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# The Global Market for Graphene, 2D Materials and Carbon Nanotubes

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## Abstracts

This report offers a comprehensive analysis of the current and future markets for graphene, non-graphene 2D materials and carbon nanotubes (multi-walled carbon nanotubes, single-walled carbon nanotubes, few-walled carbon nanotubes, double-walled carbon nanotubes etc.)

Graphene

There are now over 250 companies either producing graphene or developing applications, with scores of multi-nationals conducting R&D on these materials. Several start-ups developing graphene applications have recently received multi-million-dollar funding and graphite producers are announcing plans to start multi-ton production.

The current global production capability for graphene is inflated by production of graphene slurries and powders, mainly in the Taiwan and China markets. The market is in an “over supply” situation, but a lot of what is available is thin graphite, especially in these markets. According to research by the Centre for Advanced 2D Materials (CA2DM) at the National University of Singapore (NUS), many graphene producers supply thin graphite powder with 2-10% of graphene content.

Most major graphene producers are currently focused on smaller scale production of high-quality graphene for high value applications. The past 18 months has seen a marked increase in graphene collaborations, agreements, investments and product launches. Products are now coming to market across multiple sectors and regional markets. New products and developments incorporating graphene include body temperature regulating fabrics, jackets, coolants, sensors, automotive composites, wheelchairs, supercapacitors for public transport, cigarette filters, membrane

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technology, wearable technology for athletes and OLEDs.

Investment companies have invested multimillion dollars in small-scale producers and product developers in seat warming technology, solar panels and batteries. This shows no sign of abating with electronics giant Huawei launching the Mate 20 X phone smart phone incorporating a graphene cooling film (graphene was supplied by The Sixth Element Materials). Automotive company Ford has also announced that it will become the first automaker to use graphene parts in its vehicles, starting with the Mustang and F-150 , in collaboration with Eagle Industries and XG Sciences.

The high-value applications of graphene such as high-frequency transistors and touch screens are still some way off from full commercial realization, due to high production costs and the finite scalability of synthesis methods. Most volume based graphene producers target the conductive additives market for their materials, for application in batteries, composites, conductive inks and paints/coatings. In high-end markets, the value of graphene is evident and makes penetration more likely (comparable to quantum dots in displays). However, in large volume markets, they face significant challenges from incumbent materials.

Multi-walled carbon nanotubes

The global market of carbon nanotubes is generally segmented by multi-walled carbon nanotubes (MWCNT), single-walled carbon nanotubes (SWCNT), and others (DWCNT, FWCNT). Currently, MWCNT comprise the biggest share in terms of sales volumes, and production capacities. Demand for MWCNT is mainly from composites, energy storage, and electronics industries. As electroconductive additives MWCNT are mainly used for anti-static plastics in automotive industry, electronics packaging, and lithium-ion batteries. There are several large companies with MWCNT production capacities of hundreds of tons per year. Prices of MWCNT have reduced significantly in recent years.

Single-walled carbon nanotubes

The most remarkable properties of nanotubes are found in SWCNTs, including:

Incredible strength (they are 100 times stronger than steel at one sixth the weight);

Electrical conductivity as high as copper, but five times lighter;

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Thermal conductivity as high as diamond (up to 1000oC);

Huge surface area;

Highest length-to-diameter ratio;

Flexibility;

Thermal stability;

Lightweight;

Chemical inertness (GNTs are compatible with almost all materials).

SWCNTs are vastly superior to MWCNTs in terms of their specific properties. However, they have not been been used in industry until the last few years due to the lack of efficient mass production technology and high cost. However, recent mass production technology is making SWCNTs more affordable for use in range of industries.

Report contents include:

Current market for graphene, non-graphene 2D materials and carbon nanotubes.

Competitive landscape in terms of key market players and substituting additives/materials.

Market segmentation by type of graphene and carbon nanotubes.

Market trends.

Global graphene market in 2018 (tons, USD, CAGR 2019-2030). Graphene growth forecast 2019-2030 (tonnes, USD, CAGR 2019-2030).

Global carbon nanotubes market in 2018 (tons, USD, CAGR 2019-2030). Carbon nanotubes growth forecast 2019-2030 (tonnes, USD, CAGR 2019-2030).

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Market prospects and demand for non-graphene 2D materials, forecast to 2030.

Production capacities for graphene and carbon nanotubes.

Graphene and carbon nanotubes products prices per kg (in USD)

Company profiles (production capacities, products, general description, target markets, contact details)

Competitive landscape of graphene and carbon nanotubes against other carbon-based additives

Graphene, non-graphene 2D materials and carbon nanotubes current and potential applications

Graphene, non-graphene 2D materials and carbon nanotubes applications by industry and products

Volume of Graphene, non-graphene 2D materials and carbon nanotubes consumption, by market, current and potential.

Pricing analysis

Regional analysis.

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## TABLES

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# Figures

## FIGURES

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