Understanding the Worldwide “Graphite” Market

TREM12
Critical Material for Energy & Security
March 13-14, 2012
Key Properties of Graphite

- Thermally Conductive
- Electrically Conductive
- Lubricating
- Thermally Resistive
- Chemically Resistive
- High Strength (Graphene)
Total Worldwide Graphite Market is Estimated to be: USD $13 Billion

- Synthetic Graphite Electrode: 42%
- Synthetic Carbon Fibers: 31%
- Natural & Synthetic Graphite Powder: 8%
- Synthetic Graphite Blocks: 8%
- Other: 11%

% by Graphite Type
The largest Graphite Market is estimated to be:

USD $5.5 Billion – 42% of the worldwide Graphite market
Synthetic Graphite & Carbon Electrodes

Major Worldwide Manufacturers
(Excludes China)

- GrafTech International, Ltd.
- Graphite India, Ltd.
- HEG, Ltd.
- JSC Energoprom Management
- Nippon Carbon Co., Ltd.
- SEC Carbon, Ltd.
- SGL Carbon Group
- Showa Denko Carbon, Inc.
Synthetic Graphite & Carbon Electrodes

Graphite Electrodes
Graphite electrode process diagram
Synthetic Graphite & Carbon Electrodes

Major Market Applications

Steel Mills (Electric Arc Furnace)
Iron Foundries (Electric Arc Furnace)
Ferro Alloy Smelters (Electric Arc Furnace)
Carbon Fibers –
(sometimes referred to as Graphite Fibers)
The Second Largest Market
estimated to be:

USD $4.0 Billion - 31%
of the Worldwide Graphite Market
Major Worldwide Manufacturers

- Blue Star
- Cytec
- Formosa Plastics Group
- Hexcel
- Mitsubishi Rayon
- SGL Carbon, AB
- Toho Tenax Group
- Toray Carbon
- Zoltek
Carbon Fibers

Carbon Fiber process diagram
Carbon Fiber manufacturing facility
Market Applications

- Aircraft
- Automotive
- Energy Storage
- Friction Materials
- Off Shore Drilling
- Plastics
- Sporting Goods
- Wind Energy
Synthetic Specialty Graphite Shapes

Market is estimated to be:

USD $1.0 Billion – 8.0%

Of the worldwide Graphite Market
Synthetic Specialty Graphite

Key Worldwide Manufacturers
(excludes China)

- GrafTech International Ltd
- Graphite India
- Ibiden Co., Ltd
- Mersen Group
- Poco Graphite, Inc.
- SEC Carbon, Ltd.
- SGL Carbon Group
- Toyo Tanso Co., Ltd.
Synthetic Specialty Graphite Pieces
Synthetic Specialty Graphite

Market Applications

- Solar
- Electronics
- Industrial Diamonds
- Chemical Processing
- Nuclear
- Glass
- Extrusion
- Furnace Parts
- Battery
Worldwide “Graphite” Market
Is estimated to be:

USD $1.0 Billion – 8.0%
Of the world-wide Graphite Market
Types

• Natural Microcrystalline Graphite (Amorphous)
• Natural Flake Graphite
• Secondary Synthetic Graphite
• Primary Synthetic Graphite
Natural & Synthetic Graphite Powder

3 Types of Graphite Powder
## Major Worldwide Suppliers

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Microcrystalline</th>
<th>Flake</th>
<th>Secondary Synthetic</th>
<th>Primary Synthetic</th>
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<td>Showa Denko Carbon, Inc</td>
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<td>Timcal, Ltd. &amp; Stratmin Graphite Div.</td>
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**Major Applications of the 4 types of Graphite Powder**

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<tr>
<th>Application</th>
<th>Micro crystalline</th>
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<th>Primary Synthetic</th>
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<tr>
<td>Batteries</td>
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<td>• Alkaline &amp; Zinc Carbon</td>
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</table>
Market is estimated to be USD $1.5 Billion – 11% of the Worldwide Graphite Market.
Other Major Graphite Products

- Graphene
- Specialty Graphite Composites
- Graphite Felt
- Pyrolitic Graphite
Thank you for your attention

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