

# The Global Market for Nanotechnology and Nanomaterials 2024-2034

<https://marketpublishers.com/r/C88717E8228AEN.html>

Date: December 2023

Pages: 1145

Price: US\$ 2,535.00 (Single User License)

ID: C88717E8228AEN

## Abstracts

Nanotechnology is no longer a novel, emerging field. Nanotech-based devices & processes and engineered nanomaterials (ENMs) have been incorporated in products across all major markets. Nanomaterials are increasingly becoming part of our daily lives and are already heavily used in products such as sunscreens (titanium dioxide/zinc oxide nanoparticles), sporting goods (carbon nanotubes, graphene etc.), conductive battery additives (carbon nanotubes, graphene etc.), automotive composites (nanotubes, graphene, cellulose nanofibers etc.) and high-definition TVs (quantum dots). Their use is only going to increase due to continued industry demand for nanomaterials for current and next generation batteries, biomedical imaging and flexible electronics.

They are also contributing to sustainability challenges as they offer properties that improve an application's functionality, including corrosion protection, water and moisture protection, friction reduction, antifouling and antibacterial properties, self-cleaning, heat and radiation resistance and thermal management. Nanomaterials sustainable characteristics include:

Greener alternative to solvent-based materials.

Made entirely from non-toxic materials.

Less energy-intensive and contain no volatile organic compounds (VOCs).

Support eco-friendly manufacturing.

Low carbon footprint.

Nanotechnology offers disruptive breakthroughs and innovations that can provide solutions to industrial, environmental and societal challenges in markets including energy, electronics, environmental protection, resource management and healthcare. Nanomaterials can be produced with outstanding magnetic, electrical, optical, mechanical, and catalytic properties that are substantially different from their bulk counterparts. These properties can be tuned as desired via precisely controlling the size, shape, synthesis conditions, and appropriate functionalization.

At over 1140 pages, *The Global Market for Nanotechnology and Nanomaterials 2024-2034* is an in-depth analysis of the opportunities afforded by these remarkable materials and technologies. It covers 28 major types of nanomaterials such as cellulose nanofibers, graphene, carbon nanotubes, dendrimers, nanoclays, nanosilver and more. The report analyzes nanomaterial properties, synthesis methods, applications in end-use markets, technology readiness levels, production capacities, regional demand, pricing, competitive landscape, market drivers/trends/challenges and revenue forecasts to 2034.

End-use industry application analysis is provided in sectors such as coatings, composites, electronics, energy storage, automotive, aerospace, sensors, medical, filtration, agriculture, food, household care and more. Report contents include:

- In-depth analysis of the global market for nanotechnology and engineered nanomaterials based products.

- Nanotechnology's role in sustainability and sustainable development.

- Comprehensive listings of applications and products.

- Analysis of current market for nanotech/nanomaterials-enabled products and forecasts and market outlook to 2034, by metric tons and revenues.

- Global demand for nanomaterials globally (e.g. Carbon nanomaterials, quantum dots, metal and metal oxide nanomaterials and other nanomaterials) in terms of volume (MT).

- Demand for nanomaterial-based products in globally by market (e.g. electronics, automotive, batteries, consumer goods, medicine, coatings and other relevant

markets) in terms of revenues.

Assessment of competitive landscape, commercial prospects, applications, demand by market and region, stage of commercialization, prices and producer profiles.

TRL assessment for Engineered nanomaterials and end user markets.

Analysis of global trends, including historical data from 2010, and projections to 2034.

Exploration of Engineered nanomaterials and nanotech-enabled products market structures and value chains.

Assessment of end user markets for nanotechnology and Engineered nanomaterials including market drivers and trends, applications, market opportunity, market challenges and application and product developer profiles. Markets covered include adhesives, aerospace and aviation, automotive, Energy conversion, storage and generation technologies, sustainable technologies, biomedicine and healthcare, coatings & paints, composites, conductive inks, construction & buildings, cosmetics & sunscreens, electronics, photonics, filtration and environmental remediation, food and agriculture, fuel cells and hydrogen storage, household care and sanitary, lighting, lubricants, marine, oil, gas and mining, packaging, rubber, security and defence, sensors, photovoltaics, batteries, textiles and apparel, 3D printing, catalysts, and thermoelectrics.

Unique assessment tools for the nanomaterials market, end user applications, economic impact, addressable markets and market challenges to provide the complete picture of where the real commercial opportunities in nanotechnology and nanomaterials are. Nanomaterials covered include metal & metal oxide nanoparticles carbon nanomaterials, nanocellulose, nanoclays, dendrimers, quantum dots, other 2D materials.

Main application and product opportunities in nanotechnology and nanomaterials.

Profiles of over 1,500 nanotechnology and engineered nanomaterials producers and product developers. Companies profiled include Actnano, Arkema, Cabot

Corporation, Carbice Corp., Carbon Upcycling Technologies, C2CNT LLC, CHASM, CrayoNano AS, Daicel Corporation, Fukuda, GS Alliance Co. Ltd., GS Bavaria GmbH, Elmarco, Evove, Foshan Nanotech, LG Chemical, Nanoco Group, Nanofiber Quantum Technologies, Nanolayr, Nanosys, Nanotech Energy, Nemo Nanomaterials, Nfinite Nanotechnology, OCSiAl, Paragraf, Pixelligent Technologies, Promethean Particles, Radetec Diagnostics, Smart Nanotubes Technologies, SuperBranche and Zeon Corporation.

## Contents

### 1 RESEARCH METHODOLOGY

- 1.1 Aims and objectives of the study
- 1.2 Technology Readiness Level (TRL)

### 2 INTRODUCTION

- 2.1 Market definition
  - 2.1.1 Properties of nanomaterials
- 2.2 Categorization of engineered nanomaterials
- 2.3 Production, manufacturing and Demand for engineered nanomaterials
  - 2.3.1 Synthesis & production
  - 2.3.2 Production volumes
- 2.4 Environmental emissions of nanomaterials
  - 2.4.1 Emissions and exposures of nanomaterials
  - 2.4.2 Life cycle assessment
  - 2.4.3 Nanomaterials for Carbon Capture and Utilization

### 3 THE GLOBAL NANOMATERIALS MARKET

- 3.1 ALUMINIUM OXIDE (ALUMINA) NANOPARTICLES
  - 3.1.1 Market overview
  - 3.1.2 Properties
  - 3.1.3 Markets and applications
  - 3.1.4 Technology Readiness Level (TRL)
  - 3.1.5 Global demand in metric tons, 2010-2034
    - 3.1.5.1 Demand by market
      - 3.1.5.1.1 Demand by market 2022 (%)
      - 3.1.5.1.2 Demand by market 2022 (MT)
      - 3.1.5.1.3 Demand by market 2034 (%)
      - 3.1.5.1.4 Demand by market 2034 (MT)
    - 3.1.5.2 Demand by region
      - 3.1.5.2.1 Demand by region 2022 (%)
      - 3.1.5.2.2 Demand by region 2022 (MT)
      - 3.1.5.2.3 Demand by region 2033 (%)
      - 3.1.5.2.4 Demand by region 2033 (MT)
  - 3.1.6 Prices

### 3.1.7 Producers

## 3.2 ANTIMONY TIN OXIDE NANOPARTICLES

### 3.2.1 Market overview

### 3.2.2 Properties

### 3.2.3 Markets and applications

### 3.2.4 Technology Readiness Level (TRL)

### 3.2.5 Global demand in metric tons, 2010-2034

#### 3.2.5.1 Demand by market

##### 3.2.5.1.1 Demand by market 2022 (%)

##### 3.2.5.1.2 Demand by market 2022 (MT)

##### 3.2.5.1.3 Demand by market 2034 (%)

##### 3.2.5.1.4 Demand by market 2034 (MT)

#### 3.2.5.2 Demand by region

##### 3.2.5.2.1 Demand by region 2022 (%)

##### 3.2.5.2.2 Demand by region 2022 (MT)

##### 3.2.5.2.3 Demand by region 2033 (%)

##### 3.2.5.2.4 Demand by region 2033 (MT)

### 3.2.6 Prices

### 3.2.7 Producers

## 3.3 BISMUTH OXIDE NANOPARTICLES

### 3.3.1 Market overview

### 3.3.2 Properties

### 3.3.3 Markets and applications

### 3.3.4 Technology Readiness Level (TRL)

### 3.3.5 Global demand in metric tons, 2010-2034

#### 3.3.5.1 Demand by market

##### 3.3.5.1.1 Demand by market 2022 (%)

##### 3.3.5.1.2 Demand by market 2022 (MT)

##### 3.3.5.1.3 Demand by market 2034 (%)

##### 3.3.5.1.4 Demand by market 2034(MT)

#### 3.3.5.2 Demand by region

##### 3.3.5.2.1 Demand by region 2022 (%)

##### 3.3.5.2.2 Demand by region 2022 (MT)

##### 3.3.5.2.3 Demand by region 2033 (%)

##### 3.3.5.2.4 Demand by region 2033 (MT)

### 3.3.6 Prices

### 3.3.7 Producers

## 3.4 CELLULOSE NANOFIBERS

### 3.4.1 Market overview

3.4.2 Properties

3.4.3 Markets and applications

3.4.4 Products

3.4.5 Technology Readiness Level (TRL)

3.4.6 Global demand in metric tons, 2010-2034

3.4.6.1 Demand by market

3.4.6.1.1 Demand by market 2022 (%)

3.4.6.1.2 Demand by market 2022 (MT)

3.4.6.1.3 Demand by market 2034 (%)

3.4.6.1.4 Demand by market 2034 (MT)

3.4.6.2 Demand by region

3.4.6.2.1 Demand by region 2022 (%)

3.4.6.2.2 Demand by region 2022 (MT)

3.4.6.2.3 Demand by region 2033 (%)

3.4.6.2.4 Demand by region 2033 (MT)

3.4.7 Prices

3.4.8 Producers

### 3.5 CERIUM OXIDE NANOPARTICLES

3.5.1 Market overview

3.5.2 Properties

3.5.3 Markets and applications

3.5.4 Technology Readiness Level (TRL)

3.5.5 Global demand in metric tons, 2010-2034

3.5.5.1 Demand by market

3.5.5.1.1 Demand by market 2022 (%)

3.5.5.1.2 Demand by market 2022 (MT)

3.5.5.1.3 Demand by market 2034 (%)

3.5.5.1.4 Demand by market 2034(MT)

3.5.5.2 Demand by region

3.5.5.2.1 Demand by region 2022 (%)

3.5.5.2.2 Demand by region 2022 (MT)

3.5.5.2.3 Demand by region 2033 (%)

3.5.5.2.4 Demand by region 2033 (MT)

3.5.6 Prices

3.5.7 Producers

### 3.6 COBALT OXIDE NANOPARTICLES

3.6.1 Market overview

3.6.2 Properties

3.6.3 Markets and applications

- 3.6.4 Technology Readiness Level (TRL)
- 3.6.5 Global demand in metric tons, 2010-2034
  - 3.6.5.1 Demand by market
    - 3.6.5.1.1 Demand by market 2022 (%)
    - 3.6.5.1.2 Demand by market 2022 (MT)
    - 3.6.5.1.3 Demand by market 2034(%)
    - 3.6.5.1.4 Demand by market 2034 (MT)
  - 3.6.5.2 Demand by region
    - 3.6.5.2.1 Demand by region 2022 (%)
    - 3.6.5.2.2 Demand by region 2022 (MT)
    - 3.6.5.2.3 Demand by region 2033 (%)
    - 3.6.5.2.4 Demand by region 2033 (MT)

### 3.6.6 Prices

### 3.6.7 Producers

## 3.7 COPPER OXIDE NANOPARTICLES

- 3.7.1 Market overview
- 3.7.2 Properties
- 3.7.3 Markets and applications
- 3.7.4 Technology Readiness Level (TRL)
- 3.7.5 Global demand in metric tons, 2010-2034
  - 3.7.5.1 Demand by market
    - 3.7.5.1.1 Demand by market 2022 (%)
    - 3.7.5.1.2 Demand by market 2022 (MT)
    - 3.7.5.1.3 Demand by market 2034(%)
    - 3.7.5.1.4 Demand by market 2034 (MT)
  - 3.7.5.2 Demand by region
    - 3.7.5.2.1 Demand by region 2022 (%)
    - 3.7.5.2.2 Demand by region 2022 (MT)
    - 3.7.5.2.3 Demand by region 2033 (%)
    - 3.7.5.2.4 Demand by region 2033 (MT)

### 3.7.6 Prices

### 3.7.7 Producers

## 3.8 DENDRIMERS

- 3.8.1 Market overview
- 3.8.2 Properties
  - 3.8.2.1 Types
- 3.8.3 Markets and applications
- 3.8.4 Technology Readiness Level (TRL)
- 3.8.5 Global demand in metric tons, 2010-2034



### 3.8.5.1 Demand by market

- 3.8.5.1.1 Demand by market 2022 (%)
- 3.8.5.1.2 Demand by market 2022 (MT)
- 3.8.5.1.3 Demand by market 2034 (%)
- 3.8.5.1.4 Demand by market 2034 (MT)

### 3.8.5.2 Demand by region

- 3.8.5.2.1 Demand by region 2022 (%)
- 3.8.5.2.2 Demand by region 2022 (MT)
- 3.8.5.2.3 Demand by region 2034 (%)
- 3.8.5.2.4 Demand by region 2034 (MT)

### 3.8.6 Prices

### 3.8.7 Producers

## 3.9 FULLERENES

### 3.9.1 Market overview

### 3.9.2 Properties

### 3.9.3 Products

### 3.9.4 Markets and applications

### 3.9.5 Technology Readiness Level (TRL)

### 3.9.6 Global demand in metric tons, 2010-2034

#### 3.9.6.1 Demand by market

- 3.9.6.1.1 Demand by market 2022 (%)
- 3.9.6.1.2 Demand by market 2022 (MT)
- 3.9.6.1.3 Demand by market 2034 (%)
- 3.9.6.1.4 Demand by market 2034 (MT)

#### 3.9.6.2 Demand by region

- 3.9.6.2.1 Demand by region 2022 (%)
- 3.9.6.2.2 Demand by region 2022 (MT)
- 3.9.6.2.3 Demand by region 2034 (%)
- 3.9.6.2.4 Demand by region 2034 (MT)

### 3.9.7 Prices

### 3.9.8 Producers

## 3.10 GOLD NANOPARTICLES

### 3.10.1 Market overview

### 3.10.2 Properties

### 3.10.3 Markets and applications

### 3.10.4 Technology Readiness Level (TRL)

### 3.10.5 Global demand in metric tons, 2010-2034

#### 3.10.5.1 Demand by market

- 3.10.5.1.1 Demand by market 2022 (%)

- 3.10.5.1.2 Demand by market 2022 (MT)
- 3.10.5.1.3 Demand by market 2034 (%)
- 3.10.5.1.4 Demand by market 2034 (MT)
- 3.10.5.2 Demand by region
  - 3.10.5.2.1 Demand by region 2022 (%)
  - 3.10.5.2.2 Demand by region 2022 (MT)
  - 3.10.5.2.3 Demand by region 2034 (%)
  - 3.10.5.2.4 Demand by region 2034 (MT)
- 3.10.6 Prices
- 3.10.7 Producers
- 3.11 GRAPHENE
  - 3.11.1 Market overview
  - 3.11.2 Properties
  - 3.11.3 Markets and applications
  - 3.11.4 Technology Readiness Level (TRL)
  - 3.11.5 Products
  - 3.11.6 Global demand in metric tons, 2010-2034
    - 3.11.6.1 Demand by market
      - 3.11.6.1.1 Demand by market 2022 (%)
      - 3.11.6.1.2 Demand by market 2034 (%)
    - 3.11.6.2 Demand by region
      - 3.11.6.2.1 Demand by region 2022 (%)
      - 3.11.6.2.2 Demand by region 2022 (MT)
      - 3.11.6.2.3 Demand by region 2034 (%)
      - 3.11.6.2.4 Demand by region 2034 (MT)
  - 3.11.7 Prices
  - 3.11.8 Producers
- 3.12 IRON OXIDE NANOPARTICLES
  - 3.12.1 Market overview
  - 3.12.2 Properties
  - 3.12.3 Markets and applications
  - 3.12.4 Technology Readiness Level (TRL)
  - 3.12.5 Global demand in metric tons, 2010-2034
    - 3.12.5.1 Demand by market
      - 3.12.5.1.1 Demand by market 2022 (%)
      - 3.12.5.1.2 Demand by market 2022 (MT)
      - 3.12.5.1.3 Demand by market 2034 (%)
      - 3.12.5.1.4 Demand by market 2034 (MT)
    - 3.12.5.2 Demand by region

3.12.5.2.1 Demand by region 2022 (%)

3.12.5.2.2 Demand by region 2022 (MT)

3.12.5.2.3 Demand by region 2034 (%)

3.12.5.2.4 Demand by region 2034 (MT)

3.12.6 Prices

3.12.7 Producers

### 3.13 MAGNESIUM OXIDE NANOPARTICLES

3.13.1 Market overview

3.13.2 Properties

3.13.3 Markets and applications

3.13.4 Technology Readiness Level (TRL)

3.13.5 Global demand in metric tons, 2010-2034

3.13.5.1 Demand by market

3.13.5.1.1 Demand by market 2022 (%)

3.13.5.1.2 Demand by market 2022 (MT)

3.13.5.1.3 Demand by market 2034 (%)

3.13.5.1.4 Demand by market 2034 (MT)

3.13.5.2 Demand by region

3.13.5.2.1 Demand by region 2022 (%)

3.13.5.2.2 Demand by region 2022 (MT)

3.13.5.2.3 Demand by region 2034 (%)

3.13.5.2.4 Demand by region 2034 (MT)

3.13.6 Prices

3.13.7 Producers

### 3.14 MANGANESE OXIDE NANOPARTICLES

3.14.1 Market overview

3.14.2 Properties

3.14.3 Markets and applications

3.14.4 Technology Readiness Level (TRL)

3.14.5 Global demand in metric tons, 2010-2034

3.14.5.1 Demand by market

3.14.5.1.1 Demand by market 2022 (%)

3.14.5.1.2 Demand by market 2022 (MT)

3.14.5.1.3 Demand by market 2034 (%)

3.14.5.1.4 Demand by market 2034 (MT)

3.14.5.2 Demand by region

3.14.5.2.1 Demand by region 2022 (%)

3.14.5.2.2 Demand by region 2022 (MT)

3.14.5.2.3 Demand by region 2034 (%)

3.14.5.2.4 Demand by region 2034 (MT)

3.14.6 Prices

3.14.7 Producers

### 3.15 MULTI-WALLED CARBON NANOTUBES (MWCNT)

3.15.1 Market overview

3.15.2 Properties

3.15.3 Markets and applications

3.15.4 Technology Readiness Level (TRL)

3.15.5 Global demand in metric tons, 2010-2034

3.15.5.1 Demand by market

3.15.5.1.1 Demand by market 2022 (%)

3.15.5.1.2 Demand by market 2022 (MT)

3.15.5.1.3 Demand by market 2034 (%)

3.15.5.1.4 Demand by market 2034 (MT)

3.15.5.2 Demand by region

3.15.5.2.1 Demand by region 2022 (%)

3.15.5.2.2 Demand by region 2032 (MT)

3.15.5.2.3 Demand by region 2034 (%)

3.15.5.2.4 Demand by region 2034 (MT)

3.15.6 Prices

3.15.7 Producers

### 3.16 NANOCLAYS

3.16.1 Market overview

3.16.2 Properties

3.16.3 Markets and applications

3.16.4 Technology Readiness Level (TRL)

3.16.5 Global demand in metric tons, 2010-2034

3.16.5.1 Demand by market

3.16.5.1.1 Demand by market 2022 (%)

3.16.5.1.2 Demand by market 2022 (MT)

3.16.5.1.3 Demand by market 2034 (%)

3.16.5.1.4 Demand by market 2034 (MT)

3.16.5.2 Demand by region

3.16.5.2.1 Demand by region 2022 (%)

3.16.5.2.2 Demand by region 2022 (MT)

3.16.5.2.3 Demand by region 2034 (%)

3.16.5.2.4 Demand by region 2034 (MT)

3.16.6 Prices

3.16.7 Producers

### 3.17 NANODIAMONDS

#### 3.17.1 Market overview

#### 3.17.2 Properties

##### 3.17.2.1 Types

##### 3.17.2.2 Fluorescent nanodiamonds (FNDs)

#### 3.17.3 Markets and applications

#### 3.17.4 Technology Readiness Level (TRL)

#### 3.17.5 Global demand in metric tons, 2010-2034

##### 3.17.5.1 Demand by market

###### 3.17.5.1.1 Demand by market 2022 (%)

###### 3.17.5.1.2 Demand by market 2022 (MT)

###### 3.17.5.1.3 Demand by market 2034 (%)

###### 3.17.5.1.4 Demand by market 2034 (MT)

##### 3.17.5.2 Demand by region

###### 3.17.5.2.1 Demand by region 2022 (%)

###### 3.17.5.2.2 Demand by region 2022 (MT)

###### 3.17.5.2.3 Demand by region 2034 (%)

###### 3.17.5.2.4 Demand by region 2034 (MT)

#### 3.17.6 Prices

#### 3.17.7 Producers

### 3.18 NANOFIBERS

#### 3.18.1 Market overview

#### 3.18.2 Properties

##### 3.18.2.1 Types

###### 3.18.2.1.1 Synthetic polymer nanofibers

###### 3.18.2.1.2 Alumina nanofibers

###### 3.18.2.1.3 Carbon nanofibers

###### 3.18.2.1.4 Natural polymers

###### 3.18.2.1.5 Silicon nanofibers

#### 3.18.3 Markets and applications

#### 3.18.4 Technology Readiness Level (TRL)

#### 3.18.5 Global demand in metric tons, 2010-2034

##### 3.18.5.1 Demand by market

###### 3.18.5.1.1 Demand by market 2022 (%)

###### 3.18.5.1.2 Demand by market 2022 (MT)

###### 3.18.5.1.3 Demand by market 2034 (%)

###### 3.18.5.1.4 Demand by market 2034 (MT)

##### 3.18.5.2 Demand by region

###### 3.18.5.2.1 Demand by region 2022 (%)

3.18.5.2.2 Demand by region 2022 (MT)

3.18.5.2.3 Demand by region 2034 (%)

3.18.5.2.4 Demand by region 2034 (MT)

3.18.6 Producers

### 3.19 NANOSILVER

3.19.1 Market overview

3.19.2 Properties

3.19.3 Markets and applications

3.19.4 Technology Readiness Level (TRL)

3.19.5 Global demand in metric tons, 2010-2034

3.19.5.1 Demand by market

3.19.5.1.1 Demand by market 2022 (%)

3.19.5.1.2 Demand by market 2022 (MT)

3.19.5.1.3 Demand by market 2034 (%)

3.19.5.1.4 Demand by market 2034 (MT)

3.19.5.2 Demand by region

3.19.5.2.1 Demand by region 2022 (%)

3.19.5.2.2 Demand by region 2022 (MT)

3.19.5.2.3 Demand by region 2034 (%)

3.19.5.2.4 Demand by region 2034 (MT)

3.19.6 Prices

3.19.7 Producers

### 3.20 NICKEL NANOPARTICLES

3.20.1 Market overview

3.20.2 Properties

3.20.3 Markets and applications

3.20.4 Technology Readiness Level (TRL)

3.20.5 Global demand in metric tons, 2010-2034

3.20.5.1 Demand by market

3.20.5.1.1 Demand by market 2022 (%)

3.20.5.1.2 Demand by market 2022 (MT)

3.20.5.1.3 Demand by market 2034 (%)

3.20.5.1.4 Demand by market 2034 (MT)

3.20.5.2 Demand by region

3.20.5.2.1 Demand by region 2022 (%)

3.20.5.2.2 Demand by region 2022 (MT)

3.20.5.2.3 Demand by region 2034 (%)

3.20.5.2.4 Demand by region 2034 (MT)

3.20.6 Prices

- 3.20.7 Producers
- 3.21 QUANTUM DOTS
  - 3.21.1 Market overview
  - 3.21.2 Properties
    - 3.21.2.1 Cadmium QDs
    - 3.21.2.2 Cadmium-free QDs
  - 3.21.3 Markets and applications
  - 3.21.4 Products
  - 3.21.5 Technology Readiness Level (TRL)
  - 3.21.6 Global demand in metric tons, 2010-2034
    - 3.21.6.1 Demand by market
      - 3.21.6.1.1 Demand by market 2022 (%)
      - 3.21.6.1.2 Demand by market 2022 (MT)
      - 3.21.6.1.3 Demand by market 2034 (%)
      - 3.21.6.1.4 Demand by market 2034 (MT)
    - 3.21.6.2 Demand by region
      - 3.21.6.2.1 Demand by region 2022 (%)
      - 3.21.6.2.2 Demand by region 2022 (MT)
      - 3.21.6.2.3 Demand by region 2034 (%)
      - 3.21.6.2.4 Demand by region 2034 (MT)
  - 3.21.7 Prices
  - 3.21.8 Producers
- 3.22 SILICON OXIDE NANOPARTICLES
  - 3.22.1 Market overview
  - 3.22.2 Properties
  - 3.22.3 Markets and applications
  - 3.22.4 Technology Readiness Level (TRL)
  - 3.22.5 Global demand in metric tons, 2010-2034
    - 3.22.5.1 Demand by market
      - 3.22.5.1.1 Demand by market 2022 (%)
      - 3.22.5.1.2 Demand by market 2022 (MT)
      - 3.22.5.1.3 Demand by market 2034 (%)
      - 3.22.5.1.4 Demand by market 2022 (MT)
    - 3.22.5.2 Demand by region
      - 3.22.5.2.1 Demand by region 2022 (%)
      - 3.22.5.2.2 Demand by region 2022 (MT)
      - 3.22.5.2.3 Demand by region 2034 (%)
      - 3.22.5.2.4 Demand by region 2034 (MT)
  - 3.22.6 Prices



### 3.22.7 Producers

## 3.23 SINGLE-WALLED CARBON NANOTUBES (SWCNT)

### 3.23.1 Market overview

### 3.23.2 Properties

### 3.23.3 Markets and applications

### 3.23.4 Technology Readiness Level (TRL)

### 3.23.5 Prices

### 3.23.6 Global demand in metric tons, 2010-2034

### 3.23.7 Producers

## 3.24 TITANIUM DIOXIDE NANOPARTICLES

### 3.24.1 Market overview

### 3.24.2 Properties

#### 3.24.2.1 Photocatalytic

#### 3.24.2.2 UV-filter

### 3.24.3 Markets and applications

### 3.24.4 Technology Readiness Level (TRL)

### 3.24.5 Global demand in metric tons, 2010-2034

#### 3.24.5.1 Demand by market

##### 3.24.5.1.1 Demand by market 2022 (%)

##### 3.24.5.1.2 Demand by market 2022 (MT)

##### 3.24.5.1.3 Demand by market 2034 (%)

##### 3.24.5.1.4 Demand by market 2034 (MT)

#### 3.24.5.2 Demand by region

##### 3.24.5.2.1 Demand by region 2022 (%)

##### 3.24.5.2.2 Demand by region 2022 (MT)

##### 3.24.5.2.3 Demand by region 2034 (%)

##### 3.24.5.2.4 Demand by region 2034 (MT)

### 3.24.6 Producers

## 3.25 ZINC OXIDE NANOPARTICLES

### 3.25.1 Market overview

### 3.25.2 Properties

### 3.25.3 Markets and applications

### 3.25.4 Technology Readiness Level (TRL)

### 3.25.5 Global demand in metric tons, 2010-2034

#### 3.25.5.1 Demand by market

##### 3.25.5.1.1 Demand by market 2022 (%)

##### 3.25.5.1.2 Demand by market 2022 (MT)

##### 3.25.5.1.3 Demand by market 2034 (%)

##### 3.25.5.1.4 Demand by market 2034 (MT)



### 3.25.5.2 Demand by region

#### 3.25.5.2.1 Demand by region 2022 (%)

#### 3.25.5.2.2 Demand by region 2022 (MT)

#### 3.25.5.2.3 Demand by region 2034 (%)

#### 3.25.5.2.4 Demand by region 2034 (MT)

### 3.25.6 Producers

## 3.26 ZIRCONIUM OXIDE NANOPARTICLES

### 3.26.1 Market overview

### 3.26.2 Properties

### 3.26.3 Markets and applications

### 3.26.4 Technology Readiness Level (TRL)

### 3.26.5 Global demand in metric tons, 2010-2034

#### 3.26.5.1 Demand by market

##### 3.26.5.1.1 Demand by market 2022 (%)

##### 3.26.5.1.2 Demand by market 2022 (MT)

##### 3.26.5.1.3 Demand by market 2034 (%)

##### 3.26.5.1.4 Demand by market 2034 (MT)

#### 3.26.5.2 Demand by region

##### 3.26.5.2.1 Demand by region 2022 (%)

##### 3.26.5.2.2 Demand by region 2022 (MT)

##### 3.26.5.2.3 Demand by region 2034 (%)

##### 3.26.5.2.4 Demand by region 2034 (MT)

### 3.26.6 Prices

### 3.26.7 Producers

## 3.27 OTHER NANOMATERIALS

### 3.27.1 Carbon Nanohorns (CNHs)

#### 3.27.1.1 Properties

#### 3.27.1.2 Markets and applications

### 3.27.2 Cellulose nanocrystals

#### 3.27.2.1 Synthesis

#### 3.27.2.2 Properties

#### 3.27.2.3 Markets and applications

#### 3.27.2.4 Prices

#### 3.27.2.5 Production

#### 3.27.2.6 Producers

### 3.27.3 Bacterial nanocellulose (BNC)

#### 3.27.3.1 Production

#### 3.27.3.2 Applications

#### 3.27.3.3 Producers

- 3.27.4 Boron Nitride nanotubes (BNNTs)
  - 3.27.4.1 Properties
  - 3.27.4.2 Markets and applications
  - 3.27.4.3 Prices
  - 3.27.4.4 Producers
- 3.27.5 Erbium oxide nanoparticles/nanopowders
  - 3.27.5.1 Properties, applications, prices and producers
- 3.27.6 Indium oxide nanoparticles
  - 3.27.6.1 Properties
- 3.27.7 Molybdenum nanoparticles
  - 3.27.7.1 Properties
- 3.27.8 Perovskite quantum dots
  - 3.27.8.1 Properties
    - 3.27.8.1.1 Comparison to conventional quantum dots
  - 3.27.8.2 Synthesis methods
  - 3.27.8.3 Applications
    - 3.27.8.3.1 Displays
- 3.27.9 Graphene quantum dots
  - 3.27.9.1 Composition
  - 3.27.9.2 Comparison to quantum dots
  - 3.27.9.3 Properties
  - 3.27.9.4 Synthesis
    - 3.27.9.4.1 Top-down method
    - 3.27.9.4.2 Bottom-up method
    - 3.27.9.4.3 Comparison of synthesis methods
  - 3.27.9.5 Markets and applications
  - 3.27.9.6 Producers
- 3.28 OTHER 2D MATERIALS
  - 3.28.1 Comparative analysis of graphene and other 2D materials
  - 3.28.2 Production methods
    - 3.28.2.1 Top-down exfoliation
    - 3.28.2.2 Mechanical exfoliation method
    - 3.28.2.3 Liquid exfoliation method
  - 3.28.3 Bottom-up synthesis
    - 3.28.3.1 Chemical synthesis in solution
    - 3.28.3.2 Chemical vapor deposition
  - 3.28.4 Types of 2D materials
    - 3.28.4.1 Hexagonal boron-nitride (h-BN)/boron nitride nanosheets (BNNSs)
      - 3.28.4.1.1 Properties

- 3.28.4.1.2 Applications and markets
- 3.28.4.2 MXenes
  - 3.28.4.2.1 Properties
  - 3.28.4.2.2 Applications
- 3.28.4.3 Transition metal dichalcogenides (TMD)
  - 3.28.4.3.1 Properties
  - 3.28.4.3.2 Molybdenum disulphide (MoS<sub>2</sub>)
  - 3.28.4.3.3 Tungsten ditelluride (WTe<sub>2</sub>)
- 3.28.4.4 Borophene
  - 3.28.4.4.1 Properties
  - 3.28.4.4.2 Applications
- 3.28.4.5 Phosphorene/ Black phosphorus
  - 3.28.4.5.1 Properties
  - 3.28.4.5.2 Applications
- 3.28.4.6 Graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>)
  - 3.28.4.6.1 Properties
  - 3.28.4.6.2 C<sub>2</sub>N
  - 3.28.4.6.3 Applications
- 3.28.4.7 Germanene
  - 3.28.4.7.1 Properties
  - 3.28.4.7.2 Applications
- 3.28.4.8 Graphdiyne
  - 3.28.4.8.1 Properties
  - 3.28.4.8.2 Applications
- 3.28.4.9 Graphane
  - 3.28.4.9.1 Properties
  - 3.28.4.9.2 Applications
- 3.28.4.10 Rhenium disulfide (ReS<sub>2</sub>) and diselenide (ReSe<sub>2</sub>)
  - 3.28.4.10.1 Properties
  - 3.28.4.10.2 Applications
- 3.28.4.11 Silicene
  - 3.28.4.11.1 Properties
  - 3.28.4.11.2 Applications
- 3.28.4.12 Stanene/tinene
  - 3.28.4.12.1 Properties
  - 3.28.4.12.2 Applications
- 3.28.4.13 Antimonene
  - 3.28.4.13.1 Properties
  - 3.28.4.13.2 Applications

- 3.28.4.14 Indium selenide
  - 3.28.4.14.1 Properties
  - 3.28.4.14.2 Applications
- 3.28.4.15 Layered double hydroxides (LDH)
  - 3.28.4.15.1 Properties
  - 3.28.4.15.2 Applications
- 3.28.5 2D Materials producers and suppliers

## **4 END USE MARKETS FOR NANOTECHNOLOGY AND NANOMATERIALS**

### **4.1 ADHESIVES**

- 4.1.1 Market drivers
- 4.1.2 Markets and applications
  - 4.1.2.1 Properties
  - 4.1.2.2 End user markets
  - 4.1.2.3 Nanomaterials in adhesives
- 4.1.3 Technology Readiness Level (TRL)
- 4.1.4 Global revenues to 2034
- 4.1.5 Product developers

### **4.2 AEROSPACE AND AVIATION**

- 4.2.1 Market drivers
- 4.2.2 Markets and applications
  - 4.2.2.1 Composites
  - 4.2.2.2 Coatings
- 4.2.3 Technology Readiness Level (TRL)
- 4.2.4 Global revenues to 2034
- 4.2.5 Product developers

### **4.3 AUTOMOTIVE**

- 4.3.1 Market drivers
- 4.3.2 Markets and applications
  - 4.3.2.1 Composites
  - 4.3.2.2 Paints and coatings
  - 4.3.2.3 Tires
- 4.3.3 Technology Readiness Level (TRL)
- 4.3.4 Global revenues to 2034
- 4.3.5 Product developers

### **4.4 BIOMEDICINE AND HEALTHCARE**

- 4.4.1 Medical biosensors
  - 4.4.1.1 Market drivers and trends

- 4.4.1.2 Applications
- 4.4.1.3 Technology Readiness Level (TRL)
- 4.4.1.4 Global revenues to 2034
- 4.4.1.5 Product developers
- 4.4.2 Drug formulation and delivery
  - 4.4.2.1 Market drivers
  - 4.4.2.2 Applications
    - 4.4.2.2.1 Products
  - 4.4.2.3 Technology Readiness Level (TRL)
  - 4.4.2.4 Global revenues to 2034
  - 4.4.2.5 Product developers
- 4.4.3 Medical imaging and diagnostics
  - 4.4.3.1 Market drivers
  - 4.4.3.2 Applications
  - 4.4.3.3 Technology Readiness Level (TRL)
  - 4.4.3.4 Global revenues to 2034
  - 4.4.3.5 Product developers
- 4.4.4 Medical coatings and films
  - 4.4.4.1 Market drivers
  - 4.4.4.2 Applications
  - 4.4.4.3 Technology Readiness Level (TRL)
  - 4.4.4.4 Global revenues to 2034
  - 4.4.4.5 Product developers
- 4.4.5 Medical implants
  - 4.4.5.1 Market drivers
  - 4.4.5.2 Applications
  - 4.4.5.3 Technology Readiness Level (TRL)
  - 4.4.5.4 Global revenues to 2034
  - 4.4.5.5 Product developers
- 4.4.6 Wound care
  - 4.4.6.1 Market drivers
  - 4.4.6.2 Applications
  - 4.4.6.3 Products
  - 4.4.6.4 Technology Readiness Level (TRL)
  - 4.4.6.5 Global revenues to 2034
  - 4.4.6.6 Product developers
- 4.4.7 Dental
  - 4.4.7.1 Market drivers
  - 4.4.7.2 Applications

4.4.7.3 Technology Readiness Level (TRL)

4.4.7.4 Global revenues to 2034

4.4.7.5 Product developers

#### 4.5 COATINGS

4.5.1 Market drivers

4.5.2 Markets and applications

4.5.3 Technology Readiness Level (TRL)

4.5.4 Global revenues to 2033

4.5.5 Product developers

4.5.5.1 Anti-fingerprint nanocoatings

4.5.5.2 Anti-bacterial nanocoatings

4.5.5.3 Anti-corrosion nanocoatings

4.5.5.4 Abrasion and wear resistant nanocoatings

4.5.5.5 Barrier nanocoatings

4.5.5.6 Anti-fogging nanocoatings

4.5.5.7 Anti-fouling and easy-to-clean nanocoatings

4.5.5.8 Self-cleaning (bionic) nanocoatings

4.5.5.9 Self-cleaning (photocatalytic) nanocoatings

4.5.5.10 UV-resistant nanocoatings

4.5.5.11 Thermal barrier and flame retardant nanocoatings

4.5.5.12 Anti-icing and de-icing nanocoatings

4.5.5.13 Anti-reflective nanocoatings

4.5.5.14 Self-healing nanocoatings

#### 4.6 COMPOSITES

4.6.1 Market drivers

4.6.2 Markets and applications

4.6.2.1 Thermal management

4.6.2.2 Electrostatic discharge (ESD) and electromagnetic interference (EMI) shielding

4.6.2.3 Flame retardants

4.6.3 Technology Readiness Level (TRL)

4.6.4 Market opportunity

4.6.5 Global revenues to 2034

4.6.6 Product developers

#### 4.7 CONDUCTIVE INKS

4.7.1 Market drivers

4.7.2 Markets and applications

4.7.3 Global revenues to 2034

4.7.4 Product developers

## 4.8 CONSTRUCTION AND BUILDINGS

### 4.8.1 Market drivers

### 4.8.2 Markets and applications

#### 4.8.2.1 Insulation and thermal management

##### 4.8.2.1.1 Product developers

#### 4.8.2.2 Exterior coatings (protective, wood and glass)

##### 4.8.2.2.1 Product developers

#### 4.8.2.3 Smart windows and glass products

##### 4.8.2.3.1 Product developers

#### 4.8.2.4 VOC mitigation and air filtration

##### 4.8.2.4.1 Product developers

#### 4.8.2.5 Concrete and cement

#### 4.8.2.6 Self-healing construction materials

##### 4.8.2.6.1 Product developers

#### 4.8.2.7 Asphalt and bitumen

### 4.8.3 Technology Readiness Level (TRL)

### 4.8.4 Global revenues to 2034

### 4.8.5 Product developers

## 4.9 COSMETICS AND PERSONAL CARE

### 4.9.1 Market drivers

### 4.9.2 Markets and applications

#### 4.9.2.1 Products

### 4.9.3 Technology Readiness Level (TRL)

### 4.9.4 Global revenues to 2034

### 4.9.5 Product developers

## 4.10 ELECTRONICS AND PHOTONICS

### 4.10.1 Displays and conductive films

#### 4.10.1.1 Market drivers

#### 4.10.1.2 Applications

#### 4.10.1.3 Technology Readiness Level (TRL)

#### 4.10.1.4 Global revenues to 2034

##### 4.10.1.4.1 Touch panel and ITO replacement

##### 4.10.1.4.2 Displays

#### 4.10.1.5 Product developers

### 4.10.2 Transistors, integrated circuit, EMI shielding and other components

#### 4.10.2.1 Market drivers

#### 4.10.2.2 Applications

#### 4.10.2.3 Technology Readiness Level (TRL)

#### 4.10.2.4 Global revenues to 2034

- 4.10.2.5 Product developers
- 4.10.3 Memory devices
  - 4.10.3.1 Market drivers
  - 4.10.3.2 Applications
  - 4.10.3.3 Technology Readiness Level (TRL)
  - 4.10.3.4 Global revenues to 2034
  - 4.10.3.5 Product developers
- 4.10.4 Electronics coatings
  - 4.10.4.1 Market drivers
  - 4.10.4.2 Applications
  - 4.10.4.3 Technology Readiness Level (TRL)
  - 4.10.4.4 Global revenues to 2034
  - 4.10.4.5 Product developers
- 4.10.5 Photonics
  - 4.10.5.1 Market drivers
  - 4.10.5.2 Applications
    - 4.10.5.2.1 Si photonics versus graphene
    - 4.10.5.2.2 Optical modulators
    - 4.10.5.2.3 Photodetectors
    - 4.10.5.2.4 Plasmonics
    - 4.10.5.2.5 Fiber lasers
  - 4.10.5.3 Technology Readiness Level (TRL)
  - 4.10.5.4 Global revenues to 2034
  - 4.10.5.5 Product developers
- 4.11 ENERGY STORAGE
  - 4.11.1 BATTERIES
    - 4.11.1.1 Market drivers
    - 4.11.1.2 Markets and applications
      - 4.11.1.2.1 Lithium-ion batteries (LIB)
      - 4.11.1.2.2 Nanomaterials in Lithium sulfur (Li S) batteries
      - 4.11.1.2.3 Sodium-ion batteries
      - 4.11.1.2.4 Lithium-air batteries
      - 4.11.1.2.5 Magnesium batteries
    - 4.11.1.3 Technology Readiness Level (TRL)
    - 4.11.1.4 Global revenues to 2034
    - 4.11.1.5 Product developers
  - 4.11.2 FUEL CELLS
    - 4.11.2.1 Market drivers
    - 4.11.2.2 Markets and applications



- 4.11.2.2.1 Fuel cells
- 4.11.2.2.2 Hydrogen storage
- 4.11.2.3 Technology Readiness Level (TRL)
- 4.11.2.4 Global revenues to 2034
- 4.11.2.5 Product developers
- 4.11.3 SUPERCAPACITORS
  - 4.11.3.1 Market drivers
  - 4.11.3.2 Markets and applications
  - 4.11.3.3 Technology Readiness Level (TRL)
  - 4.11.3.4 Global revenues to 2034
  - 4.11.3.5 Product developers
- 4.12 FILTRATION
  - 4.12.1 Market drivers
  - 4.12.2 Applications
    - 4.12.2.1 Desalination and water filtration
    - 4.12.2.2 Airborne filters
    - 4.12.2.3 Gas separation
  - 4.12.3 Technology Readiness Level (TRL)
  - 4.12.4 Global revenues to 2034
  - 4.12.5 Product developers
- 4.13 FOOD AND AGRICULTURE
  - 4.13.1 Market drivers
  - 4.13.2 Markets and applications
    - 4.13.2.1 Food packaging
    - 4.13.2.2 Coatings
    - 4.13.2.3 Sensors
    - 4.13.2.4 Additives in food additives and supplements
    - 4.13.2.5 Agricultural production
  - 4.13.3 Technology Readiness Level (TRL)
  - 4.13.4 Global revenues to 2034
  - 4.13.5 Product developers (52 company profiles)
- 4.14 HOUSEHOLD CARE AND SANITARY
  - 4.14.1 Market drivers
  - 4.14.2 Markets and applications
    - 4.14.2.1 Anti-microbial coatings
    - 4.14.2.2 Self-cleaning & easy clean coatings
    - 4.14.2.3 Photocatalytic coatings
    - 4.14.2.4 Anti-fingerprint nanocoatings
  - 4.14.3 Technology Readiness Level (TRL)

4.14.4 Global revenues to 2034

4.14.5 Product developers

#### 4.15 LIGHTING

4.15.1 Market drivers

4.15.2 Markets and applications

4.15.3 Technology Readiness Level (TRL)

4.15.4 Global revenues to 2034

4.15.5 Product developers

#### 4.16 LUBRICANTS

4.16.1 Market drivers

4.16.2 Markets and applications

4.16.3 Technology Readiness Level (TRL)

4.16.4 Global revenues to 2034

4.16.5 Product developers

#### 4.17 MARINE

4.17.1 Market drivers

4.17.2 Markets and applications

4.17.3 Technology Readiness Level (TRL)

4.17.4 Global revenues to 2034

4.17.5 Product developers

#### 4.18 OIL, GAS AND MINING

4.18.1 Market drivers

4.18.2 Markets and applications

4.18.2.1 Sensing and reservoir management

4.18.2.2 Coatings

4.18.2.3 Drilling fluids

4.18.2.4 Sorbent materials

4.18.2.5 Separation

4.18.3 Technology Readiness Level (TRL)

4.18.4 Global revenues to 2034

4.18.5 Product developers

#### 4.19 PLASTICS AND PACKAGING

4.19.1 Market drivers

4.19.2 Markets and applications

4.19.3 Technology Readiness Level (TRL)

4.19.4 Global revenues to 2034

4.19.5 Product developers

#### 4.20 RUBBER

4.20.1 Market drivers

- 4.20.2 Markets and applications
- 4.20.3 Technology Readiness Level (TRL)
- 4.20.4 Global revenues to 2034
- 4.20.5 Product developers
- 4.21 SECURITY AND DEFENCE
  - 4.21.1 Market drivers
  - 4.21.2 Markets and applications
    - 4.21.2.1 Military textiles
    - 4.21.2.2 Military equipment
    - 4.21.2.3 Anti-counterfeiting
    - 4.21.2.4 Sensors and detection
    - 4.21.2.5 Ballistic protection 1000
  - 4.21.3 Technology Readiness Level (TRL) 1000
  - 4.21.4 Global revenues to 2034 1001
  - 4.21.5 Product developers 1002
- 4.22 SENSORS 1007
  - 4.22.1 Market drivers 1007
  - 4.22.2 Markets and applications 1008
    - 4.22.2.1 Gas sensors 1010
    - 4.22.2.2 Strain sensors 1011
    - 4.22.2.3 Biosensors 1012
    - 4.22.2.4 Food sensors 1013
    - 4.22.2.5 Image sensors 1014
    - 4.22.2.6 Infrared (IR) sensors 1014
    - 4.22.2.7 Optical sensors 1014
    - 4.22.2.8 Pressure sensors 1015
    - 4.22.2.9 Humidity sensors 1016
    - 4.22.2.10 Acoustic sensors 1016
    - 4.22.2.11 Wireless sensors 1016
  - 4.22.3 Technology Readiness Level (TRL) 1017
  - 4.22.4 Global revenues to 2034 1017
  - 4.22.5 Product developers 1019
- 4.23 PHOTOVOLTAICS 1024
  - 4.23.1 Market drivers 1024
  - 4.23.2 Markets and applications 1025
    - 4.23.2.1 Solar cells 1026
    - 4.23.2.2 Solar water splitting 1029
    - 4.23.2.3 Solar coatings 1030
  - 4.23.3 Technology Readiness Level (TRL) 1031

- 4.23.4 Global revenues to 2034 1031
- 4.23.5 Product developers 1033
- 4.24 TEXTILES & APPAREL 1038
  - 4.24.1 Market drivers 1038
  - 4.24.2 Markets and applications 1042
    - 4.24.2.1 Protective textiles 1043
    - 4.24.2.2 Electronic textiles 1043
  - 4.24.3 Technology Readiness Level (TRL) 1049
  - 4.24.4 Global revenues to 2034 1049
  - 4.24.5 Product developers 1052
- 4.25 TOOLS & MANUFACTURING 1057
  - 4.25.1 Market drivers 1057
  - 4.25.2 Markets and applications 1058
  - 4.25.3 Technology Readiness Level (TRL) 1059
  - 4.25.4 Global revenues to 2034 1060
  - 4.25.5 Product developers 1061
- 4.26 3D PRINTING 1066
  - 4.26.1 Markets and applications 1066
  - 4.26.2 Technology Readiness Level (TRL) 1067
  - 4.26.3 Global revenues to 2034 1068
  - 4.26.4 Product developers 1070
- 4.27 OTHER MARKETS 1072
  - 4.27.1 CATALYSTS 1072
    - 4.27.1.1 Markets and applications 1072
    - 4.27.1.2 Product developers 1073
  - 4.27.2 WIRE AND CABLE 1074
    - 4.27.2.1 Markets and applications 1074
      - 4.27.2.1.1 Composites 1074
      - 4.27.2.1.2 Coatings 1074
    - 4.27.2.2 Product developers 1074
  - 4.27.3 SPORTING GOODS 1076
    - 4.27.3.1 Markets and applications 1076
      - 4.27.3.1.1 Composites 1076
      - 4.27.3.1.2 Coatings 1076
    - 4.27.3.2 Product developers 1076
  - 4.27.4 WIND ENERGY 1078
    - 4.27.4.1 Market drivers 1078
    - 4.27.4.2 Markets and applications 1078
      - 4.27.4.2.2 Product developers 1080

#### 4.27.5 THERMOELECTRICS 1081

4.27.5.1 Market drivers 1081

4.27.5.2 Markets and applications 1081

4.27.5.3 Product developers 1082

#### **5 REFERENCES 1083**

## List Of Tables

### LIST OF TABLES

Table 1. Technology Readiness Level (TRL) Examples.

Table 2. Categorization of nanomaterials.

Table 3. The Global market for engineered nanomaterials in 2022-consumption, market characteristics and growth prospects.

Table 4. Global demand for engineered nanomaterials in metric tons (MT), 2010-2034.

Table 5. Occupational exposure limits associated with nanomaterials.

Table 6. Life cycle assessment studies on nanomaterials.

Table 7. Nanomaterials utilized in carbon capture and utilization-advantages & disadvantages.

Table 8. CO<sub>2</sub> capture performance of nanomaterials sorbents.

Table 9. Market overview for aluminium oxide nanoparticles-Selling grade particle diameter, usage, advantages, high volume applications, low volume applications and novel applications.

Table 10. Markets, benefits and applications of aluminium oxide nanoparticles.

Table 11. Global demand for aluminium oxide nanoparticles (MT), 2010-2034.

Table 12. Aluminium oxide nanoparticles Demand by market 2022 (MT)

Table 13. Aluminium oxide nanoparticles market consumption 2034 (MT).

Table 14. Demand for aluminium oxide nanoparticles by region 2022 (MT).

Table 15. Demand for aluminium oxide nanoparticles by region 2034 (MT).

Table 16. Prices of aluminium oxide nanoparticles from producers & distributors.

Table 17. Aluminium oxide nanoparticles producer profiles.

Table 18. Market summary for antimony tin oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 19. Markets, benefits and applications of antimony tin oxide nanoparticles

Table 20. Global demand for antimony tin oxide nanoparticles/nanopowders, in metric tons, 2010-2034.

Table 21. Antimony tin oxide nanoparticles Demand by market 2022 (MT).

Table 22. Antimony tin oxide nanoparticles market consumption 2034 (MT).

Table 23. Demand for antimony tin oxide nanoparticles by region 2022 (MT).

Table 24. Demand for antimony tin oxide nanoparticles by region 2034 (MT).

Table 25. Prices of antimony tin oxide nanoparticles.

Table 26. Antimony tin oxide nanoparticles/nanopowders producers and suppliers.

Table 27. Market overview bismuth oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume

applications and novel applications.

Table 28. Markets, benefits and applications of aluminium oxide nanoparticles

Table 29. Global demand for bismuth oxide nanoparticles in metric tons, 2010-2034.

Table 30. Bismuth oxide nanoparticles Demand by market 2022 (MT).

Table 31. Bismuth oxide nanoparticles Demand by market 2034 (MT).

Table 32. Demand for bismuth oxide nanoparticles by region 2022 (MT).

Table 33. Demand for bismuth oxide nanoparticles by region 2034 (MT).

Table 34. Prices of bismuth oxide nanoparticles.

Table 35. Bismuth oxide nanoparticles/nanopowders producers and suppliers.

Table 36. Market overview for nanocellulose-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 37. Properties of nanocellulose, by type.

Table 38. Markets and applications of cellulose nanofibers.

Table 39. Cellulose nanofibers-based commercial products.

Table 40. Cellulose nanofibers production capacities and production process, by producer.

Table 41. Global demand for cellulose nanofibers by market in metric tons, 2018-2034.

Table 42. Cellulose nanofibers (CNF) Demand by market 2022 (MT).

Table 43. Cellulose nanofibers (CNF) Demand by market 2034 (MT).

Table 44. Demand for Cellulose nanofibers (CNF) by region 2022 (MT).

Table 45. Demand for Cellulose nanofibers (CNF) by region 2034 (MT).

Table 46. Product/price/application matrix of cellulose nanofiber producers.

Table 47. Cellulose nanofiber producers.

Table 48. Market overview for cerium oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 49. Markets, benefits and applications of cerium oxide nanoparticles.

Table 50. Global demand for cerium oxide nanoparticles (MT), 2010-2034.

Table 51. Cerium oxide nanoparticles Demand by market 2022 (MT).

Table 52. Cerium oxide nanoparticles Demand by market 2034 (MT).

Table 53. Demand for Cerium Oxide Nanoparticles by region 2022 (MT).

Table 54. Demand for Cerium Oxide Nanoparticles by region 2033 (MT).

Table 55. Prices of cerium oxide nanoparticles.

Table 56. Cerium oxide nanoparticles and nanopowders producers and suppliers.

Table 57. Market overview for cobalt oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 58. Markets, benefits and applications of cobalt oxide nanoparticles.



- Table 59. Global demand for cobalt oxide nanoparticles (MT), 2010-2034.
- Table 60. Cobalt oxide nanoparticles Demand by market 2022 (MT).
- Table 61. Cobalt oxide nanoparticles Demand by market 2034 (MT).
- Table 62. Demand for Cobalt Oxide Nanoparticles by region 2022 (MT).
- Table 63. Demand for Cobalt Oxide Nanoparticles by region 2034 (MT).
- Table 64. Prices of cobalt oxide nanoparticles.
- Table 65. Market overview for copper oxide nanoparticles -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 66. Markets, benefits and applications of copper oxide nanoparticles.
- Table 67. Global demand for copper oxide nanoparticles (MT), 2010-2034.
- Table 68. Copper oxide nanoparticles Demand by market 2022 (MT).
- Table 69. Copper oxide nanoparticles Demand by market 2034 (MT).
- Table 70. Demand for copper oxide nanoparticles by region 2022 (MT).
- Table 71. Demand for copper oxide nanoparticles by region 2034 (MT).
- Table 72. Example prices of copper oxide nanoparticles.
- Table 73. Copper and copper oxide nanoparticles and nanopowders producers and suppliers.
- Table 74. Market overview for dendrimers -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 75. Types of dendrimer.
- Table 76. Markets, benefits and applications of dendrimers.
- Table 77. Global demand for dendrimers in metric tons, 2010-2034.
- Table 78. Dendrimers Demand by market 2022 (MT).
- Table 79. Dendrimers Demand by market 2034 (MT).
- Table 80. Demand for dendrimers by region 2022 (MT).
- Table 81. Demand for dendrimers by region 2034 (MT).
- Table 82. Example prices of dendrimers.
- Table 83. Dendrimers producers.
- Table 84. Market overview for fullerenes-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 85. Types of fullerenes and applications.
- Table 86. Products incorporating fullerenes.
- Table 87. Markets, benefits and applications of fullerenes.
- Table 88. Global demand for fullerenes in metric tons, 2010-2034.
- Table 89. Fullerenes Demand by market 2022 (MT).
- Table 90. Fullerenes Demand by market 2034 (MT).



- Table 91. Demand for fullerenes by region 2022 (MT).
- Table 92. Demand for fullerenes by region 2034 (MT).
- Table 93. Example prices of fullerenes.
- Table 94. Fullerene producers and suppliers.
- Table 95. Market overview for gold nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 96. Markets, benefits and applications of gold nanoparticles.
- Table 97. Global demand for gold nanoparticles in metric tons, 2010-2034.
- Table 98. Gold nanoparticles Demand by market 2022 (MT).
- Table 99. Gold nanoparticles Demand by market 2034 (MT).
- Table 100. Demand for gold nanoparticles by region 2022 (MT).
- Table 101. Demand for gold nanoparticles by region 2034 (MT).
- Table 102. Price of gold nanoparticles.
- Table 103. Gold nanoparticle producers and suppliers.
- Table 104. Market overview for graphene-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 105. Properties of graphene.
- Table 106. Markets, benefits and applications of graphene.
- Table 107. Products incorporating graphene.
- Table 108. Main graphene producers by country, annual production capacities, types and main markets they sell into 2020.
- Table 109. Demand for graphene (tons), 2018-2034.
- Table 110. Demand for graphene by region 2022 (MT).
- Table 111. Demand for graphene by region 2034 (MT).
- Table 112. Graphene types and cost per kg.
- Table 113. Graphene producers and suppliers.
- Table 114. Market overview for iron oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 115. Markets, benefits and applications of iron oxide nanoparticles.
- Table 116. Global demand for iron oxide nanoparticles in metric tons, 2010-2034.
- Table 117. Iron oxide nanoparticles Demand by market 2022 (MT).
- Table 118. Iron oxide nanoparticles Demand by market 2034 (MT).
- Table 119. Demand for iron oxide nanoparticles by region 2022 (MT).
- Table 120. Demand for iron oxide nanoparticles by region 2034 (MT).
- Table 121. Example prices of iron oxide nanoparticles.
- Table 122. Iron oxide nanoparticle/nanopowder producers and suppliers.

Table 123. Market overview for magnesium oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, market estimates, high volume applications, low volume applications and novel applications.

Table 124. Markets, benefits and applications of magnesium oxide nanoparticles.

Table 125. Global demand for magnesium oxide nanoparticles in metric tons, 2010-2034.

Table 126. Magnesium oxide nanoparticles Demand by market 2022 (MT).

Table 127. Magnesium oxide nanoparticles Demand by market 2034 (MT).

Table 128. Demand for magnesium oxide nanoparticles by region 2022 (MT).

Table 129. Demand for magnesium oxide nanoparticles by region 2034 (MT).

Table 130. Example prices of magnesium oxide nanoparticles/nanopowders.

Table 131. Magnesium oxide nanoparticle/nanopowder producers and suppliers.

Table 132. Market overview for manganese oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 133. Markets, benefits and applications of manganese oxide nanoparticles.

Table 134. Global demand for manganese oxide nanoparticles in metric tons, 2010-2034, 2010-2034.

Table 135. Manganese oxide nanoparticles Demand by market 2022 (MT).

Table 136. Manganese oxide nanoparticles Demand by market 2034 (MT).

Table 137. Demand for manganese oxide nanoparticles by region 2022 (MT).

Table 138. Demand for manganese oxide nanoparticles by region 2034 (MT).

Table 139. Example prices of manganese oxide nanoparticles.

Table 140. Manganese oxide nanoparticle/nanopowder producers and suppliers.

Table 141. Market overview for multi-walled carbon nanotubes-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 142. Properties of multi-walled carbon nanotubes and comparable materials.

Table 143. Markets, benefits and applications of multi-walled Carbon Nanotubes (MWCNT).

Table 144. Key MWCNT producers production capacities 2021.

Table 145. MWCNT Demand by market 2022 (MT).

Table 146. MWCNT Demand by market 2034 (MT).

Table 147. Demand for MWCNT by region 2022 (MT).

Table 148. Demand for MWCNT by region 2034 (MT).

Table 149. Carbon nanotubes pricing (MWCNTS, SWCNT etc.) by producer.

Table 150. Multi-walled carbon nanotube (MWCNT) producers and suppliers.

Table 151. Market overview for nanoclays -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and

novel applications.

Table 152. Markets, benefits and applications of nanoclays.

Table 153. Global demand for nanoclays in metric tons, 2010-2034.

Table 154. Nanoclays Demand by market 2022 (MT).

Table 155. Nanoclays Demand by market 2034 (MT).

Table 156. Demand for nanoclays by region 2022 (MT).

Table 157. Demand for nanoclays by region 2034 (MT).

Table 158. Example prices of nanoclays.

Table 159. Main nanoclays producers and products.

Table 160. Market summary for nanodiamonds-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 161. Properties of nanodiamonds.

Table 162. Markets, benefits and applications of nanodiamonds.

Table 163. Nanodiamonds Demand by market 2022 (MT).

Table 164. Nanodiamonds Demand by market 2034 (MT).

Table 165. Demand for nanodiamonds by region 2022 (MT).

Table 166. Demand for nanodiamonds by region 2034 (MT).

Table 167. Pricing of nanodiamonds, by producer/distributor.

Table 168. Production methods, by main ND producers.

Table 169. Nanodiamond producers and suppliers.

Table 170. Market summary for nanofibers- Selling grade particle diameter, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 171. Nanofibers types, properties and applications.

Table 172. Electrospinning instrument manufacturers.

Table 173. Applications of polymer, alumina, carbon and other nanofibers.

Table 174. Global revenues for nanofibers, by market 2018-2034, millions USD.

Table 175. Nanofibers Demand by market 2022 (MT).

Table 176. Nanofibers Demand by market 2034 (MT).

Table 177. Demand for Nanofibers by region 2022 (MT).

Table 178. Demand for Nanofibers by region 2034 (MT).

Table 179. Nanofibers producers.

Table 180. Market overview for nanosilver-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 181. Markets, benefits and applications of nanosilver.

Table 182. Global demand for nanosilver in metric tons, 2010-2034.

Table 183. Nanosilver Demand by market 2022 (MT).

- Table 184. Nanosilver Demand by market 2034 (MT).
- Table 185. Demand for nanosilver by region 2022 (MT).
- Table 186. Demand for nanosilver by region 2034 (MT).
- Table 187. Prices of nanosilver.
- Table 188. Nanosilver producers.
- Table 189. Market overview for nickel nanoparticles -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 190. Markets, benefits and applications of nickel nanoparticles.
- Table 191. Global demand for nickel nanoparticles in metric tons, 2010-2034.
- Table 192. Nickel nanoparticles Demand by market 2022 (MT).
- Table 193. Nickel nanoparticles Demand by market 2034 (MT).
- Table 194. Demand for nickel nanoparticles by region 2022 (MT).
- Table 195. Demand for nickel nanoparticles by region 2034 (MT).
- Table 196. Example prices of nickel nanoparticles.
- Table 197. Nickel nanoparticle/nanopowders producers and suppliers.
- Table 198. Market overview for quantum dots -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 199. Markets, benefits and applications of quantum dots.
- Table 200. Quantum dot display products.
- Table 201. Global demand for quantum dots in metric tons, 2018-2034.
- Table 202. Quantum dots Demand by market 2022 (MT).
- Table 203. Quantum dots Demand by market 2034 (MT).
- Table 204. Demand for quantum dots by region 2022 (MT).
- Table 205. Demand for quantum dots by region 2034 (MT).
- Table 206. Example prices of quantum dots.
- Table 207. Quantum dot producers and suppliers.
- Table 208. Market overview for silicon oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.
- Table 209. Markets, benefits and applications of silicon oxide nanoparticles.
- Table 210. Global consumption of silicon oxide nanoparticles in metric tons, 2010-2034
- Table 211. Silicon oxide nanoparticles Demand by market 2022 (MT).
- Table 212. Silicon oxide nanoparticles Demand by market 2034 (MT).
- Table 213. Demand for silicon oxide nanoparticles by region 2022 (MT).
- Table 214. Demand for silicon oxide nanoparticles by region 2034 (MT).
- Table 215. Example prices of silicon oxide nanoparticles.
- Table 216. Silicon oxide nanoparticles/nanopowders producers and suppliers.

Table 217. Market overview for single-walled carbon nanotubes-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 218. Properties of single-walled carbon nanotubes.

Table 219. Typical properties of SWCNT and MWCNT.

Table 220. Markets, benefits and applications of single-walled Carbon Nanotubes.

Table 221. SWCNT prices.

Table 222. Annual production capacity of the key SWCNT producers,

Table 223. Global demand for SWCNTs in metric tons, 2018-2034.

Table 224. SWCNT producers.

Table 225. Market overview for titanium dioxide nanoparticles -Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 226. Markets, benefits and applications of titanium dioxide nanoparticles.

Table 227. Global demand for titanium dioxide nanoparticles in metric tons, 2010-2034.

Table 228. Titanium dioxide nanoparticles Demand by market 2022 (MT).

Table 229. Titanium dioxide nanoparticles Demand by market 2034 (MT).

Table 230. Demand for titanium dioxide nanoparticles by region 2022 (MT).

Table 231. Demand for titanium dioxide nanoparticles by region 2034 (MT).

Table 232. Titanium dioxide nanoparticles/nanopowders producers and suppliers.

Table 233. Market overview for zinc oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 234. Markets and applications for zinc oxide nanoparticles.

Table 235. Main Zinc oxide nanoparticles-Suppliers, products, primary particle size.

Table 236. Global demand for zinc oxide nanoparticles in metric tons, 2010-2034.

Table 237. Zinc oxide nanoparticles Demand by market 2022 (MT).

Table 238. Zinc oxide nanoparticles Demand by market 2034 (MT).

Table 239. Demand for zinc oxide nanoparticles by region 2022 (MT).

Table 240. Demand for zinc oxide nanoparticles by region 2034 (MT).

Table 241. Zinc oxide nanoparticle/nanopowder producers and suppliers,

Table 242. Market overview for zirconium oxide nanoparticles-Selling grade particle diameter, usage, advantages, average price/ton, high volume applications, low volume applications and novel applications.

Table 243. Markets, benefits and applications of zirconium oxide nanoparticles.

Table 244. Global demand for zirconium oxide nanoparticles in metric tons, 2010-2034.

Table 245. Zirconium oxide nanoparticles Demand by market 2022 (MT).

Table 246. Zirconium oxide nanoparticles Demand by market 2034 (MT).

Table 247. Demand for zirconium oxide nanoparticles by region 2022 (MT).



- Table 248. Demand for zirconium oxide nanoparticles by region 2034 (MT).
- Table 249. Prices of zirconium oxide nanoparticles.
- Table 250. Zirconium oxide nanoparticles/nanopowders producers and suppliers.
- Table 251. Synthesis methods for cellulose nanocrystals (CNC).
- Table 252. CNC sources, size and yield.
- Table 253. CNC properties.
- Table 254. Mechanical properties of CNC and other reinforcement materials.
- Table 255. Applications of cellulose nanocrystals (CNC).
- Table 256. Product/price/application matrix of cellulose nanocrystal producers.
- Table 257: Cellulose nanocrystal production capacities and production process, by producer.
- Table 258. Cellulose nanocrystal producers.
- Table 259. Applications of bacterial nanocellulose (BNC).
- Table 260. Bacterial nanocellulose producers.
- Table 261. Comparative properties of BNNTs and CNTs.
- Table 262. Applications of BNNTs.
- Table 263. BNNT pricing by producer.
- Table 264. Boron nitride nanotubes producers.
- Table 265. Erbium oxide nanoparticles/nanopowders-Properties, applications, prices and producers.
- Table 266. Indium oxide nanoparticles-Properties, applications, prices and producers.
- Table 267. Molybdenum nanoparticles-Properties, applications, prices and producers.
- Table 268. Comparative properties of conventional QDs and Perovskite QDs.
- Table 269. Applications of perovskite QDs.
- Table 270. Development roadmap for perovskite QDs.
- Table 271. Properties of perovskite QLEDs comparative to OLED and QLED.
- Table 272. Comparison of graphene QDs and semiconductor QDs.
- Table 273. Advantages and disadvantages of methods for preparing GQDs.
- Table 274. Applications of graphene quantum dots.
- Table 275. Graphene quantum dots companies.
- Table 276. 2D materials types.
- Table 277. Comparative analysis of graphene and other 2-D nanomaterials.
- Table 278. Comparison of top-down exfoliation methods to produce 2D materials.
- Table 279. Comparison of the bottom-up synthesis methods to produce 2D materials.
- Table 280. Properties of hexagonal boron nitride (h-BN).
- Table 281. Electronic and mechanical properties of monolayer phosphorene, graphene and MoS<sub>2</sub>.
- Table 282. Properties and applications of functionalized germanene.
- Table 283. GDY-based anode materials in LIBs and SIBs

- Table 284. Physical and electronic properties of Stanene.
- Table 285. 2D materials producers and suppliers.
- Table 286. Market drivers for nanotechnology and nanomaterials in adhesives.
- Table 287. Market overview for nanotechnology and nanomaterials in adhesives.
- Table 288. Nanomaterials properties relevant to application in adhesives.
- Table 289. Applications of nanomaterials in adhesives, by market.
- Table 290: Applications in adhesives, by nanomaterials type.
- Table 291. Market assessment for nanotechnology and nanomaterials in adhesives.
- Table 292. Global revenues for nanotechnology and nanomaterials in adhesives, 2018-2034, conservative and optimistic estimates (millions USD) .
- Table 293: Nanotechnology and nanomaterials product developers in adhesives.
- Table 294. Market assessment for nanotechnology and nanomaterials in aerospace and aviation.
- Table 295. Market drivers for nanotechnology and nanomaterials in aerospace and aviation.
- Table 296. Market overview for nanotechnology and nanomaterials in aerospace and aviation.
- Table 297. Applications in aerospace composites, by nanomaterials type and benefits thereof.
- Table 298. Types of nanocoatings utilized in aerospace and application.
- Table 299. Applications in aerospace coatings, by nanomaterials type and benefits thereof.
- Table 300. Global revenues for nanotechnology and nanomaterials in aerospace and aviation, 2018-2034, millions USD.
- Table 301. Nanotechnology and nanomaterials application and product developers in the aerospace and aviation industry.
- Table 302. Market drivers for nanotechnology and nanomaterials in automotive.
- Table 303. Market overview for nanotechnology and nanomaterials in automotive.
- Table 304. Applications in automotive composites, by nanomaterials type and benefits thereof.
- Table 305. Nanocoatings applied in the automotive industry.
- Table 306: Applications in automotive tires, by nanomaterials type and benefits thereof.
- Table 307. Market assessment for nanotechnology and nanomaterials in automotive.
- Table 308. Global revenues for nanotechnology and nanomaterials in automotive, 2018-2034, millions USD.
- Table 309. Nanotechnology and nanomaterials product developers in the automotive industry.
- Table 310. Market drivers for nanomaterials-based products in medical biosensors.
- Table 311. Applications in medical biosensors, by nanomaterials type and benefits

thereof.

Table 312. Global revenues for nanotechnology and nanomaterials in medical biosensors, 2018-2034, millions USD.

Table 313. Nanotechnology and nanomaterials product developers in medical biosensors.

Table 314. Market drivers for nanomaterials-based products in drug formulation and delivery.

Table 315. Types of Nanocarriers.

Table 316. Applications in drug formulation and delivery, by nanomaterials type and benefits thereof.

Table 317. Types of nanoparticles and products thereof.

Table 318. Nanotechnology drug products.

Table 319. List of antigens delivered by using different nanocarriers.

Table 320. Global revenues for nanotechnology and nanomaterials in drug delivery, 2018-2034, millions USD.

Table 321. Nanotechnology and nanomaterials products developers in drug formulation and delivery.

Table 322. Market drivers for Nanotechnology and nanomaterials-based products in imaging and diagnostics.

Table 323: Applications in medical imaging and diagnostics, by nanomaterials type and benefits thereof.

Table 324. Global revenues for nanotechnology and nanomaterials in imaging and diagnostics, 2018-2034, millions USD.

Table 325. Nanotechnology and nanomaterials product developers in medical imaging and diagnostics

Table 326. Market drivers for nanomaterials-based products in medical coatings and films.

Table 327. Nanocoatings applied in the medical industry-type of coating, nanomaterials utilized, benefits and applications.

Table 328. Nanomaterials utilized in medical coatings and films coatings-benefits and applications.

Table 329. Global revenues for nanomaterials in medical coatings, 2018-2034, millions USD.

Table 330: Nanomaterials-based products developers in medical coatings and films.

Table 331: Market drivers for nanomaterials-based products in medical implants.

Table 332. Applications in medical implants and devices, by nanomaterials type and benefits thereof.

Table 333. Global revenues for nanomaterials in medical implants 2018-2034, millions USD.



- Table 334: Nanotechnology and nanomaterials product developers in medical implants and devices.
- Table 335. Market drivers for nanotechnology and nanomaterials in wound care.
- Table 336. Applications in wound care, by nanomaterials type and benefits thereof.
- Table 337: Medical wound care products.
- Table 338. Global revenues for nanotechnology and nanomaterials in wound care, 2018-2034, millions USD.
- Table 339: Nanomaterials-based products and application developers in wound care.
- Table 340. Market drivers for nanotechnology and nanomaterials-based products in dental.
- Table 341: Applications in dental, by nanomaterials type and benefits thereof.
- Table 342. Global revenues for nanotechnology and nanomaterials in dental, 2018-2034, millions USD.
- Table 343. Nanomaterials-based product developers in dental.
- Table 344. Market drivers in nanocoatings.
- Table 345. Market overview for nanotechnology and nanomaterials in coatings and paints.
- Table 346. Properties of nanocoatings.
- Table 347. End user markets for nanocoatings.
- Table 348. Anti-fingerprint nanocoatings companies.
- Table 349. Anti-bacterial nanocoatings companies.
- Table 350. Anti-corrosion nanocoatings coatings.
- Table 351. Abrasion and wear resistant nanocoatings companies.
- Table 352. Barrier nanocoatings companies.
- Table 353. Anti-fogging nanocoatings companies.
- Table 354. Anti-fouling and easy-to-clean nanocoatings companies.
- Table 355. Self-cleaning (bionic) nanocoatings companies.
- Table 356. Self-cleaning (photocatalytic) nanocoatings companies.
- Table 357. UV-resistant nanocoatings companies.
- Table 358. Thermal barrier and flame retardant nanocoatings companies.
- Table 359. Anti-icing and de-icing nanocoatings companies.
- Table 360. Anti-reflective nanocoatings companies.
- Table 361. Market drivers for nanotechnology and nanomaterials in composites.
- Table 362. Market overview for nanotechnology and nanomaterials in composites.
- Table 363. Applications in polymer composites, by nanomaterials type and benefits thereof.
- Table 364. Applications in thermal management composites, by nanomaterials type and benefits thereof.
- Table 365. Applications in ESD and EMI shielding composites, by nanomaterials type

and benefits thereof.

Table 366. Applications in flame retardants, by nanomaterials type and benefits thereof.

Table 367. Market assessment for nanotechnology and nanomaterials in composites.

Table 368. Global revenues for nanotechnology and nanomaterials in composites, 2018-2034, millions USD.

Table 369. Nanotechnology and nanomaterials-based application and product developers in composites.

Table 370. Comparative properties of conductive inks.

Table 371. Market drivers for nanotechnology and nanomaterials in conductive inks.

Table 372. Market overview for nanotechnology and nanomaterials in conductive inks.

Table 373. Applications in conductive inks by nanomaterials type and benefits thereof.

Table 374. Market assessment for nanotechnology and nanomaterials in conductive inks.

Table 375. Global revenues for nanotechnology and nanomaterials in conductive inks, 2017-2034, millions USD.

Table 376. Nanotechnology and Nanomaterials-based application and product developers in conductive inks.

Table 377. Market drivers for nanotechnology and nanomaterials in construction.

Table 378. Market overview for nanotechnology and nanomaterials in construction, building protection and architectural coatings.

Table 379. Applications in insulation and heating, by nanomaterials type and benefits thereof.

Table 380. Nanomaterials-based product developers in insulation.

Table 381. Applications in exterior coatings by nanomaterials type and benefits thereof.

Table 382. Nanomaterials-based product developers in exterior coatings.

Table 383. Applications in smart windows by nanomaterials type and benefits thereof.

Table 384. Nanomaterials-based product developers in smart windows and glass products.

Table 385. Applications in VOC mitigation and filtration by nanomaterials type and benefits thereof.

Table 386. Nanomaterials-based product developers in VOC mitigation and filtration.

Table 387. Applications in concrete and cement by nanomaterials type and benefits thereof.

Table 388. Applications in self-healing construction materials by nanomaterials type and benefits thereof.

Table 389. Nanomaterials-based product developers self-healing construction materials.

Table 390. Nanomaterials for asphalt and bitumen.

Table 391. Global revenues for nanotechnology and nanomaterials in construction, 2018-2034, millions USD.

Table 392. Nanotechnology and nanomaterials-based application and product developers in construction, building protection and architectural coatings.

Table 393: Market drivers for nanotechnology and nanomaterials in cosmetics and personal care.

Table 394: Applications in cosmetics and personal care, by nanomaterials type and benefits thereof.

Table 395. Cosmetics products incorporating nanomaterials/nanocarriers.

Table 396. Global revenues for nanotechnology and nanomaterials in cosmetics and personal care, 2018-2034, millions USD.

Table 397. Nanotechnology and nanomaterials-based product developers in the cosmetics and personal care market.

Table 398. Market drivers for nanotechnology and nanomaterials in flexible electronics, conductive films and displays.

Table 399. Applications in flexible electronics, flexible conductive films and displays, by nanomaterials type and benefits thereof.

Table 400. Global revenues for nanomaterials in flexible electronics, 2018-2034.

Table 401. Global revenues for nanotechnology and nanomaterials in displays, 2018-2034.

Table 402: Nanotechnology and nanomaterials-based product developers in flexible electronics, flexible conductive films and displays.

Table 403. Market drivers for nanotechnology and nanomaterials in transistors, integrated circuits EMI shielding and other components.

Table 404. Applications in transistors, integrated circuits and other components, by nanomaterials type and benefits thereof.

Table 405. Global revenues for nanotechnology and nanomaterials in transistors, integrated circuits and other components, 2018-2034.

Table 406. Nanotechnology and Nanomaterials-based product developers in transistors, integrated circuits and other components.

Table 407. Market drivers for nanotechnology and nanomaterials in memory devices.

Table 408. Applications in memory devices, by nanomaterials type and benefits thereof.

Table 409. Global revenues for nanotechnology and nanomaterials in memory devices, 2018-2034.

Table 410: Nanotechnology and Nanomaterials-based product developers in memory devices.

Table 411. Market drivers for nanotechnology and nanomaterials in electronics coatings.

Table 412. Nanocoatings applied in the consumer electronics industry.

Table 413. Global revenues for nanotechnology and nanomaterials in electronics coatings, 2018-2034.

Table 414. Nanotechnology and Nanomaterials-based product developers in electronics coatings.

Table 415. Market drivers for nanotechnology and nanomaterials in photonics.

Table 416. Applications in photonics, by nanomaterials type and benefits thereof.

Table 417: Graphene properties relevant to application in optical modulators.

Table 418. Global revenues for nanotechnology and nanomaterials in photonics, 2018-2034.

Table 419. Nanotechnology and Nanomaterials-based product developers in photonics.

Table 420. Market drivers for nanotechnology and nanomaterials in batteries.

Table 421. Market overview for nanotechnology and nanomaterials in batteries.

Table 422. Applications in LIB, by nanomaterials type and benefits thereof.

Table 423. Applications in Li-S batteries, by nanomaterials type and benefits thereof.

Table 424. Applications in sodium-ion batteries, by nanomaterials type and benefits thereof.

Table 425. Applications in lithium-air batteries, by nanomaterials type and benefits thereof.

Table 426. Applications in magnesium batteries, by nanomaterials type and benefits thereof.

Table 427. Market assessment for nanotechnology and nanomaterials in batteries.

Table 428. Global revenues for nanotechnology and nanomaterials in batteries, 2018-2034, millions USD.

Table 429. Nanotechnology and nanomaterials product developers in batteries.

Table 430. Market drivers for nanotechnology and nanomaterials in fuel cells and hydrogen storage.

Table 431. Applications in fuel cells, by nanomaterials type and benefits thereof.

Table 432. Applications hydrogen storage, by nanomaterials type and benefits thereof.

Table 433. Global revenues for nanotechnology and nanomaterials in fuel cells, 2018-2034, millions USD.

Table 434. Nanotechnology and Nanomaterials-based product developers in fuel cells and hydrogen storage.

Table 435. Market drivers for nanotechnology and nanomaterials in supercapacitors.

Table 436. Applications in supercapacitors, by nanomaterials type and benefits thereof.

Table 437. Global revenues for nanotechnology and nanomaterials in supercapacitors, 2018-2034, millions USD.

Table 438. Nanotechnology and Nanomaterials-based product developers in supercapacitors.

Table 439. Market drivers for nanotechnology and nanomaterials in filtration and environmental remediation.

Table 440. Types of filtration.

Table 441. Applications in desalination and water filtration, by nanomaterials type and benefits thereof.

Table 442. Applications in airborne filters, by nanomaterials type and benefits thereof.

Table 443. Applications in gas separation, by nanomaterials type and benefits thereof.

Table 444. Global revenues for nanotechnology and nanomaterials in filtration, 2018-2034, millions USD.

Table 445. Nanotechnology and Nanomaterials-based product developers in filtration and environmental remediation.

Table 446. Market drivers for nanotechnology and nanomaterials in food and agriculture.

Table 447. Applications in food packaging, by nanomaterials type and benefits thereof.

Table 448. Food packaging products incorporating nanomaterials.

Table 449. Applications in food coatings, by nanomaterials type and benefits thereof.

Table 450. Applications in food additives and supplements, by nanomaterials type and benefits thereof.

Table 451. Applications in agricultural production, by nanomaterials type and benefits thereof.

Table 452. Global revenues for nanomaterials in food and agriculture, 2018-2034, millions USD.

Table 453: Nanotechnology and Nanomaterials-based product developers in food and agriculture.

Table 454. Market drivers for nanotechnology and nanomaterials in household care and sanitary.

Table 455. Applications in anti-microbial coatings, by nanomaterials type and benefits thereof.

Table 456. Applications in anti-fingerprint nanocoatings, by nanomaterials type and benefits thereof.

Table 457. Global revenues for nanotechnology and nanomaterials in household care and sanitary, 2018-2034, millions USD.

Table 458. Nanomaterials-based application and product developers in household care and sanitary.

Table 459. Market drivers for nanotechnology and nanomaterials in lighting.

Table 460. Applications in lighting, by nanomaterials type and benefits thereof.

Table 461. Global revenues for nanotechnology and nanomaterials in lighting, 2018-2034, millions USD.

Table 462: Nanotechnology and Nanomaterials-based product developers in lighting.

Table 463: Market drivers for nanotechnology and nanomaterials in lubricants.

Table 464. Nanomaterial lubricant products.

Table 465. Applications in lubricants, by nanomaterials type and benefits thereof.

Table 466. Global revenues for nanotechnology and nanomaterials in lubricants, 2018-2034, millions USD.

Table 467. Nanotechnology and Nanomaterials-based product developers in lubricants.

Table 468. Market drivers for nanotechnology and nanomaterials in the marine market.

Table 469. Nanocoatings applied in the marine industry-type of coating, nanomaterials utilized and benefits.

Table 470. Global revenues for nanotechnology and nanomaterials in the marine sector, 2018-2034, millions USD.

Table 471. Nanotechnology and Nanomaterials-based product developers in the marine industry.

Table 472. Market drivers for nanotechnology and nanomaterials in oil, gas and mining.

Table 473. Applications in sensing and reservoir management, by nanomaterials type and benefits thereof.

Table 474. Applications in oil, gas and mining coatings, by nanomaterials type and benefits thereof.

Table 475. Applications in oil & gas exploration drilling fluids, by nanomaterials type and benefits thereof.

Table 476. Applications in oil & gas exploration sorbent materials, by nanomaterials type and benefits thereof.

Table 477. Applications in separation, by nanomaterials type and benefits thereof.

Table 478. Global revenues for nanotechnology and nanomaterials in oil, gas and mining, 2018-2034, millions USD.

Table 479. Nanotechnology and Nanomaterials-based product developers in oil & gas exploration.

Table 480. Market drivers for nanotechnology and nanomaterials in packaging.

Table 481. Application markets, competing materials, nanomaterials advantages and current market size in packaging.

Table 482. Applications in packaging, by nanomaterials type and benefits thereof.

Table 483. Global revenues for nanotechnology and nanomaterials in packaging, 2018-2034, millions USD.

Table 484. Nanotechnology and Nanomaterials-based product developers in packaging.

Table 485: Market drivers for nanotechnology and nanomaterials in rubber.

Table 486. Market overview for nanotechnology and nanomaterials in rubber.

Table 487. Applications in rubber and elastomers, by nanomaterials type and benefits thereof.

Table 488. Market assessment for nanotechnology and nanomaterials in rubber.

Table 489. Global revenues for nanotechnology and nanomaterials in rubber, 2018-2034, millions USD.

Table 490. Nanotechnology and Nanomaterials-based product developers in rubber.



Table 491. Market drivers for nanotechnology and nanomaterials in security and defence.

Table 492. Applications in military textiles, by nanomaterials type and benefits thereof.

Table 493. Applications in military equipment, by nanomaterials type and benefits thereof.

Table 494. Applications in anti-counterfeiting, by nanomaterials type and benefits thereof.

Table 495. Applications in security and defence sensors and detection, by nanomaterials type and benefits thereof.

Table 496. Applications in ballistic protection, by nanomaterials type and benefits thereof. 1000

Table 497. Global revenues for nanotechnology and nanomaterials in security and defence, 2018-2034, millions USD. 1001

Table 498: Nanotechnology and Nanomaterials-based product developers in security and defence. 1002

Table 499. Market drivers for nanotechnology and nanomaterials in sensors. 1007

Table 500. Graphene properties relevant to application in sensors. 1009

Table 501. Applications in strain sensors, by nanomaterials type and benefits thereof. 1010

Table 502. Applications in strain sensors, by nanomaterials type and benefits thereof. 1011

Table 503. Applications in biosensors, by nanomaterials type and benefits thereof. 1012

Table 504. Applications in food sensors, by nanomaterials type and benefits thereof. 1013

Table 505. Applications in image sensors, by nanomaterials type and benefits thereof. 1014

Table 506. Applications in infrared (IR) sensors, by nanomaterials type and benefits thereof. 1014

Table 507. Applications in optical sensors, by nanomaterials type and benefits thereof. 1014

Table 508. Applications in pressure sensors, by nanomaterials type and benefits thereof. 1015

Table 509. Applications in humidity sensors, by nanomaterials type and benefits thereof. 1016

Table 510. Applications in acoustic sensors, by nanomaterials type and benefits thereof. 1016

Table 511. Applications in wireless sensors, by nanomaterials type and benefits thereof. 1016

Table 512. Global revenues for nanotechnology and nanomaterials in sensors,

2018-2034, millions USD. 1017

Table 513. Nanotechnology and Nanomaterials-based product developers in sensors. 1019

Table 514. Market drivers for nanotechnology and nanomaterials in photovoltaics. 1024

Table 515. Applications in photovoltaics, by nanomaterials type and benefits thereof. 1027

Table 516: Applications in solar water splitting, by nanomaterials type and benefits thereof. 1029

Table 517: Applications in solar coatings, by nanomaterials type and benefits thereof. 1030

Table 518. Global revenues for nanotechnology and nanomaterials in photovoltaics, 2018-2034, millions USD. 1032

Table 519. Nanotechnology and nanomaterials-based products and application developers in photovoltaics. 1033

Table 520. Market drivers for nanotechnology and nanomaterials in textiles and apparel. 1038

Table 521. Desirable functional properties for the textiles industry afforded by the use of nanomaterials. 1042

Table 522. Applications in textiles, by nanomaterials type and benefits thereof. 1044

Table 523. Nanocoatings applied in the textiles industry-type of coating, nanomaterials utilized, benefits and applications. 1045

Table 524. Global revenues for nanotechnology and nanomaterials in textiles and apparel, 2018-2034, millions USD. 1050

Table 525. Nanotechnology and Nanomaterials-based product developers in textiles. 1052

Table 526. Market drivers for nanotechnology and nanomaterials in tools & manufacturing. 1057

Table 527. Applications in tools & manufacturing, by nanomaterials type and benefits thereof. 1058

Table 528. Global revenues for nanotechnology and nanomaterials in tools and manufacturing, 2018-2034, millions USD. 1060

Table 529. Nanotechnology and nanomaterials-based product developers in tools & manufacturing. 1061

Table 530. Applications in 3D printing, by nanomaterials type and benefits thereof. 1066

Table 531. Market assessment for nanotechnology and nanomaterials in 3D printing. 1068

Table 532. Global revenues for nanotechnology and nanomaterials in 3D printing, 2018-2034, millions USD. 1069

Table 533. Nanotechnology and Nanomaterials-based product developers in 3D



printing. 1070

Table 534. Applications in catalysts, by nanomaterials type and benefits thereof. 1072

Table 535. Nanotechnology and Nanomaterials-based product developers in catalysts.  
1073

Table 536. Nanotechnology and Nanomaterials-based product developers in cabling.  
1074

Table 537. Nanotechnology and Nanomaterials-based product developers in sporting goods. 1076

Table 538. Applications in wind energy nanocomposites, by nanomaterials type and benefits thereof. 1079

Table 539: Applications in wind energy nanosensors, by nanomaterials type and benefits thereof. 1079

Table 540: Applications in wind energy nanocoatings, by nanomaterials type and benefits thereof. 1079

Table 541: Nanotechnology and Nanomaterials-based product developers in wind energy. 1080

Table 542. Applications in thermoelectrics, by nanomaterials type and benefits thereof.  
1081

Table 543. Nanotechnology and nanomaterials product developers in thermoelectrics.  
1082

## List Of Figures

### LIST OF FIGURES

Figure 1. Synthesis of nanomaterials via top-down and bottom-up approaches.

Figure 2. Global production volume of engineered nanomaterials in metric tons (MT), 2010-2034.

Figure 3. Transportation pathways of natural and artificial (incidental and engineered).

Figure 4. Engineered nanomaterials life cycle.

Figure 5. Technology Readiness Level for aluminium oxide nanoparticles.

Figure 6. Global demand for aluminium oxide nanoparticles (MT), 2010-2034.

Figure 7. Aluminium oxide nanoparticles Demand by market 2022 (%).

Figure 8. Aluminium oxide nanoparticles Demand by market 2034 (%).

Figure 9. Demand for aluminium oxide nanoparticles by region 2022 (%).

Figure 10. Demand for aluminium oxide nanoparticles by region 2034 (%).

Figure 11. Stage of commercial development for Antimony Tin Oxide Nanoparticles.

Figure 12. Global demand for antimony tin oxide nanoparticles/nanopowders, in metric tons, 2010-2034.

Figure 13. Antimony tin oxide nanoparticles Demand by market 2022 (%).

Figure 14. Antimony tin oxide nanoparticles Demand by market 2034 (%).

Figure 15. Demand for antimony tin oxide nanoparticles by region 2022 (%).

Figure 16. Demand for antimony tin oxide nanoparticles by region 2034 (%).

Figure 17. Technology Readiness Level (TRL) for Bismuth Oxide Nanoparticles.

Figure 18. Global demand for bismuth oxide nanoparticles in metric tons, 2010-2034.

Figure 19. Bismuth oxide nanoparticles Demand by market 2022 (%).

Figure 20. Bismuth oxide nanoparticles Demand by market 2034 (%).

Figure 21. Demand for bismuth oxide nanoparticles by region 2022 (%).

Figure 22. Demand for bismuth oxide nanoparticles by region 2034 (%).

Figure 23. Technology Readiness Level (TRL) for cellulose nanofibers.

Figure 24. Global demand for cellulose nanofibers in metric tons by market, 2018-2034.

Figure 25. Cellulose nanofibers (CNF) Demand by market 2022 (%).

Figure 26. Cellulose nanofibers (CNF) Demand by market 2034 (%).

Figure 27. Demand for Cellulose nanofibers (CNF) by region 2022 (%)

Figure 28. Demand for Cellulose nanofibers (CNF) by region 2034 (%)

Figure 29. Technology Readiness Level (TRL) for cerium oxide nanoparticles.

Figure 30. Global demand for cerium oxide nanoparticles (MT), 2010-2034.

Figure 31. Cerium oxide nanoparticles Demand by market 2022 (%)

Figure 32. Cerium oxide nanoparticles Demand by market 2034 (%)

Figure 33. Demand for Cerium Oxide Nanoparticles by region 2022 (%).

- Figure 34. Demand for Cerium Oxide Nanoparticles by region 2034 (%).
- Figure 35. Technology Readiness Level (TRL) for Cobalt Oxide Nanoparticles.
- Figure 36. Global demand for cobalt oxide nanoparticles (MT), 2010-2034.
- Figure 37. Cobalt oxide nanoparticles Demand by market 2022 (%).
- Figure 38. Cobalt oxide nanoparticles Demand by market 2034 (%).
- Figure 39. Demand for Cobalt Oxide Nanoparticles by region 2022 (%).
- Figure 40. Demand for Cobalt Oxide Nanoparticles by region 2034 (%).
- Figure 41. Cobalt oxide nanoparticles and nanopowders producers and suppliers.
- Figure 42. Technology Readiness Level (TRL) for copper oxide nanoparticles.
- Figure 43. Global demand for copper oxide nanoparticles (MT), 2010-2034.
- Figure 44. Copper oxide nanoparticles Demand by market 2022 (%).
- Figure 45. Copper oxide nanoparticles Demand by market 2034 (%).
- Figure 46. Demand for copper oxide nanoparticles by region 2022 (%).
- Figure 47. Demand for copper oxide nanoparticles by region 2034 (%).
- Figure 48. Dendrimer structure.
- Figure 49. Dendrimer schematic for application in biomedicine.
- Figure 50. Technology Readiness Level (TRL) for dendrimers.
- Figure 51. Global demand for dendrimers in metric tons, 2010-2034.
- Figure 52. Dendrimers Demand by market 2022 (%).
- Figure 53. Dendrimers Demand by market 2034 (%).
- Figure 54. Demand for dendrimers by region 2022 (%)
- Figure 55. Demand for dendrimers by region 2034 (%)
- Figure 56. Technology Readiness Level (TRL) for fullerenes.
- Figure 57. Global demand for fullerenes in metric tons, 2010-2034.
- Figure 58. Fullerenes Demand by market 2022 (%).
- Figure 59. Fullerenes Demand by market 2034 (%).
- Figure 60. Demand for fullerenes by region 2022 (%).
- Figure 61. Demand for fullerenes by region 2033 (%).
- Figure 62. Technology Readiness Level (TRL) for gold nanoparticles.
- Figure 63. Global demand for gold nanoparticles in metric tons, 2010-2034.
- Figure 64. Gold nanoparticles Demand by market 2022 (%).
- Figure 65. Gold nanoparticles Demand by market 2034 (%).
- Figure 66. Demand for gold nanoparticles by region 2022 (%).
- Figure 67. Demand for gold nanoparticles by region 2033 (%).
- Figure 68. Technology Readiness Level (TRL) for graphene.
- Figure 69. Demand for graphene, 2018-2034, tons.
- Figure 70. Graphene Demand by market 2022 (%)
- Figure 71. Graphene Demand by market 2034 (%)
- Figure 72. Demand for graphene by region 2022 (%).

- Figure 73. Demand for graphene by region 2034 (%)
- Figure 74. Technology Readiness Level (TRL) for iron oxide nanoparticles.
- Figure 75. Global demand for iron oxide nanoparticles in metric tons, 2010-2034.
- Figure 76. Iron oxide nanoparticles Demand by market 2022 (%)
- Figure 77. Iron oxide nanoparticles Demand by market 2034 (%).
- Figure 78. Demand for iron oxide nanoparticles by region 2022 (%)
- Figure 79. Demand for iron oxide nanoparticles by region 2034 (%).
- Figure 80. Technology Readiness Level (TRL) for magnesium oxide nanoparticles.
- Figure 81. Global demand for magnesium oxide nanoparticles in metric tons, 2010-2034.
- Figure 82. Magnesium oxide nanoparticles Demand by market 2022 (%).
- Figure 83. Magnesium oxide nanoparticles Demand by market 2034 (%).
- Figure 84. Demand for magnesium oxide nanoparticles by region 2022 (%).
- Figure 85. Demand for magnesium oxide nanoparticles by region 2034 (%).
- Figure 86. Technology Readiness Level (TRL) for manganese oxide nanoparticles.
- Figure 87. Global demand for manganese oxide nanoparticles in metric tons, 2010-2034.
- Figure 88. Manganese oxide nanoparticles Demand by market 2022 (%).
- Figure 89. Manganese oxide nanoparticles Demand by market 2034(%)
- Figure 90. Demand for manganese oxide nanoparticles by region 2022 (%).
- Figure 91. Demand for manganese oxide nanoparticles by region 2034 (%).
- Figure 92. Technology Readiness Level (TRL) for multi-walled Carbon Nanotubes by application.
- Figure 93. Global demand for multi-walled carbon nanotubes in metric tons, 2010-2034.
- Figure 94. MWCNT Demand by market 2022 (%)
- Figure 95. MWCNT Demand by market 2034 (%)
- Figure 96. Demand for MWCNT by region 2022 (%).
- Figure 97. Demand for MWCNT by region 2034 (%).
- Figure 98. Technology Readiness Level (TRL) for nanoclays.
- Figure 99. Global demand for nanoclays in metric tons, 2010-2034.
- Figure 100. Nanoclays Demand by market 2022 (%).
- Figure 101. Nanoclays Demand by market 2034(%)
- Figure 102. Demand for nanoclays by region 2022 (%).
- Figure 103. Demand for nanoclays by region 2034 (%).
- Figure 104. Detonation Nanodiamond.
- Figure 105. DND primary particles and properties.
- Figure 106. Functional groups of Nanodiamonds.
- Figure 107. Technology Readiness Level (TRL) for nanodiamonds.
- Figure 108. Global demand for nanodiamonds in metric tons, 2010-2034

- Figure 109. Nanodiamonds Demand by market 2022 (%)
- Figure 110. Nanodiamonds Demand by market 2034 (%)
- Figure 111. Demand for nanodiamonds by region 2022 (%).
- Figure 112. Demand for nanodiamonds by region 2034 (%).
- Figure 113. Technology Readiness Level (TRL) for nanofibers.
- Figure 114. Global revenues for nanofibers, by market 2018-2034, millions USD.
- Figure 115. Nanofibers Demand by market 2022 (%)
- Figure 116. Nanofibers Demand by market 2034 (%)
- Figure 117. Demand for Nanofibers by region 2022 (%).
- Figure 118. Demand for Nanofibers by region 2034 (%).
- Figure 119. Supply chain for nanosilver products.
- Figure 120. Technology Readiness Level (TRL) for nanosilver.
- Figure 121. Global demand for nanosilver in metric tons, 2010-2034.
- Figure 122. Nanosilver Demand by market 2022 (%).
- Figure 123. Nanosilver Demand by market 2034(%)
- Figure 124. Demand for nanosilver by region 2022 (%).
- Figure 125. Demand for nanosilver by region 2034 (%).
- Figure 126. Technology Readiness Level (TRL) for nickel nanoparticles.
- Figure 127. Global demand for nickel nanoparticles in metric tons, 2010-2034.
- Figure 128. Nickel nanoparticles Demand by market 2022 (%).
- Figure 129. Nickel nanoparticles Demand by market 2034 (%).
- Figure 130. Demand for nickel nanoparticles by region 2022 (%).
- Figure 131. Demand for nickel nanoparticles by region 2034 (%)
- Figure 132. Technology Readiness Level (TRL) for quantum dots.
- Figure 133. Global demand for quantum dots in metric tons, 2018-2034.
- Figure 134. Quantum dots Demand by market 2022 (%).
- Figure 135. Quantum dots Demand by market 2034 (%)
- Figure 136. Demand for quantum dots by region 2022 (%)
- Figure 137. Demand for quantum dots by region 2034 (%)
- Figure 138. Technology Readiness Level (TRL) for silicon oxide nanoparticles.
- Figure 139. Global demand for silicon oxide nanoparticles in metric tons, 2010-2034
- Figure 140. Silicon oxide nanoparticles Demand by market 2022 (%).
- Figure 141. Silicon oxide nanoparticles Demand by market 2034 (%).
- Figure 142. Demand for silicon oxide nanoparticles by region 2022 (%).
- Figure 143. Demand for silicon oxide nanoparticles by region 2034 (%).
- Figure 144. Technology Readiness Level (TRL) for Single-walled Carbon Nanotubes.
- Figure 145. SWCNT market demand forecast (metric tons), 2018-2034.
- Figure 146. Technology Readiness Level (TRL) for Titanium Oxide Nanoparticles.
- Figure 147. Global demand for titanium dioxide nanoparticles in metric tons, 2010-2034.



- Figure 148. Titanium dioxide nanoparticles Demand by market 2022 (%).
- Figure 149. Titanium dioxide nanoparticles Demand by market 2034 (%).
- Figure 150. Demand for titanium dioxide nanoparticles by region 2022 (%).
- Figure 151. Demand for titanium dioxide nanoparticles by region 2034 (%).
- Figure 152. Technology Readiness Level (TRL) for zinc oxide nanoparticles.
- Figure 153. Global demand for zinc oxide nanoparticles in metric tons, 2010-2034.
- Figure 154. Zinc oxide nanoparticles Demand by market 2022 (%).
- Figure 155. Zinc oxide nanoparticles Demand by market 2034 (%).
- Figure 156. Demand for zinc oxide nanoparticles by region 2022 (%).
- Figure 157. Demand for zinc oxide nanoparticles by region 2034 (%).
- Figure 158. Technology Readiness Level (TRL) for zirconium oxide nanoparticles.
- Figure 159. Global demand for zirconium oxide nanoparticles in metric tons, 2010-2034.
- Figure 160. Zirconium oxide nanoparticles Demand by market 2022 (%).
- Figure 161. Zirconium oxide nanoparticles Demand by market 2034 (%).
- Figure 162. Demand for zirconium oxide nanoparticles by region 2022 (%)
- Figure 163. Demand for zirconium oxide nanoparticles by region 2034 (%).
- Figure 164. Schematic representation of carbon nanohorns.
- Figure 165. Schematic illustration of three-chamber system for SWCNH production.
- Figure 166. TEM image of cellulose nanocrystals.
- Figure 167. CNC preparation.
- Figure 168. Extracting CNC from trees.
- Figure 169. CNC slurry.
- Figure 170: Schematic of Boron Nitride nanotubes (BNNTs). Alternating B and N atoms are shown in blue and red.
- Figure 171. A pQLED device structure.
- Figure 172. Perovskite quantum dots under UV light.
- Figure 173: Green-fluorescing graphene quantum dots.
- Figure 174. Schematic of (a) CQDs and (c) GQDs. HRTEM images of (b) C-dots and (d) GQDs showing combination of zigzag and armchair edges (positions marked as 1 4).
- Figure 175. Graphene quantum dots.
- Figure 176. Top-down and bottom-up methods.
- Figure 177. Structures of nanomaterials based on dimensions.
- Figure 178. Schematic of 2-D materials.
- Figure 179. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in adhesives.
- Figure 180. Global revenues for nanotechnology and nanomaterials in adhesives, 2018-2034, conservative and optimistic estimates (millions USD).
- Figure 181. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in aerospace and aviation.

Figure 182. Global revenues for nanotechnology and nanomaterials in aerospace and aviation, 2018-2034, millions USD.

Figure 183. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in automotive.

Figure 184. Global revenues for nanotechnology and nanomaterials in automotive, 2018-2034, millions USD.

Figure 185. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in medical biosensors.

Figure 186. Global revenues for nanotechnology and nanomaterials in medical biosensors, 2018-2034, Millions USD.

Figure 187. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in drug delivery.

Figure 188. Global revenues for nanotechnology and nanomaterials in drug delivery, 2018-2034, millions USD.

Figure 189. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in medical imaging and diagnostics

Figure 190. Global revenues for nanotechnology and nanomaterials in imaging and diagnostics, 2018-2034.

Figure 191. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in medical coatings and films.

Figure 192. Global revenues for nanomaterials in medical coatings 2018-2034, millions USD.

Figure 193. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in medical implants.

Figure 194. Global revenues for nanomaterials in medical implants, 2018-2034, millions USD.

Figure 195. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in medical wound care.

Figure 196. Global revenues for nanotechnology and nanomaterials in wound care, 2018-2034, millions USD.

Figure 197. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in dental.

Figure 198. Global revenues for nanotechnology and nanomaterials in dental, 2018-2034, millions USD.

Figure 199. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in coatings and paints.

Figure 200. Global revenues for nanotechnology and nanomaterials in coatings and paints, 2018-2034, millions USD.

Figure 201. Self-healing nanocoatings.

Figure 202. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in composites.

Figure 203. Global revenues for nanotechnology and nanomaterials in composites, 2018-2034, millions USD.

Figure 204. Global revenues for nanotechnology and nanomaterials in conductive inks, 2017-2034, millions USD.

Figure 205. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in construction and buildings.

Figure 206. Global revenues for nanotechnology and nanomaterials in construction, 2018-2034, millions USD.

Figure 207. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in cosmetics and personal care.

Figure 208. Global revenues for nanotechnology and nanomaterials in cosmetics and personal care, 2018-2034, millions USD.

Figure 209. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in flexible electronics, conductive films and displays.

Figure 210: QD-LCD supply chain.

Figure 211. Global revenues for nanotechnology and nanomaterials in flexible electronics, 2018-2034.

Figure 212. Global revenues for nanomaterials in displays, 2018-2034.

Figure 213. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in transistors, integrated circuits and other components.

Figure 214. Global revenues for nanotechnology and nanomaterials in transistors, integrated circuits and other components, 2018-2034.

Figure 215. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in memory devices.

Figure 216. Global revenues for nanotechnology and nanomaterials in memory devices, 2018-2034.

Figure 217. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in electronics coatings.

Figure 218. Global revenues for nanotechnology and nanomaterials in electronics coatings, 2018-2034.

Figure 219. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in photonics.

Figure 220. Global revenues for nanotechnology and nanomaterials in photonics, 2018-2034.

Figure 221. Electrochemical performance of nanomaterials in LIBs.

Figure 222. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in batteries.



Figure 223. Global revenues for nanotechnology and nanomaterials in batteries, 2018-2034, millions USD.

Figure 224. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in fuel cells.

Figure 225. Global revenues for nanotechnology and nanomaterials in fuel cells, 2018-2034, millions USD.

Figure 226. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in supercapacitors.

Figure 227. Global revenues for nanotechnology and nanomaterials in supercapacitors, 2018-2034, millions USD.

Figure 228. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in filtration.

Figure 229. Global revenues for nanotechnology and nanomaterials in filtration, 2018-2034, millions USD.

Figure 230. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in food and agriculture.

Figure 231. Global revenues for nanomaterials in food and agriculture, 2018-2034, millions USD.

Figure 232. Technology Readiness Level (TRL) for nanotechnology and nanomaterials household care and sanitary.

Figure 233. Global revenues for nanotechnology and nanomaterials in household care and sanitary, 2018-2034, millions USD.

Figure 234. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in lighting.

Figure 235. Global revenues for nanotechnology and nanomaterials in lighting, 2018-2034, millions USD.

Figure 236. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in lubricants.

Figure 237. Global revenues for nanotechnology and nanomaterials in lubricants, 2018-2034, millions USD.

Figure 238. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in marine.

Figure 239. Global revenues for nanotechnology and nanomaterials in the marine sector, 2018-2034, millions USD.

Figure 240. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in oil, gas and mining.

Figure 241. Global revenues for nanotechnology and nanomaterials in oil, gas and mining, 2018-2034, millions USD.

Figure 242. Technology Readiness Level (TRL) for nanotechnology and nanomaterials

in packaging.

Figure 243. Global revenues for nanotechnology and nanomaterials in packaging, 2018-2034, millions USD.

Figure 244. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in rubber.

Figure 245. Global revenues for nanotechnology and nanomaterials in rubber, 2018-2034, millions USD.

Figure 246. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in security and defence. 1000

Figure 247. Global revenues for nanotechnology and nanomaterials in security and defence, 2018-2034, millions USD. 1002

Figure 248. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in sensors. 1017

Figure 249. Global revenues for nanotechnology and nanomaterials in sensors, 2018-2034, millions USD. 1018

Figure 250. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in photovoltaics. 1031

Figure 251. Global revenues for nanotechnology and nanomaterials in photovoltaics, 2018-2034, millions USD. 1033

Figure 252. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in textiles and apparel. 1049

Figure 253. Global revenues for nanotechnology and nanomaterials in textiles and apparel, 2018-2034, millions USD. 1051

Figure 254. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in tools & manufacturing. 1059

Figure 255. Global revenues for nanotechnology and nanomaterials in tools and manufacturing 2018-2034, millions USD. 1061

Figure 256. Technology Readiness Level (TRL) for nanotechnology and nanomaterials in 3D printing. 1067

Figure 257. Global revenues for nanotechnology and nanomaterials in 3D printing, 2018-2034, millions USD. 1070

## I would like to order

Product name: The Global Market for Nanotechnology and Nanomaterials 2024-2034

Product link: <https://marketpublishers.com/r/C88717E8228AEN.html>

Price: US\$ 2,535.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

[info@marketpublishers.com](mailto:info@marketpublishers.com)

## Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/C88717E8228AEN.html>

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:  
Last name:  
Email:  
Company:  
Address:  
City:  
Zip code:  
Country:  
Tel:  
Fax:  
Your message:

**\*\*All fields are required**

Customer signature \_\_\_\_\_

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at <https://marketpublishers.com/docs/terms.html>

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970