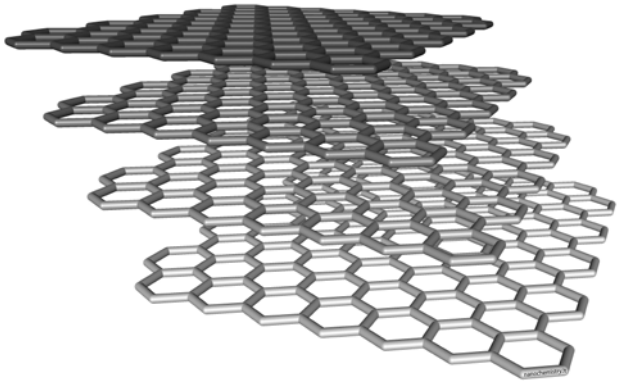

BULK GRAPHENE PRICING REPORT

by Fullerex

2017

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EXECUTIVE SUMMARY

This report aims to provide sufficient details for bulk graphene producers to confidently price their materials both in relation to their competition and by examining commercial requirements to penetrate relevant market sectors. Additionally, the contents of this report should allow for end-users to gain better transparency in the market for bulk graphene, thereby strengthening negotiations with suppliers.

Current Environment

The graphene market is fast growing and has significant commercial potential. However, the market is also extremely diffuse and fragmented at its present stage, with little or no material standards and a very large number of professed applications across the different emerging material grades that may or may not be realised.

It is currently difficult to characterise materials for quality standards that have any commercial or industrial relevance since universal material standards have been largely undefined. Up to now most assessment for material quality has been relative to efficacy in application rather than collective, industry-wide standards, which does not provide a conducive framework by which to establish a fair value for different products. Therefore, making any objective comparison of product quality between the graphene materials of various different producers requires investigation as provided by this report.

Some graphene producers are currently focused on customer-driven pricing strategies, where their materials are priced according to what each individual end user is willing to pay, reflecting the value of using the product within the customer's specific end application. Whilst this allows for capturing more value from customers in the short term, producers could risk pricing themselves out of the market in the long term by focusing too heavily on individual customer price sensitivity and ignoring the broader market dynamic. There is already growing downward pressure on pricing, with tepid demand and an overcapacity situation, particularly driven by the increasing competition in production within export-oriented trading nations such as China and India.

Differentiation is key to preserving pricing and protecting margin, this is reflected in the trend towards producers offering downstream products or "nano-intermediates". The production of nano-intermediates is also a consequence of the vertical market failure that the early stage industry is experiencing from the imbalance in supply vs demand with uptake initially limited to a small number of early adopters. As graphene producers look to penetrate markets that currently use more traditional materials, many are choosing to demonstrate the advantages of the new technology to potential customers by creating ready-to-use products.

Methodology

In order to bridge the gap caused by limited commercial trade data required for comprehensive market based pricing, in this report we will examine competition based pricing and demand based pricing.

Information gathered in this report was collected using a variety of means, including meetings and conference calls with key decision makers at over 100 companies last year alone, both producer firms and industrial end-users. Also, through networking with relevant market influencers at numerous industry events and conferences each year and dedicated research and information sourcing across a wide range of international academic and industry research papers.

As a commodity, graphene prices are ultimately subject to the market and therefore pricing can be broadly established by identifying the price threshold for a given application, that being the cost that an end-user (buyer) is willing to accept. With such a wide range of applications for graphene this opens up a myriad of price targets for a producer to achieve in order to successfully enter each of these markets. This theme has been developed somewhat extensively in these pages to illustrate the market value for graphene from the end-user perspective.

Limitations of the Report

Establishing accurate pricing for a particular graphene product is a challenging task as due to the nascent nature of the market there is limited trade data to achieve accurate price discovery. Most publicly available price lists from producers are only available for R&D quantities, with many producers either cautious or simply unable to provide pricing details on commercial-scale orders. Producers will more freely provide production capacity figures however these are nameplate capacity figures and not actual sales volumes, so again determining actual volumes of material sales are based on best estimates and aggregating data from various sources.

Findings and Recommendations

Of the numerous proposed applications for graphene, opportunities for commercialisation have been looked at for both new market applications and pre-existing markets (by replacing incumbent materials), with a focus on the latter. Time to market for new, niche, high-value/low-volume use of graphene presents a myriad of challenges for producers. Targeting markets for graphene by replacing or augmenting incumbent materials in the near term also poses its own difficulties.

Uses of graphene as a performance additive in conventional materials are the relatively low hanging fruit here, even though most of the initial applications will be modest in scope.

In this report, we will look at several of these industrial materials with a range of prices spanning some three orders of magnitude. Initially producers will want to focus on high value, low volume applications to maximise margins, and scale up as production costs come down. As the market matures and more producers are able to match the competition, applications within a particular price point become saturated.

Producers need to achieve several key targets in order to successfully commercialise graphene which have been highlighted in this report. Crucially, by understanding the market and determining their true competitors, along with relevant industrial applications for their materials, producers can position themselves strongly with appropriate pricing that can help unlock these opportunities.

ABOUT

Fullerex

Fullerex is a leading independent broker of nanomaterials and nano-intermediates representing a number of key products across a complimentary and broad suite of materials and technologies.

At Fullerex we seek to support the advancement of nanotechnology in order to create radical, transformative and sustainable improvement to society. We are dedicated to achieving these aims by accelerating the commercialisation and usage of nanomaterials across industry and beyond.

Fullerex is active in market development and physical trading of advanced materials. We generate demand for nanomaterials across synergistic markets by stimulating innovation with end-users and ensuring robust supply chains are in place to address growing trade interest.

Fullerex is based in Greater London and operates trading during UK and USA business hours.

Our specialist focus on nanomaterials is driven by our in-depth knowledge of the market. The pricing information and market commentary in our reports provides valuable insight for producers and end-users alike to better understand price drivers, negotiate with producers/end-users and develop internal price formulas.

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