

# World Graphene

Industry Study with Forecasts for 2020, 2025 & 2035

Study #3402 | April 2016 | \$6300



## Bright outlook for global graphene market through 2035

Graphene has been touted as a “wonder material” with the potential to disrupt and revolutionize technologies utilized in composites, electronics, energy, and numerous other sectors. Researchers are seeking “killer applications” that will exploit graphene’s unique properties and drive rapid growth in commercial demand. Through 2035, suppliers are expected to overcome the manufacturing difficulties, high costs, and technological barriers that have impeded faster commercialization of many graphene-enhanced products.

## Composites & energy storage markets lead growth

The graphene market is poised for torrid gains through 2020, fueled initially by applications with higher technology readiness levels, including graphene-based polymer composites, lithium-ion battery materials, water filtration systems, and oilfield chemicals. A more significant wave of commercialized graphene products is anticipated between 2020 and 2035, especially as graphene takes hold in applications such as supercapacitors, high-frequency transistors, sensors, and biomedical technologies.

## Growth reliant on price reductions

Prospects for graphene as a disruptive technology are largely contingent on price reductions. As manufacturing processes improve and output of high-quality graphene nanoplatelets and graphene oxide is scaled up, prices are

expected to fall rapidly, reaching levels more competitive with substitute materials by 2035. Semi-continuous processes (such as roll-to-roll methods) are expected to boost output of high-quality graphene film, enabling lower costs and wider adoption in applications such as flexible displays and transistors.

## US remains top graphene consumer

The US is forecast to remain the leading global market for graphene through 2035, bolstered by growing adoption of the material in high-performance composites and energy storage devices, as well as by rising R&D spending in advanced electronics fields (such as optoelectronics and spintronics). The Asia/Pacific region will remain the top regional consumer of graphene, driven by the advanced electronics and energy storage industries of Japan, China, and South Korea. Like the US, these countries will remain at the forefront of graphene R&D, funding nanotechnology projects to further explore graphene’s potential.

## Study coverage

This study analyzes the world graphene industry. It offers historical data (2010 and 2015) plus forecasts (2020, 2025, 2035) for demand by product (e.g., graphene nanoplatelets, graphene oxide, graphene film, other) and by market (e.g., composites, energy, electronics, academic research, biomedical, other) in 5 regions and 9 major countries. The study also considers market environment factors, details the industry structure, and profiles industry competitors worldwide.

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## ASIA/PACIFIC

### South Korea: Graphene Markets

Demand for graphene in South Korea is projected to reach \$ million in 2020, and grow to nearly half of total sales will be bolstered by increasing use of graphene in various applications. A particular emphasis on mobile phone technology -- is driving advanced technologies for consumer electronics. The Samsung Advanced Institute of Technology is developing longer lasting Li-Ion batteries manufactured with anode materials on graphene and silicon. Samsung has also partnered with US-based XG Sciences, a leading supplier of graphene nanoplatelets, for the commercialization of batteries manufactured with these materials. Additional sales will stem from local researchers employing graphene development of improved supercapacitors that can compete with batteries in terms of energy density.

By 2035, the electronics market is projected to overtake the segment as the leading outlet for graphene in South Korea, driven by the commercialization of transistors, displays, and other graphene based electronics. Of the leading electronics applications, the transistors market is expected to post the largest sales increases between 2020 and 2035, boosted by a ramp-up in R&D spending as these products approach market readiness. Displays -- particularly touchscreens for mobile phones, for which Samsung is acquiring patents -- are forecast to account for the second largest share of sales. Commercialization of flexible, printed electronics based on graphene inks will also contribute to overall segment growth.

By 2020, the composites segment is projected to encompass a percent share of total demand. As in other parts of the world, research

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TABLE VII-8

### South Korea: Graphene Demand by Market (million dollars)

Item	2010	2015	2020	2025	2035
Graphene Demand					
Composites					
Energy:					
Batteries					
Supercapacitors					
Fuel Cells & Other					
Electronics:					
Displays					
Transistors					
Sensors					
Other Electronics					
Biomedical					
Academic Research					
Other					
% South Korea					
Asia/Pacific Graphene Demand					

Source: The Freedonia Group

TABLE VI-3

### Germany: Graphene Demand by Product

Item	2010	2015	2020	2025	2035
Gross Domestic Product (bil 2014\$)					
\$ GDP/capita					
Population (million persons)					
Manufacturing Value Added (bil 2014\$)					
Electrical & Electronic MVA (bil 2014\$)					
Health Care Expenditures (bil 2014\$)					
\$ graphene/mil \$ GDP					
\$ graphene/capita					
Graphene Demand (mil \$)					
Graphene Nanoplatelets					
Graphene Oxide					
Graphene Film					
Other					

Source: The Freedonia Group

## This study can help you:

- Determine your market & sales potential
- Learn more about industry competitors
- Assess new products & technologies
- Identify firms to merge with or acquire
- Complement your research & planning
- Gather data for presentations
- Confirm your own internal data
- Make better business decisions

## Related Studies

### World Rare Earths

Global demand for rare earths is forecast to increase 3.5 percent per year to 149,500 metric tons in 2019, valued at \$4.5 billion. Battery alloys, permanent magnets, and autocatalysts will be the fastest growing end use markets. China will remain the dominant geographic market, while India will grow the fastest. This study analyzes the 125,900 metric ton world rare earths industry, with forecasts for 2019 and 2024 by product and market for six world regions and 13 major countries. The study also evaluates company market share and profiles industry players.

#3349.....November 2015.....\$6300

### World Lithium

Global demand for lithium metal is projected to rise 8.9 percent per year through 2019 to 49,350 metric tons. Gains will be driven by torrid advances in lithium-ion (Li-Ion) batteries as world demand for hybrid and electric vehicles, energy storage systems, and high-drain portable electronics continues to grow. This study analyzes the 32,200 metric ton world lithium industry, with forecasts for 2019 and 2024 by product and market for six world regions and 19 major countries. The study also evaluates company market share and profiles industry players.

#3331.....September 2015.....\$6300

### World Tungsten

World demand for processed tungsten will rise 4.2 percent yearly to 146,400 metric tons in 2019. The Asia/Pacific region, led by China, will continue to dominate supply and consumption, while India will be the fastest growing market. Tungsten alloys will pace gains by product, while cemented carbides remain the largest segment. This study analyzes the 119,100 metric ton world tungsten industry, with forecasts for 2019 and 2024 by product for six world regions and 16 major countries. The study also evaluates company market share and profiles industry players.

#3306.....July 2015.....\$6200

### World Copper

Global demand for copper metal (refined copper and recycled scrap) is projected to advance 4.2 percent per year through 2019 to 36.0 million metric tons. Gains will be driven by applications such as building wire and plumbing and electrical grid wire and cable. The Asia/Pacific region will remain the largest and fastest growing market. This study analyzes the 29.3 million metric ton world copper industry, with forecasts for 2019 and 2024 by market, world region, and for 21 major countries. The study also evaluates company market share, and profiles industry participants.

#3274.....April 2015.....\$6300

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## Freedonia's methods

- Establishing consistent economic & market forecasts
- Using input/output ratios, flow charts & other economic methods to quantify data
- Employing in-house analysts who meet stringent quality standards
- Interviewing key industry participants, experts & end users
- Researching a proprietary database that includes trade publications, government reports & corporate literature

## About The Freedonia Group

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