World Graphite (Natural, Synthetic & Carbon Fiber)

Industry Study with Forecasts for 2018 & 2023

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Demand will be driven by accelerating demand for steel and other metals -- which use synthetic graphite electrodes in production furnaces -- as well as by use in metallurgy applications.

World demand to rise 5.8% annually through 2018

World demand for natural and synthetic graphite (including carbon fiber) is forecast to expand 5.8 percent per annum to 4.2 million metric tons in 2018, with a market value of nearly $30 billion. An overall strengthening of the global economy will bode well for all forms of graphite. Accelerating demand for steel and other metals will particularly benefit synthetic graphite electrodes that are essential for electric arc furnace steel production, as well as synthetic graphite powders and natural graphite used in other metallurgy applications.

Due to its large manufacturing economy, China is the leading consumer of synthetic and natural graphite, using one-third of global sales. Other major consumers include the US, Japan, India, South Korea, Germany, and Russia. Carbon fiber demand is scattered among the developed economies of Western Europe, Japan, and the US, as well as China. Synthetic graphite production capacity is widely distributed among a large number of countries. In contrast, the natural graphite industry is dominated by China.

Synthetic graphite to remain dominant, carbon fiber to grow the fastest

Synthetic graphite demand will grow 5.7 annually to more than 2.8 million metric tons in 2018, valued at more than $25 billion. The increasing use of electric arc furnaces to produce steel in most parts of the world will boost sales of electrodes, the leading synthetic graphite product. The rise of new technologically-advanced outlets, ranging from graphene to fuel cells, will also give a lift to demand for synthetic graphite. Production capacity for synthetic graphite is growing in low cost countries, helping to keep prices down and making it more readily available to the industries in those nations.

Demand for carbon fiber is expected to grow at a double-digit annual pace as its use in aerospace, automotive, wind turbine, and other applications increases sharply. Manufacturers are expected to incorporate greater amounts of carbon fiber into their products in order to reduce weight and improve strength.

In the natural graphite segment, flake graphite will continue to capture market share from amorphous graphite, as high-tech applications become more important and the availability of flake graphite greatly increases. In particular, interest in flake graphite has increased dramatically with the rise of lithium ion batteries, which are used in electronics and electric motor vehicles. Nevertheless, traditional markets for natural graphite, such as metallurgy and refractories, will continue to account for the lion’s share of its use.
Asia/Pacific

India: Natural Graphite Products & Markets

Demand for natural graphite in India, the world’s fourth largest natural graphite market, amounted to 38,000 metric tons in 2013. Flake graphite, which is mined locally, is the dominant product type, accounting for three-fourths of all natural graphite sales in 2013. All amorphous graphite sold in the country must be imported. The refractories and metallurgy markets are the leading consumers of natural graphite in India. The country is one of the world’s largest consumers of refractory-grade graphite used in these applications because of its large metals, ceramics, cement, and glass industries. Also, refractory grade flake graphite is widely available in the country. India is a leading producer of steel and several other types of metals, including aluminum, iron, and zinc. Its metallurgy industry generates a considerable amount of demand for natural graphite annually. Lubricants and brake linings are significant applications in India as well. Together, they accounted for eight percent of product sales in 2013. Among the other significant markets for natural graphite found in India are batteries, carbon products, chemical processing, electronics, industrial products, pharmaceuticals, and rubber. Pencils are a particularly important market in India because it is home to several dozen manufacturers, which can be attributed to the widespread availability of natural graphite.

Demand for natural graphite in India expanded 5.9 percent annually between 2008 and 2013, one of the fastest growth rates worldwide. Manufacturing activity grew at a swift pace during this period, boosting natural graphite demand. Sales of natural graphite for refractory, brake lining, lubricant, and carbon and industrial products rose at a rapid rate, as the production of crude steel and other metals all advanced at an aggessive pace, boosting demand for natural graphite significantly.

The production of natural graphite in India is projected to advance at an average annual rate of 5.6 percent through 2018, outperforming most other markets.

Table VI-11

INDIA: NATURAL GRAPHITE DEMAND BY PRODUCT & MARKET

<table>
<thead>
<tr>
<th>Item</th>
<th>2003</th>
<th>2008</th>
<th>2013</th>
<th>2018</th>
<th>2023</th>
</tr>
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<tbody>
<tr>
<td>Graphite Demand</td>
<td>60.2</td>
<td>117.9</td>
<td>174.1</td>
<td>244.0</td>
<td>337.0</td>
</tr>
<tr>
<td>% natural</td>
<td>30.7</td>
<td>24.2</td>
<td>21.8</td>
<td>20.5</td>
<td>19.3</td>
</tr>
<tr>
<td>Natural Graphite Demand</td>
<td>18.5</td>
<td>28.5</td>
<td>38.0</td>
<td>50.0</td>
<td>65.0</td>
</tr>
<tr>
<td>By Product:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flake</td>
<td>14.5</td>
<td>21.5</td>
<td>28.0</td>
<td>37.0</td>
<td>51.0</td>
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<tr>
<td>Amorphous</td>
<td>4.0</td>
<td>7.0</td>
<td>10.0</td>
<td>13.0</td>
<td>14.0</td>
</tr>
<tr>
<td>By Market:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractories</td>
<td>10.0</td>
<td>13.0</td>
<td>15.0</td>
<td>16.5</td>
<td>18.0</td>
</tr>
<tr>
<td>Metallurgy</td>
<td>4.5</td>
<td>8.5</td>
<td>13.0</td>
<td>18.0</td>
<td>23.0</td>
</tr>
<tr>
<td>Batteries</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Lubricants</td>
<td>0.8</td>
<td>1.4</td>
<td>2.0</td>
<td>3.0</td>
<td>4.4</td>
</tr>
<tr>
<td>Brake Linings</td>
<td>0.3</td>
<td>0.6</td>
<td>1.0</td>
<td>1.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Other</td>
<td>2.8</td>
<td>4.9</td>
<td>6.8</td>
<td>10.4</td>
<td>16.5</td>
</tr>
</tbody>
</table>
Sample Profile, Table & Forecast

COMPANY PROFILES

Nacional de Grafite Limitada
Av. Paulista 460, 11th Floor
Bela Vista, São Paulo 01310
Brazil
55-11-3289-1322
http://www.grafite.com

Annual Sales: $100 million (verified by company, 5/14)
Employment: 850 (verified by company, 5/14)

Key Products: natural crystalline graphite, graphite dispersions, and graphite-based lubricants

Nacional de Grafite is involved in the mining and refining of natural crystalline graphite and related products. The Company is privately held.

Nacional de Grafite, the largest producer of natural graphite worldwide, was responsible for 6.4 percent of global product sales in 2013. The Company is active in the world graphite industry via the production of natural crystalline graphite in fine flake, large flake, high-purity, micronized, granulated, and expandable grades. These products are sold under the GRAFINE, GRAFLAKE, GRAFMAX, MICROGRAF, SUPERGRAF, and GRAFEXP brand names. Typical applications for these products include pencils, refractories, batteries, fuel cells, lubricants, carbon brushes, specialty paints, plastics, sintered metal parts, brake pads and linings, and fire retardants. Additionally, Nacional de Grafite makes HIDROGRAF water-based graphite dispersions and OILGRAF oil-based graphite dispersions, both of which are suitable for use in various forging and demolding processes; and GRAFSOLO graphite-based lubricants for fertilizer and seed lubricant applications in the agricultural industry.

STUDY COVERAGE

This Freedonia study, *World Graphite (Natural, Synthetic, & Carbon Fiber)*, provides historical data (2003, 2008 and 2013) plus forecasts (2018 and 2023) for supply and demand, as well as demand by product and market in six regions and 16 countries. In addition, the study details market environment factors, evaluates company market share and profiles 36 global industry players.
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