

The Graphene Market, Production and Pricing Report 2022

https://marketpublishers.com/r/G3834C7A446CEN.html

Date: February 2022

Pages: 580

Price: US\$ 1,000.00 (Single User License)

ID: G3834C7A446CEN

Abstracts

Graphene is a ground-breaking two-dimensional (2D) material that possesses extraordinary electrical and mechanical properties that promise a new generation of innovative devices. In recent years there has seen a marked increase in commercial graphene collaborations, agreements, investments and product launches. Products are now coming to market across multiple sectors and regional markets. New products and developments launched over the past two years include body temperature regulating fabrics, jackets, coolants, automotive composites, hiking shoes, power banks, sports equipment, anti-corrosion coatings, CPU cooling systems, batteries & supercapacitors, concrete additives and engine oil additives.

Graphene exhibits a unique combination of mechanical, thermal, electronic and optical properties that provide opportunities for further innovation in flexible displays, transistors, photosensors, RFID tags, solar cells, fuel cells, conductive inks, EMI shielding, filtration, anti-oxidation and LEDs across multiple industries including consumer electronics, automotive, aerospace, medicine, energy, 3D printing, polymer composites, wireless technology, filtration and coatings.

The Graphene Market, Production and Pricing Report 2022 includes:

Pricing landscape for graphene, by types and producers.

Analysis of the global market for graphene. Markets covered include 3D printing, adhesives, aerospace, automotive, batteries, composites, conductive inks, construction, electronics, filter media, fuel cells, life sciences & healthcare, lighting, lubricants, oil & gas, paints & coatings, photonics, solar, rubber, sensors, textiles, supercapacitors, audio equipment and sporting goods.



Production volumes by graphene producer (current and planned).

Commercial graphene product guide.

323 company profiles including production processes, products, target markets and collaborations. Companies profiled include Avadain LLC, First Graphene, Paragraf, Levidian Nanosystems, nanoEMI, Graphene Square, Sparc Technologies, Universal Matter, Versarien, Zentek and many more.



Contents

1 EXECUTIVE SUMMARY

- 1.1 Graphene properties
- 1.2 Commercialization
- 1.3 The graphene market to date
- 1.4 Market outlook for 2022 and beyond
- 1.5 The market in 2021
- 1.6 Graphene commercial market developments 2020-2022
- 1.7 Graphene funding and investments 2020-2022
- 1.8 Publicly listed graphene companies
- 1.9 Graphene global production capacities, in tons and by type
- 1.10 Global demand for graphene
 - 1.10.1 Global graphene demand, to 2032, tons
 - 1.10.2 Global graphene demand, by end user market to 2032
 - 1.10.3 Graphene market, by region
 - 1.10.3.1 Asia-Pacific
 - 1.10.3.2 North America
 - 1.10.3.3 Europe
- 1.11 Graphene products
- 1.12 Industrial collaborations and licence agreements
- 1.13 Graphene market challenges

2 TYPES OF GRAPHENE

- 2.1 Graphene materials
 - 2.1.1 CVD Graphene
 - 2.1.1.1 Applications
 - 2.1.2 Graphene nanoplatelets
 - 2.1.3 Graphene oxide and reduced Graphene Oxide
 - 2.1.4 Graphene quantum dots (GQDs)
 - 2.1.4.1 Applications
 - 2.1.4.2 Markets
- 2.2 Intermediate products
 - 2.2.1 Graphene masterbatches
 - 2.2.2 Graphene dispersions

3 GRAPHENE PRODUCTION



- 3.1 Quality
- 3.2 Assessment of graphene production methods
- 3.3 Commercial production capacities
- 3.4 Graphene oxide and reduced Graphene Oxide production capacities
 - 3.4.1 By producer
- 3.5 Graphene nanoplatelets production capacities
 - 3.5.1 By producer
- 3.6 CVD graphene film
 - 3.6.1 By producer
- 3.7 Graphene production issues and challenges
 - 3.7.1 Oversupply
 - 3.7.2 Quality
 - 3.7.3 Large-volume markets
 - 3.7.4 Commoditisation
 - 3.7.5 Industrial end-user perspective

4 GRAPHENE PRICING

- 4.1 Pristine graphene flakes pricing/CVD graphene
- 4.2 Few-Layer graphene pricing
- 4.3 Graphene nanoplatelets pricing
- 4.4 Graphene oxide (GO) and reduced Graphene Oxide (rGO) pricing
- 4.5 Graphene quantum dots pricing
- 4.6 Multilayer graphene (MLG) pricing
- 4.7 Graphene ink

5 MARKETS FOR GRAPHENE

- 5.1 3D PRINTING
 - 5.1.1 Market overview
 - 5.1.2 Market drivers, trends and applications
 - 5.1.3 Global market in tons, historical and forecast to 2032
 - 5.1.4 Products and product developers
- 5.2 ADHESIVES
 - 5.2.1 Market overview
 - 5.2.2 Market drivers, trends and applications
 - 5.2.3 Global market in tons, historical and forecast to 2032
 - 5.2.4 Products and product developers



5.3 AEROSPACE

- 5.3.1 Market overview
- 5.3.2 Market drivers, trends and applications
- 5.3.3 Global market in tons, historical and forecast to 2032
- 5.3.4 Products and product developers

5.4 AUTOMOTIVE

- 5.4.1 Market overview
- 5.4.2 Market drivers, trends and applications
- 5.4.3 Global market in tons, historical and forecast to 2032
- 5.4.4 Product developers

5.5 BATTERIES

- 5.5.1 Market overview
- 5.5.2 Market drivers, trends and applications
- 5.5.3 Global market in tons, historical and forecast to 2032
- 5.5.4 Products and product developers

5.6 COMPOSITES

- 5.6.1 Market overview
 - 5.6.1.1 Fiber-based composite parts
- 5.6.1.2 Metal-matrix composites
- 5.6.2 Global market in tons, historical and forecast to 2032
- 5.6.3 Products and product developers

5.7 CONDUCTIVE INKS

- 5.7.1 Market overview
- 5.7.2 Market drivers, trends and applications
- 5.7.3 Global market in tons, historical and forecast to 2032
- 5.7.4 Products and product developers

5.8 CONSTRUCTION AND BUILDINGS

- 5.8.1 Market overview
- 5.8.2 Market drivers, trends and applications
 - 5.8.2.1 Cement
 - 5.8.2.2 Asphalt bitumen
 - 5.8.2.3 Aerogels
- 5.8.3 Global market in tons, historical and forecast to 2032
- 5.8.4 Products and product developers

5.9 ELECTRONICS

5.9.1 WEARABLE ELECTRONICS AND DISPLAYS

- 5.9.1.1 Market overview
- 5.9.1.2 Market drivers, trends and applications
- 5.9.1.3 Global market, historical and forecast to 2032



5.9.1.4 Products and product developers

5.9.2 TRANSISTORS AND INTEGRATED CIRCUITS

- 5.9.2.1 Market overview
- 5.9.2.2 Market drivers, trends and applications
- 5.9.2.3 Global market, historical and forecast to 2032
- 5.9.2.4 Products and product developer

5.9.3 MEMORY DEVICES

- 5.9.3.1 Market overview
- 5.9.3.2 Market drivers, trends and applications
- 5.9.3.3 Global market in tons, historical and forecast to 2031
- 5.9.3.4 Products and product developer

5.10 FILTER MEDIA

- 5.10.1 Market overview
- 5.10.2 Market drivers, trends and applications
- 5.10.3 Global market in tons, historical and forecast to 2032
- 5.10.4 Products and product developers

5.11 FUEL CELLS

- 5.11.1 Market overview
- 5.11.2 Market drivers, trends and applications
- 5.11.3 Global market in tons, historical and forecast to 2032
- 5.11.4 Products and product developers

5.12 LIFE SCIENCES AND MEDICINE

- 5.12.1 Market overview
 - 5.12.1.1 Drug delivery
 - 5.12.1.2 Imaging and diagnostics
 - 5.12.1.3 Implants
 - 5.12.1.4 Medical biosensors
 - 5.12.1.5 Woundcare
 - 5.12.1.6 Medical wearables
 - 5.12.1.7 Gene delivery
- 5.12.2 Market drivers, trends and applications
- 5.12.3 Global market in tons, historical and forecast to 2032
- 5.12.4 Products and product developers

5.13 LIGHTING

- 5.13.1 Market overview
- 5.13.2 Market drivers, trends and applications
- 5.13.3 Global market in tons, historical and forecast to 2032
- 5.13.4 Products and product developers

5.14 LUBRICANTS



- 5.14.1 Market overview
- 5.14.2 Market drivers, trends and applications
- 5.14.3 Global market in tons, historical and forecast to 2032
- 5.14.4 Products and product developers
- 5.15 OIL AND GAS
 - 5.15.1 Market overview
 - 5.15.2 Market drivers, trends and applications
 - 5.15.3 Global market in tons, historical and forecast to 2032
 - 5.15.4 Products and product developers
- 5.16 PAINTS AND COATINGS
 - 5.16.1 Market overview
 - 5.16.2 Market drivers, trends and applications
 - 5.16.3 Global market in tons, historical and forecast to 2031
 - 5.16.4 Products and product developers
- 5.17 PHOTONICS
 - 5.17.1 Market overview
 - 5.17.2 Market drivers, trends and applications
 - 5.17.3 Global market in tons, historical and forecast to 2031
 - 5.17.4 Products and product developers
- 5.18 PHOTOVOLTAICS
 - 5.18.1 Market overview
 - 5.18.2 Market drivers, trends and applications
 - 5.18.3 Global market in tons, historical and forecast to 2031
 - 5.18.4 Products and product developers
- 5.19 RUBBER AND TIRES
 - 5.19.1 Market overview
 - 5.19.2 Market outlook
 - 5.19.3 Market drivers, trends and applications
 - 5.19.4 Global market in tons, historical and forecast to 2031
 - 5.19.5 Products and product developers
- 5.20 SENSORS
 - 5.20.1 Market overview
 - 5.20.2 Market drivers, trends and applications
 - 5.20.3 Global market in tons, historical and forecast to 2031
 - 5.20.4 Products and product developers
- 5.21 TEXTILES AND APPAREL
 - 5.21.1 Market overview
 - 5.21.2 Market drivers, trends and applications
 - 5.21.3 Global market in tons, historical and forecast to 2031



5.21.4 Product developers

5.22 SUPERCAPACITORS

- 5.22.1 Market overview
- 5.22.2 Market drivers, trends and applications
 - 5.22.2.1 Flexible and stretchable supercapacitors
- 5.22.3 Global market in tons, historical and forecast to 2031
- 5.22.4 Products and product developers
- 5.23 OTHER MARKETS
 - 5.23.1 Audio equipment
 - 5.23.2 Sporting goods and apparel

6 GRAPHENE COMPANY PROFILES 320 (323 COMPANY PROFILES)

7 RESEARCH METHODOLOGY

8 REFERENCES



List Of Tables

LIST OF TABLES

- Table 1. Properties of graphene, properties of competing materials, applications thereof.
- Table 2. Graphene commercial market developments 2020-2022.
- Table 3. Graphene funding and investments 2020-2022.
- Table 4. Publicly listed graphene companies.
- Table 5. Main graphene producers by country, annual production capacities, types and main markets they sell to.
- Table 6. Demand for graphene (tons), 2018-2032.
- Table 7. Main graphene producers in North America.
- Table 8. Main graphene producers in Europe.
- Table 9. Commercial products incorporating graphene.
- Table 10. Graphene industrial collaborations, licence agreements and target markets.
- Table 11. Graphene market challenges.
- Table 12. Applications of GO and rGO.
- Table 13. Comparison of graphene QDs and semiconductor QDs.
- Table 14. Applications of graphene quantum dots.
- Table 15. Markets and applications for graphene quantum dots in electronics and photonics.
- Table 16. Markets and applications for graphene quantum dots in energy storage and conversion.
- Table 17. Markets and applications for graphene quantum dots in sensors.
- Table 18. Markets and applications for graphene quantum dots in biomedicine and life sciences.
- Table 19. Markets and applications for graphene quantum dots in electronics.
- Table 20. Prices for graphene quantum dots.
- Table 21. Assessment of graphene production methods.
- Table 22. Graphene oxide production capacity by producer, 2014-2022.
- Table 23. Graphene nanoplatelets capacity in tons by producer, 2010-2022.
- Table 24. CVD graphene film capacity by producer, 2014-2022 in 000s m2.
- Table 25. Types of graphene and typical prices.
- Table 26. Pristine graphene flakes pricing by producer.
- Table 27. Few-layer graphene pricing by producer.
- Table 28. Graphene nanoplatelets pricing by producer.
- Table 29. Graphene oxide and reduced graphene oxide pricing, by producer.
- Table 30. Graphene quantum dots pricing by producer.
- Table 31. Multi-layer graphene pricing by producer.



- Table 32. Graphene ink pricing by producer.
- Table 33. Market outlook for graphene in 3D printing.
- Table 34. Market and applications for graphene in 3D printing.
- Table 35. Demand for graphene in 3-D printing (tons), 2018-2032.
- Table 36. Product developers in graphene 3D printing.
- Table 37. Market overview for graphene in adhesives.
- Table 38. Market outlook for graphene in adhesives.
- Table 39. Market and applications for graphene in adhesives.
- Table 40. Demand for graphene in adhesives (tons), 2018-2032.
- Table 41. Product developers in graphene adhesives.
- Table 42. Graphene in aerospace.
- Table 43. Market and applications for graphene in aerospace.
- Table 44: Demand for graphene in aerospace (tons), 2018-2030.
- Table 45: Product developers in graphene for aerospace.
- Table 46. Market and applications for graphene in automotive.
- Table 47. Demand for graphene in automotive (tons), 2018-2032.
- Table 48. Product developers in the graphene automotive market.
- Table 49. Market and applications for graphene in batteries.
- Table 50. Estimated demand for graphene in batteries (tons), 2018-2032.
- Table 51. Product developers in graphene batteries.
- Table 52. Market outlook for graphene in fiber-based polymer composite parts.
- Table 53. Market and applications for graphene in fiber-based composite parts.
- Table 54. Market and applications for graphene in metal matrix composites.
- Table 55. Global market for graphene in composites 2018-2032, tons.
- Table 56. Product developers in graphene composites.
- Table 57. Market overview for graphene in conductive inks.
- Table 58. Market outlook for graphene in conductive inks.
- Table 59. Market and applications for graphene in conductive inks.
- Table 60. Comparative properties of conductive inks.
- Table 61. Demand for graphene in conductive ink (tons), 2018-2032.
- Table 62. Product developers in graphene conductive inks.
- Table 63. Market overview for graphene in construction and buildings.
- Table 64. Market outlook for graphene in construction.
- Table 65. Graphene for cement.
- Table 66. Graphene for asphalt bitumen.
- Table 67. Demand for graphene in construction (tons), 2018-2032.
- Table 68: Graphene product developers in construction.
- Table 69. Market overview for graphene in wearable electronics and displays.
- Table 70. Market outlook for graphene in wearable electronics and displays.



- Table 71. Market and applications for graphene in electronics.
- Table 72. Comparison of ITO replacements.
- Table 73. Demand for graphene in wearable, flexible and stretchable electronics, 2018-2032.
- Table 74. Product developers in graphene-based electronics.
- Table 75. Market overview for graphene in transistors and integrated circuits.
- Table 76. Comparative properties of silicon and graphene transistors.
- Table 77. Market outlook for graphene in transistors and integrated circuits.
- Table 78. Market and applications for graphene in transistors and integrated circuits.
- Table 79. Demand for graphene in transistors and integrated circuits, 2018-2032.
- Table 80. Product developers in graphene transistors and integrated circuits.
- Table 81. Market overview for graphene in memory devices.
- Table 82. Market outlook for graphene in memory devices.
- Table 83. Market and applications for graphene in memory devices.
- Table 84. Demand for graphene in memory devices, 2018-2032.
- Table 85. Product developers in graphene memory devices.
- Table 86. Market overview for graphene in filtration.
- Table 87. Market outlook for graphene in filtration.
- Table 88. Market and applications for graphene in filtration.
- Table 89. Demand for graphene in filtration (tons), 2018-2032.
- Table 90. Graphene product developers in filtration.
- Table 91. Market overview for graphene in fuel cells.
- Table 92. Market outlook for graphene in fuel cells.
- Table 93. Market and applications for graphene in fuel cells.
- Table 94. Demand for graphene in fuel cells (tons), 2018-2032.
- Table 95. Product developers in graphene fuel cells.
- Table 96. Market overview for graphene in life sciences and medicine.
- Table 97. Market outlook for graphene in drug delivery.
- Table 98. Scorecard for graphene in imaging and diagnostics.
- Table 99. Scorecard for graphene in medical implants.
- Table 100. Scorecard for graphene in medical biosensors.
- Table 101. Scorecard for graphene in woundcare.
- Table 102. Market and applications for graphene in life sciences and medicine.
- Table 103. Demand for graphene in life sciences and medical (tons), 2018-2032.
- Table 104. Product developers in graphene life sciences and biomedicine.
- Table 105. Market overview for graphene in lighting.
- Table 106. Market outlook for graphene in lighting.
- Table 107. Market and applications for graphene in lighting.
- Table 108. Demand for graphene in lighting, 2018-2032.



- Table 109. Product developers in graphene lighting.
- Table 110. Market overview for graphene in lubricants.
- Table 111. Nanomaterial lubricant products.
- Table 112. Market outlook for graphene in lubricants.
- Table 113. Market and applications for graphene in lubricants.
- Table 114. Demand for graphene in lubricants (tons), 2018-2032.
- Table 115. Product developers in graphene lubricants.
- Table 116. Market overview for graphene in oil and gas.
- Table 117. Market outlook for graphene in oil and gas.
- Table 118. Market and applications for graphene in oil and gas.
- Table 119. Demand for graphene in oil and gas (tons), 2018-2032.
- Table 120. Product developers in graphene oil and gas.
- Table 121. Market overview for graphene in paints and coatings.
- Table 122. Market outlook for graphene in paints and coatings.
- Table 123. Market and applications for graphene in paints and coatings.
- Table 124. Demand for graphene in paints and coatings (tons), 2018-2032.
- Table 125. Product developers in graphene paints and coatings.
- Table 126. Market overview for graphene in paints and coatings.
- Table 127. Market outlook for graphene in photonics.
- Table 128. Market and applications for graphene in photonics.
- Table 129. Demand for graphene in photonics, 2018-2032.
- Table 130. Product developers in graphene photonics.
- Table 131. Market overview for graphene in photovoltaics.
- Table 132. Market outlook for graphene in photovoltaics.
- Table 133. Market and applications for graphene in photovoltaics.
- Table 134. Demand for graphene in photovoltaics (tons), 2018-2032.
- Table 135. Product developers in graphene solar.
- Table 136. Market overview for graphene in rubber and tires.
- Table 137. Market outlook for graphene in rubber and tires.
- Table 138. Market and applications for graphene in rubber and tires.
- Table 139. Demand for graphene in rubber and tires (tons), 2018-2032.
- Table 140. Product developers in rubber and tires.
- Table 141. Market overview for graphene in sensors.
- Table 142. Market outlook for graphene in sensors.
- Table 143. Market and applications for graphene in sensors.
- Table 144. Demand for graphene in sensors (tons), 2018-2032.
- Table 145. Product developers in graphene sensors.
- Table 146. Market overview for graphene in smart textiles and apparel.
- Table 147. Market outlook for graphene in smart textiles and apparel.



- Table 148. Market and applications for graphene in smart textiles and apparel.
- Table 149. Demand for graphene in textiles (tons), 2018-2032.
- Table 150. Graphene product developers in smart textiles and apparel.
- Table 151. Market overview for graphene in supercapacitors.
- Table 152. Market outlook for graphene in supercapacitors.
- Table 153: Comparative properties of graphene supercapacitors and lithium-ion batteries.
- Table 154. Market and applications for graphene in supercapacitors.
- Table 155. Demand for graphene in supercapacitors (tons), 2018-2032.
- Table 156. Product developers in graphene supercapacitors.
- Table 157. Graphene audio equipment producers and products.
- Table 158. Graphene sporting goods producers and products.
- Table 159. Performance criteria of energy storage devices.
- Table 160. Technology Readiness Level (TRL) Examples.



List Of Figures

LIST OF FIGURES

- Figure 1. Demand for graphene, by market, 2021.
- Figure 2. Demand for graphene, 2018-2032, tons.
- Figure 3. Global graphene demand by market, 2018-2032 (tons), conservative estimate.
- Figure 4. Global graphene demand by market, 2018-2032 (tons). Medium estimate.
- Figure 5. Global graphene demand by market, 2018-2032 (tons). High estimate.
- Figure 6. Demand for graphene in China, by market, 2021.
- Figure 7. Demand for graphene in Asia-Pacific, by market, 2021.
- Figure 8. Main graphene producers in Asia-Pacific.
- Figure 9. Demand for graphene in North America, by market, 2021.
- Figure 10. Demand for graphene in Europe, by market, 2021.
- Figure 11. Graphene and its descendants: top right: graphene; top left: graphite = stacked graphene; bottom right: nanotube=rolled graphene; bottom left: fullerene=wrapped graphene.
- Figure 12. Types of CVD methods.
- Figure 13. Schematic of the manufacture of GnPs starting from natural graphite.
- Figure 14. Green-fluorescing graphene quantum dots.
- Figure 15. 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 16. Revenues for graphene quantum dots 2019-2032, millions USD
- Figure 17. Fabrication methods of graphene.
- Figure 18. TEM micrographs of: A) HR-CNFs; B) GANF® HR-CNF, it can be observed its high graphitic structure; C) Unraveled ribbon from the HR-CNF; D) Detail of the ribbon; E) Scheme of the structure of the HR-CNFs; F) Large single graphene oxide sheets derived from GANF.
- Figure 19. (a) Graphene powder production line The Sixth Element Materials
- Technology Co. Ltd. (b) Graphene film production line of Wuxi Graphene Films Co. Ltd.
- Figure 20. Schematic illustration of the main graphene production methods.
- Figure 21. CVD Graphene on Cu Foil.
- Figure 22. Applications of graphene in 3D printing.
- Figure 23. Demand for graphene in 3-D printing (tons), 2018-2032.
- Figure 24. CNCTArch lightweight mounting for digital signalling.
- Figure 25. Applications of graphene in adhesives.
- Figure 26. Demand for graphene in adhesives (tons), 2018-2032.
- Figure 27. Graphene Adhesives.
- Figure 28. Applications of graphene in aerospace.



- Figure 29: Demand for graphene in aerospace (tons), 2018-2032.
- Figure 30. Orbex Prime rocket.
- Figure 31: Graphene enhanced aircraft cargo container.
- Figure 32: Graphene aircraft.
- Figure 33. Summary of graphene in automobiles.
- Figure 34. Applications of graphene in automotive.
- Figure 35. Demand for graphene in automotive (tons), 2018-2032.
- Figure 36. Supercar incorporating graphene.
- Figure 37. Graphene anti-corrosion primer.
- Figure 38. Graphene-R Brake pads.
- Figure 39. Antistatic graphene tire.
- Figure 40. Graphene engine oil additives.
- Figure 41. Applications of graphene in batteries.
- Figure 42. Demand for graphene in batteries (tons), 2018-2032.
- Figure 43. Apollo Traveler graphene-enhanced USB-C / A fast charging power bank.
- Figure 44. Exide Graphene Lead Acid Battery.
- Figure 45. 6000mAh Portable graphene batteries.
- Figure 46. Real Graphene Powerbank.
- Figure 47. Graphene Functional Films UniTran EH/FH.
- Figure 48. Applications of graphene in composites.
- Figure 49. Demand for graphene in composites (tons), 2018-2032.
- Figure 50. Graphene bike.
- Figure 51. Graphene lacrosse equipment.
- Figure 52. Graphene-based suitcase made from recycled plastic.
- Figure 53. Aros Create.
- Figure 54. Grays graphene hockey sticks.
- Figure 55. Applications of graphene in conductive inks.
- Figure 56. Demand for graphene in conductive ink (tons), 2018-2032.
- Figure 57. BGT Materials graphene ink product.
- Figure 58. Printed graphene conductive ink.
- Figure 59. Textiles covered in conductive graphene ink.
- Figure 60. Comparison of nanofillers with supplementary cementitious materials and aggregates in concrete.
- Figure 61. Demand for graphene in construction (tons), 2018-2032.
- Figure 62. Graphene asphalt additives.
- Figure 63. OG (Original Graphene) Concrete Admix Plus.
- Figure 64. Demand for graphene in wearable, flexible and stretchable electronics, 2018-2032.
- Figure 65. Moxi flexible film developed for smartphone application.



- Figure 66. Applications of graphene in transistors and integrated circuits.
- Figure 67. Demand for graphene in transistors and integrated circuits, 2018-2032.
- Figure 68. Graphene IC in wafer tester.
- Figure 69. Schematic cross-section of a graphene based transistor (GBT, left) and a graphene field-effect transistor (GFET, right).
- Figure 70. Demand for graphene in memory devices, 2018-2032.
- Figure 71. Layered structure of tantalum oxide, multilayer graphene and platinum used for resistive random-access memory (RRAM).
- Figure 72. Applications of graphene in filtration.
- Figure 73. Demand for graphene in filtration (tons), 2018-2032.
- Figure 74. Graphene anti-smog mask.
- Figure 75. Graphene filtration membrane.
- Figure 76. Graphene water filer cartridge.
- Figure 77. Applications of graphene in fuel cells.
- Figure 78. Demand for graphene in fuel cells (tons), 2018-2032.
- Figure 79. Graphene-based E-skin patch.
- Figure 80. Applications of graphene in life sciences and medicine
- Figure 81. Demand for graphene in life sciences and medical (tons), 2018-2032.
- Figure 82. Graphene medical biosensors for wound healing.
- Figure 83. Graphene Frontiers' Six[™] chemical sensors consists of a field effect transistor (FET) with a graphene channel. Receptor molecules, such as DNA, are attached directly to the graphene channel.
- Figure 84. BioStamp nPoint.
- Figure 85. Applications of graphene in lighting.
- Figure 86. Demand for graphene in lighting, 2018-2032.
- Figure 87. Graphene LED bulbs.
- Figure 88. Applications of graphene in lubricants.
- Figure 89. Demand for graphene in lubricants (tons), 2018-2032.
- Figure 90. Tricolit spray coating.
- Figure 91. Graphenoil products.
- Figure 92. Applications of graphene in oil and gas.
- Figure 93. Demand for graphene in oil and gas (tons), 2018-2032.
- Figure 94. Directa Plus Grafysorber.
- Figure 95. Applications of graphene in paints and coatings.
- Figure 96. Demand for graphene in paints and coatings (tons), 2018-2032.
- Figure 97. Cryorig CPU cooling system with graphene coating.
- Figure 98. Four layers of graphene oxide coatings on polycarbonate.
- Figure 99. 23303 ZINCTON GNC graphene paint.
- Figure 100. Graphene-enhanced anti-corrosion aerosols under their Hycote brand.



- Figure 101. Scania Truck head lamp brackets ACT chamber 6 weeks, equivalent to 3y
- field use. Piece treated with GO to the left together with different non-GO coatings.
- Figure 102. Schematic of graphene heat film.
- Figure 103. Applications of graphene in photonics.
- Figure 104. Demand for graphene in photonics, 2018-2032.
- Figure 105. All-graphene optical communication link demonstrator operating at a data rate of 25 Gb/s per channel.
- Figure 106. Applications of graphene in photovoltaics.
- Figure 107. Demand for graphene in photovoltaics (tons), 2018-2032.
- Figure 108. Graphene coated glass.
- Figure 109. Applications of graphene in rubber and tires.
- Figure 110. Demand for graphene in rubber and tires (tons), 2018-2032.
- Figure 111. Eagle F1 graphene tire.
- Figure 112. Graphene floor mats.
- Figure 113. Vittoria Corsa G+ tire.
- Figure 114. Graphene-based sensors for health monitoring.
- Figure 115. Applications of graphene in sensors.
- Figure 116. Demand for graphene in sensors (tons), 2018-2032.
- Figure 117. AGILE R100 system.
- Figure 118. Graphene fully packaged linear array detector.
- Figure 119. GFET sensors.
- Figure 120. Graphene is used to increase sensitivity to middle-infrared light.
- Figure 121. Applications of graphene in smart textiles and apparel.
- Figure 122. Demand for graphene in textiles (tons), 2018-2032.
- Figure 123. 878 Project One jacket display.
- Figure 124. Colmar graphene ski jacket.
- Figure 125. Graphene dress. The dress changes colour in sync with the wearer's breathing.
- Figure 126. G+ Graphene Aero Jersey.
- Figure 127. Inov-8 graphene shoes.
- Figure 128. Graphene Functional Membranes UniTran GM.
- Figure 129. Graphene jacket.
- Figure 130. Applications of graphene in supercapacitors.
- Figure 131. Demand for graphene in supercapacitors (tons), 2018-2032.
- Figure 132. KEPCO's graphene supercapacitors.
- Figure 133. Skeleton Technologies supercapacitor.
- Figure 134. Zapgo supercapacitor phone charger.
- Figure 135. Callaway Chrome Soft golf and Chrome Soft X golf balls.
- Figure 136. Graphene heating films.



- Figure 137. Graphene flake products.
- Figure 138. AIKA Black-T.
- Figure 139. Printed graphene biosensors.
- Figure 140. Brain Scientific electrode schematic.
- Figure 141. Graphene battery schematic.
- Figure 142. Dotz Nano GQD products.
- Figure 143. Graphene-based membrane dehumidification test cell.
- Figure 144. Proprietary atmospheric CVD production.
- Figure 145. Wearable sweat sensor.
- Figure 146. InP/ZnS, perovskite quantum dots and silicon resin composite under UV illumination.
- Figure 147. Sensor surface.
- Figure 148. BioStamp nPoint.
- Figure 149. Nanotech Energy battery.
- Figure 150. Hybrid battery powered electrical motorbike concept.
- Figure 151. NAWAStitch integrated into carbon fiber composite.
- Figure 152. Schematic illustration of three-chamber system for SWCNH production.
- Figure 153. TEM images of carbon nanobrush.
- Figure 154. Test performance after 6 weeks ACT II according to Scania STD4445.
- Figure 155. Quantag GQDs and sensor.
- Figure 156. The Sixth Element graphene products.
- Figure 157. Thermal conductive graphene film.
- Figure 158. Talcoat graphene mixed with paint.
- Figure 159. T-FORCE CARDEA ZERO.



I would like to order

Product name: The Graphene Market, Production and Pricing Report 2022

Product link: https://marketpublishers.com/r/G3834C7A446CEN.html

Price: US\$ 1,000.00 (Single User License / Electronic Delivery)

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

Service:

info@marketpublishers.com

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page https://marketpublishers.com/r/G3834C7A446CEN.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
	Custumer 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