

# Research Report on China Graphene Industry, 2017-2021

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## Abstracts

### Description

The single-layer graphene is only as thick as 0.335nm like an atom, which is one of the thinnest known materials at present. The movement of electron is limited to a flat surface with only one layer of atom so graphene is characterized with new electrical properties. However, characteristics of graphene change sharply with the increase of layers.

In China, graphene materials are generic names of graphene with no more than 10 layers of carbon atoms and relevant derivatives. In contrast, graphene materials with more than 10 layers of carbon atoms generally belong to graphite for the loss of high graphene performance.

Graphene possesses excellent functions compared to various common materials. It is the hardest material known to human with good transmittance (almost completely transparent), high thermal conductivity coefficient (5300W/m•K), high electron mobility (1.5?10<sup>4</sup>cm<sup>2</sup>/ Vs) and high mechanical strength. The application potential of graphene is large in various fields for its super performance. For example, it can be applied to transistors, sensors and super capacitors for high electron mobility.

It can also be used in the transparent conducting film with priority for its low light absorption rate. Market opportunities exist for graphene in fields such as flexible display and wearable devices with its excellent flexibility. It possesses huge application potential in electronic thermal material field with its strongest heat-conducting property. Meanwhile, graphene as additives can be applied to fields such as functional coating, plastics, rubber, sea water desalination and catalysts. Therefore, graphene is expected

to be one of the advanced materials with the most positive application prospect in the future.

Graphene materials win the most impressive attention in the world from its emerging for unparalleled properties, and developed rapidly during the past 12 years from 2004. The discoverer of graphene won the Nobel Prize for physics in 2010, from when researches and industrialization related to graphene grew rapidly.

Many countries including Europe, the U.S.A. and Japan issued a series of policies supporting the development of the graphene industry. Transnational companies pay attention to the graphene market for the promotion of R&D together with application of graphene such as Dow Chemical Company, Samsung, IBM, General Motors, Xerox, Bayer and BASF.

The graphene industry started due to the cost reduction and expanded downstream application in China. In recent years, the production costs decreased to 10% in 2016 of that in 2011 with the improvement of graphene processing technics. Graphene realizes the industrialized application in multiple fields such as energy storage materials, sensors, touch devices, conductive ink pastes and composite materials and is ready for mass volume. Meanwhile, graphene is sold for profits in some products of multiple front applications to be broke through such as lithium batteries conductive paste, heat conduction film, composite materials and flexible displays.

According to market researches of CRI, graphene manufacturers are generally medium and small scale enterprises mainly at the downstream of the industry chain. Meanwhile, the market is at its infancy while the development is rapid. Graphene enterprises released some products in fields such as touch screens, graphene lithium ion batteries and functional coatings to promote the development of this industry.

For example, mass production of graphene is achieved in energy storage material fields including conductive agents and flexible displays. Meanwhile, graphene conductive agents are mainly applied in 3C and power battery field for higher charging speed of lithium iron phosphate battery. Large-scale application of graphene films developed by 2D Carbon is achieved in flexible touch screens with the sales revenue of more than CNY 10 million in 2015.

From 2014, Chinese government continuously issued supporting policies concerning graphene. It issued The Upgrading Engineering of Key Materials in November 2014 stipulating to realize stable batch production and large-scale application of graphene by

2016. According to the plan of Made in China 2025, the market size of the graphene industry will exceed CNY 10 billion by 2020 and exceed CNY 100 billion by 2025.

In November 2015, Chinese government issued Opinions on Promoting the Innovative Development of Graphene Industry to promote the development of graphene in various fields. Meanwhile, China's Ministry of Industry Raw Material Industrial Division put forward suggestions on promoting the industry development. It is estimated that more supporting policies concerning the graphene industry will be issued by Chinese government in 2017. Major forms may include the establishment of industrial support funds and the implementation of preferential taxes.

CRI estimates that the CAGR of the graphene market size will reach 300% to 500% from 2017 to 2021.

Through this report, readers can acquire the following information:

Support Policies of Chinese Government on the Graphene Industry

Major Manufacturing Methods of Graphene in China

Forecast on Supply and Demand in China Graphene Industry

Major Downstream Application of Graphene Industry

Major Manufacturers of Graphene in China, 2013-2016

Competition Status of Graphene Industry in China

Major Driving Forces and Market Opportunities in China Graphene Industry

Risks and Challenges in China Graphene Industry

Development Trend of China Graphene Industry, 2017-2021

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