER 5. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET SIZE & FORECASTS BY TYPE 2022–2032

5.1. Segment Dashboard

5.2. Global Market: Type Revenue Trend Analysis, 2022 & 2032 (USD Billion)

5.2.1. Gold

5.2.2. Silver

5.2.3. Iron Oxide

5.2.4. Alumina

5.2.5. Gadolinium

5.2.6. Cerium

CHAPTER 6. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET SIZE & FORECASTS BY APPLICATION 2022–2032

6.1. Segment Dashboard

6.2. Global Market: Application Revenue Trend Analysis, 2022 & 2032 (USD Billion)

6.2.1. In-vivo Imaging

6.2.2. Targeted Drug Delivery

6.2.3. Proton Therapy

6.2.4. In-vitro Assays

CHAPTER 7. GLOBAL NANOPARTICLES – METAL & METAL OXIDES MARKET SIZE & FORECASTS BY REGION 2022–2032

7.1. North America

7.1.1. U.S.

7.1.2. Canada

7.2. Europe

7.2.1. UK

7.2.2. Germany

7.2.3. France

7.2.4. Spain

7.2.5. Italy

7.2.6. Rest of Europe

7.3. Asia Pacific

7.3.1. China

7.3.2. India

7.3.3. Japan

- 7.3.4. Australia
- 7.3.5. South Korea
- 7.3.6. Rest of Asia Pacific
- 7.4. Latin America
 - 7.4.1. Brazil
 - 7.4.2. Mexico
 - 7.4.3. Rest of Latin America
- 7.5. Middle East & Africa
 - 7.5.1. Saudi Arabia
 - 7.5.2. South Africa
 - 7.5.3. Rest of Middle East & Africa

CHAPTER 8. COMPETITIVE INTELLIGENCE

- 8.1. Key Company SWOT Analysis
 - 8.1.1. Nanobiotix
 - 8.1.2. CytImmune Sciences
 - 8.1.3. American Elements
- 8.2. Top Market Strategies
- 8.3. Company Profiles
 - 8.3.1. Nanobiotix
 - 8.3.1.1. Key Information
 - 8.3.1.2. Overview
 - 8.3.1.3. Financial (Subject to Data Availability)
 - 8.3.1.4. Product Summary
 - 8.3.1.5. Market Strategies
 - 8.3.2. CytImmune Sciences
 - 8.3.3. American Elements
 - 8.3.4. NanoComposix
 - 8.3.5. Nanosphere Health Sciences
 - 8.3.6. QuantumSphere Inc.
 - 8.3.7. Creative Diagnostics
 - 8.3.8. PlasmaChem GmbH
 - 8.3.9. Cerion LLC
 - 8.3.10. NanoApps Medical Inc.
 - 8.3.11. Nanotherapeutics, Inc.
 - 8.3.12. Micromod Partikeltechnologie GmbH
 - 8.3.13. Sigma-Aldrich Co. LLC (Merck Group)
 - 8.3.14. Malvern Panalytical

8.3.15. Strem Chemicals, Inc.

CHAPTER 9. RESEARCH PROCESS

9.1. Research Process

9.1.1. Data Mining

9.1.2. Analysis

9.1.3. Market Estimation

9.1.4. Validation

9.1.5. Publishing

9.2. Research Attributes

List Of Tables

LIST OF TABLES

TABLE 1. Global Nanoparticles – Metal & Metal Oxides market, report scope
TABLE 2. Global market estimates & forecasts by Region 2022–2032 (USD Billion)
TABLE 3. Global market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 4. Global market estimates & forecasts by Application 2022–2032 (USD Billion)
TABLE 5. U.S. market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 6. U.S. market estimates & forecasts by Application 2022–2032 (USD Billion)
TABLE 7. Canada market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 8. Canada market estimates & forecasts by Application 2022–2032 (USD Billion)
TABLE 9. UK market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 10. Germany market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 11. France market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 12. Spain market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 13. Italy market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 14. Rest of Europe market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 15. China market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 16. India market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 17. Japan market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 18. Australia market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 19. South Korea market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 20. Rest of Asia Pacific market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 21. Brazil market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 22. Mexico market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 23. Rest of Latin America market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 24. Saudi Arabia market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 25. South Africa market estimates & forecasts by Type 2022–2032 (USD Billion)
TABLE 26. Rest of Middle East & Africa market estimates & forecasts by Type 2022–2032 (USD Billion)

List Of Figures

LIST OF FIGURES

- FIG 1. Global Nanoparticles – Metal & Metal Oxides market research methodology
- FIG 2. Global market estimation techniques
- FIG 3. Global market size estimates & forecast methods
- FIG 4. Global market key trends 2023
- FIG 5. Global market growth prospects 2022–2032
- FIG 6. Global market Porter's Five Forces model
- FIG 7. Global market PESTEL analysis
- FIG 8. Global market value chain analysis
- FIG 9. Global market by Type, 2022 & 2032 (USD Billion)
- FIG 10. Global market by Application, 2022 & 2032 (USD Billion)
- FIG 11. Global market by Region, 2022 & 2032 (USD Billion)
- FIG 12. Global market regional snapshot 2022–2032
- FIG 13. North America market 2022 & 2032 (USD Billion)
- FIG 14. Europe market 2022 & 2032 (USD Billion)
- FIG 15. Asia Pacific market 2022 & 2032 (USD Billion)
- FIG 16. Latin America market 2022 & 2032 (USD Billion)
- FIG 17. Middle East & Africa market 2022 & 2032 (USD Billion)
- FIG 18. Global market company market share analysis (2023)
- FIG 19. Global market forecast overview (2022–2032)

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