FINE CHEMICALS
Industry definition and current status

The fine chemical industry is a typical processed and intermediary materials industry that procures basic chemicals produced by the petrochemical industry to supply raw materials and auxiliary materials to downstream industries such as the automotive, shipbuilding, electronics, textile, construction and medical device industries.

In general, the fine chemical industry refers to pharmaceuticals, dye, pigment, paint, ink, cosmetics, perfume, surfactant, adhesive, photographic chemicals and pesticides.

Upstream and downstream of the fine chemical industry and related industries

- Other new materials industries include materials used for electronic devices, such as display materials, semiconductor materials and renewable battery materials, which are classified as electronic components under the Korean Standard Industrial Classification (KSIC).

The definition and scope of the fine chemical industry varies between market research institutes and researchers.

- The biopharmaceuticals and cosmetics segments will be discussed in separate industry reports, given their significance to human life and health, relatively large market size and growth potential.

- This report excludes the biopharmaceuticals and cosmetics segments and includes the electronic materials segment.
Characteristics

The fine chemical industry is a capital-, knowledge- and technology-intensive industry that generates high added value. In particular, fine chemicals are used as core materials and applied materials in the downstream industries. The fine chemical industry has far-reaching economic impacts, enabling related industries to have more sophisticated functions and higher-added values while creating jobs.

- When one drum of naphtha, feedstock to petrochemical products, is converted to synthetic resin, its added value is four times higher than if it were to be used as fuel. If naphtha is used to produce specialty chemicals, the added value can be 10 to 100,000 times greater than that of fuel.

Fine chemicals can be manufactured by a small-quantity, batch method, making it possible for small- and medium-sized enterprises (SME) to become specialized manufacturers. Fine chemicals are critical for related industries to improve product quality and develop new products.

Development of knowhow and experience through continuous R&D is a key competitive factor for the fine chemical industry. The short product life cycle increases investment risks, which requires a production system that can respond to market demand on time.

When developing new products, other related-industries have increasingly relied on the fine chemical industry's materials, products and capacity to conduct joint R&D with the downstream industries.

Demand for special chemicals has been expanding at a faster pace than that for commodity chemicals with the spread of technological sophistication and specialization, growing importance of value-added effects and growing awareness of health and well-being.

Due to industry characteristics and the spread of globalization, assembly industries such as automotive and electronics are accelerating the relocation of their production facilities to developing countries such as China, in order to separate their production processes and respond to local market needs swiftly while reducing costs.

- Amid such market development, the chemical industry, which is considered upstream in the value chain, has a more important role than ever to enhance the competitiveness of the process and assembly industries.

The materials industry, especially fine chemicals with high added value, plays a key role in the economy.

- In particular, the electro chemicals segment, such as display, semiconductor, LCD / LED and rechargeable battery materials, has continued on a rapid growth path, which merits attention.

- By segment, adhesive is likely to drive growth in the chemicals market, as the demand base is expected to expand thanks to a rising income level, while commodity goods such as pesticides, pigment, paint and photographic chemicals are expected to grow at a slower pace.

Amid an increase in living standards and growing awareness of health and well-being, the future consumption pattern is likely to be driven by electronic materials used for high-tech IT devices (displays, semiconductors, etc.), which have a wide demand base and a short life cycle.

International conventions on environmental regulations increased as major international organizations such as the OECD started to raise regulatory pressure since the 1990s.

- As the chemical industry is seen in an increasingly negative light, environmental and safety regulations have become stricter in Korea and abroad with the introduction of the EU's Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), Convention on Climate Change and Korea's carbon emissions trading scheme.

- Advanced economies have already developed technologies to meet tighter international environmental regulations and have taken full advantage of international environmental regulations as a technical barrier to trade (TBT) to outpace developing economies with less competitive technologies.

As technology development leads to new products and as income levels increase, demand for low- to mid-end commodity products has weakened, while demand for high-end and highly functional products has sharply increased.

- In particular, demand for biotech-based fine chemicals, which are clean or less polluting, has been significantly growing amid increasing awareness of environmental problems.

In response to global warming and pollution problems, technology developments have accelerated in various areas, such as renewable energy materials, high-performance batteries such as solar cells and new environment-friendly bio-chemicals including biodegradable plastics — PLA (polylactic acid), PHA (polyhydroxyalkanoate) and PBS (polybutylene succinate) — and biomass-based polymers. These technology challenges show that the fine chemical industry is a high-tech backbone industry with enormous growth potential.

Global market overview

According to the European Chemical Industry Council (CEFIC), the global chemical industry (including fine chemicals and petrochemicals, excluding pharmaceuticals) stood at EUR 3.156 trillion (USD 4.1896 trillion) in 2013 in terms of sales revenue.

The Asian chemical industry stands at EUR 1.6601 trillion, holding a dominant market share of 52.6%.
In particular, China stands out from other Asian countries, as it is the world’s largest single country market, accounting for one-third of the global market, with EUR 1.05 trillion. China’s global market share surged from a mere 8.7% in 2003 to 33.2% in 2013 thanks to a dramatically increased demand for basic materials such as chemicals amid China’s rapid economic growth.

Despite the chemical industry’s rapid growth at home, China imports a tremendous amount of chemicals every year, as its supply still falls short of demand, making it the world’s largest chemicals importer.

Among Asian countries, Korea, India and Taiwan, as well as China, have significantly increased their global market shares. In terms of supply or production capacity, the Middle East has quickly emerged.

While Asia (excluding Japan) expanded its share of the global chemicals market’s sales, advanced economies experienced a sharp contraction in their combined market share during the same period.

For example, the EU’s global market share was nearly halved, from 31.2% in 2003 to 16.7% in 2013, as was Japan’s market share, which went from 9.4% to 4.8% during the same period. NAFTA’s market share dropped as much as 9.2%p during the same period.

According to the CEFIC, China is the world’s largest chemical market in terms of sales revenue in 2013, followed by the United States, Japan, Germany, Korea, France, India, Brazil, Taiwan and Russia. Korea’s chemical industry is the world’s fifth largest.

In contrast to its major competitors, such as Japan, Korea has enjoyed a steady increase in exports to its neighboring market of China despite the global financial crisis thanks to its superb production management capacity and timely response to China’s economic stimulus policy.

Korea has emerged as the world’s 5th both in the global chemical and automotive industries.

According to the Small and Medium Business Administration (2013), the global fine chemical industry stood at USD 1 trillion in 2012 and is expected to reach USD 1.2 trillion in 2016, posting a CAGR of 4.7%.

### Chemical product sales breakdown by region (unit: %)

- **2003**
  - EU: 16.7
  - NAFTA: 4.4
  - Latin America: 4.6
  - Asia: 24.1
  - China: 33.2

- **2013**
  - EU: 18.7
  - NAFTA: 4.6
  - Latin America: 4.6
  - Asia: 24.2
  - China: 33.2

### Chemical industry’s sales by country in 2013 (unit: EUR bn)

<table>
<thead>
<tr>
<th>Country</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1,047.3</td>
</tr>
<tr>
<td>USA</td>
<td>465.7</td>
</tr>
<tr>
<td>Japan</td>
<td>151.6</td>
</tr>
<tr>
<td>Germany</td>
<td>148.7</td>
</tr>
<tr>
<td>South Korea</td>
<td>123.1</td>
</tr>
<tr>
<td>France</td>
<td>76.4</td>
</tr>
<tr>
<td>India</td>
<td>72.2</td>
</tr>
<tr>
<td>Brazil</td>
<td>70.2</td>
</tr>
<tr>
<td>Taiwan</td>
<td>62.9</td>
</tr>
<tr>
<td>Russia</td>
<td>56.1</td>
</tr>
</tbody>
</table>

### Long-term changes in the global chemical industry’s market share breakdown

- **1985**
  - Asia: 15%
  - Europe: 45%
  - NAFTA: 30%
  - Rest of world: 7%

- **2010**
  - Asia: 45%
  - Europe: 40%
  - NAFTA: 25%
  - Rest of world: 10%

- **2030e2**
  - Asia: 66%
  - Europe: 15%
  - NAFTA: 12%
  - Rest of world: 7%

### Source

- CEFIC (2014), The European Chemical Industry: Facts and Figures
- Small and Medium Business Administration (2013)
- AT Kearney (2012), Chemicals Industry Vision 2030: A European Perspective
Global fine chemicals market outlook

- Semiconductor and display materials should drive market growth thanks to the rising global demand for smart devices during the same period while demand for separators is expected to rise with the expansion of the rechargeable battery segment.

Global fine chemicals materials market outlook by key segment

Overview

The focus of Korea’s 50-year fine chemical industry has shifted from pharmaceuticals, pesticide, dye, pigment and paint to finished and commodity chemicals for import substitution.

In particular, Korea’s fine chemical industry can match its advanced competitors in terms of process upgrade and manufacturing technologies in commodity-grade chemicals such as adhesive, dye, pigment, paint and surfactant.

On the other hand, Korea is less competitive and depends heavily on foreign imports, especially Japan, in the high value-added chemicals segment, such as technical ingredients, intermediate compounds, dye, pigment and electro chemicals, which require advanced technologies and enormous R&D investment.

Asia is expected to deliver more dynamic growth than any other market in the world through 2030.

- Korea is located in Asia, the world’s largest chemicals market, with excellent proximity to the world’s largest importer, China, as well as fast-growing Southeast Asia.

Korea’s fine chemical industry is the world’s seventh largest and has been on a fast growth path thanks to its globally competitive downstream industries, such as automotive and electronics.

- Semiconductor and display materials should drive market growth thanks to the rising global demand for smart devices during the same period while demand for separators is expected to rise with the expansion of the rechargeable battery segment.

Global fine chemicals materials market outlook by key segment

<table>
<thead>
<tr>
<th>Year Segment</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dye &amp; pigment</td>
<td>223</td>
<td>229</td>
<td>235</td>
<td>242</td>
<td>249</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semiconductor parts materials</td>
<td>834</td>
<td>917</td>
<td>1,009</td>
<td>1,110</td>
<td>1,221</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display parts materials</td>
<td>524</td>
<td>572</td>
<td>625</td>
<td>683</td>
<td>745</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>9.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eco-friendly fine paint</td>
<td>223</td>
<td>231</td>
<td>239</td>
<td>248</td>
<td>257</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polymers</td>
<td>113</td>
<td>149</td>
<td>196</td>
<td>259</td>
<td>342</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine nanofilms</td>
<td>336</td>
<td>356</td>
<td>377</td>
<td>403</td>
<td>423</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>5.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separators</td>
<td>171</td>
<td>185</td>
<td>200</td>
<td>217</td>
<td>235</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>8.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart fiber</td>
<td>1,770</td>
<td>1,832</td>
<td>1,896</td>
<td>1,962</td>
<td>2,031</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive plastic materials</td>
<td>63</td>
<td>66</td>
<td>69</td>
<td>73</td>
<td>77</td>
</tr>
<tr>
<td>CAGR (%)</td>
<td></td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Datamonitor’s outlook for the global fine chemicals market

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Datamonitor’s outlook for the global fine chemicals market

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Global fine chemicals market outlook

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Global fine chemicals market outlook

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Global fine chemicals market outlook

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Global fine chemicals market outlook

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.

Global fine chemicals market outlook

- According to Datamonitor (2011), a major market research institute, the global fine chemicals market is expected to post a CAGR of 5.4%, from USD 706.3 billion in 2010 to USD 918.6 billion in 2015.

- The share of fine chemicals in the total chemicals market is forecast to slightly decline, from 20.5% in 2011 to 18.7% in 2015, as the share of basic and commodity chemicals increases at a relatively faster pace.
Thus, Korea provides partnership opportunities with global set makers such as Samsung Electronics, LG Electronics, Hyundai-Kia Automotive Group, Hyundai Heavy Industries and Daewoo Shipbuilding & Marine Engineering and chemical giants such as LG Chem and Samsung SDI (rechargeable batteries and polarizers).

Three Korean companies – LG Chem (13th), Lotte Chemical (23rd) and SK Innovation (31st) – ranked among the world’s top 50 chemical companies in 2013.

Korea’s leading chemical companies are focused on the petrochemical segment, but LG Chem (polarizers, rechargeable batteries, electronic parts and materials), Lotte Chemical (ESS, water treatment, PP catalyst, biochemicals) and SK Innovation (petroleum development, electronic materials and batteries) have been making aggressive efforts to diversify their businesses and penetrate global markets.

In addition, the conclusion of the Korea-China FTA in November of 2014 lowered tariff barriers to China, which should increase Korea’s exports to the world’s largest importer, China.

Production and added value of Korea’s fine chemical industry

The Korean fine chemical industry’s production amounted to KRW 27.677 trillion (USD 25.2 billion) in 2013, down 4.8% YoY, and posted a 2000-2013 CAGR of 6.8%.

This figure is below the manufacturing industry’s CAGR of 8.2% and the chemicals industry’s 9.7%.

This is due to the fact that the Korean petrochemical industry exports more than 50% of its production, while the fine chemical industry relies more on the domestic market, which is virtually saturated.

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing industry (A)</th>
<th>Chemical industry (B)</th>
<th>Fine chemicals (C)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C/A</td>
</tr>
<tr>
<td>2000</td>
<td>534,650</td>
<td>60,505</td>
<td>11,246</td>
<td>2.5</td>
</tr>
<tr>
<td>2005</td>
<td>801,682</td>
<td>94,862</td>
<td>14,477</td>
<td>1.8</td>
</tr>
<tr>
<td>2008</td>
<td>1,122,896</td>
<td>131,219</td>
<td>19,882</td>
<td>1.8</td>
</tr>
<tr>
<td>2009</td>
<td>1,121,973</td>
<td>127,394</td>
<td>20,457</td>
<td>1.8</td>
</tr>
<tr>
<td>2010</td>
<td>1,334,133</td>
<td>153,599</td>
<td>23,316</td>
<td>1.7</td>
</tr>
<tr>
<td>2011</td>
<td>1,502,252</td>
<td>191,238</td>
<td>27,372</td>
<td>1.8</td>
</tr>
<tr>
<td>2012</td>
<td>1,511,695</td>
<td>202,815</td>
<td>29,081</td>
<td>1.9</td>
</tr>
<tr>
<td>2013</td>
<td>1,495,730</td>
<td>202,622</td>
<td>27,677</td>
<td>1.9</td>
</tr>
</tbody>
</table>

* Source: KOSTAT, KOSIS DB
* Note: The chemical industry includes fertilizer, rubber and plastic manufacturing industries, excluding pharmaceuticals.

By segment, the basic inorganic chemicals segment stood at KRW 7.466 trillion in 2013, the largest in the fine chemical industry, followed by paint and ink (KRW 6.21 trillion) and pigment and dye (KRW 2.585 trillion).

Production of Korea’s fine chemical industry by segment

Korea’s fine chemical industry accounted for 1.9% of the manufacturing industry’s production and 2.5% in terms of added value in 2013. It accounts for 13.7% of Korea’s chemical production and 20.4% of the Korean chemical industry’s added value.

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing industry (A)</th>
<th>Chemical industry (B)</th>
<th>Fine chemicals (C)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C/A</td>
</tr>
<tr>
<td>2000</td>
<td>205,186</td>
<td>21,962</td>
<td>6,410</td>
<td>3.1</td>
</tr>
<tr>
<td>2005</td>
<td>291,152</td>
<td>31,143</td>
<td>6,549</td>
<td>2.2</td>
</tr>
<tr>
<td>2008</td>
<td>367,630</td>
<td>36,443</td>
<td>8,651</td>
<td>2.4</td>
</tr>
<tr>
<td>2009</td>
<td>374,500</td>
<td>36,387</td>
<td>9,227</td>
<td>2.5</td>
</tr>
<tr>
<td>2010</td>
<td>435,944</td>
<td>42,552</td>
<td>8,106</td>
<td>1.9</td>
</tr>
<tr>
<td>2011</td>
<td>480,203</td>
<td>55,580</td>
<td>10,395</td>
<td>2.2</td>
</tr>
<tr>
<td>2012</td>
<td>480,712</td>
<td>46,139</td>
<td>11,700</td>
<td>2.4</td>
</tr>
<tr>
<td>2013</td>
<td>479,281</td>
<td>58,632</td>
<td>11,129</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* Source: KOSTAT, KOSIS DB
* Note: The chemical industry includes fertilizer, rubber and plastic manufacturing industries, excluding pharmaceuticals.

Fine chemicals’ share of manufacturing and chemicals added value

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing industry (A)</th>
<th>Chemical industry (B)</th>
<th>Fine chemicals (C)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C/A</td>
</tr>
<tr>
<td>2000</td>
<td>205,186</td>
<td>21,962</td>
<td>6,410</td>
<td>3.1</td>
</tr>
<tr>
<td>2005</td>
<td>291,152</td>
<td>31,143</td>
<td>6,549</td>
<td>2.2</td>
</tr>
<tr>
<td>2008</td>
<td>367,630</td>
<td>36,443</td>
<td>8,651</td>
<td>2.4</td>
</tr>
<tr>
<td>2009</td>
<td>374,500</td>
<td>36,387</td>
<td>9,227</td>
<td>2.5</td>
</tr>
<tr>
<td>2010</td>
<td>435,944</td>
<td>42,552</td>
<td>8,106</td>
<td>1.9</td>
</tr>
<tr>
<td>2011</td>
<td>480,203</td>
<td>55,580</td>
<td>10,395</td>
<td>2.2</td>
</tr>
<tr>
<td>2012</td>
<td>480,712</td>
<td>46,139</td>
<td>11,700</td>
<td>2.4</td>
</tr>
<tr>
<td>2013</td>
<td>479,281</td>
<td>58,632</td>
<td>11,129</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* Source: KOSTAT, KOSIS DB
* Note: The chemical industry includes fertilizer, rubber and plastic manufacturing industries, excluding pharmaceuticals.

2 Currency conversion based on March 6, 2015 rate.
Characteristics of Korea's fine chemical industry: Companies and workforce
The number of employees in the fine chemical industry and their shares in the manufacturing and chemicals industries posted a slight increase, but the figures are technically considered stagnant.

The number of people employed in the fine chemical industry relative to the manufacturing and chemicals industries (Unit: people)

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing industry (A)</th>
<th>Chemical industry (B)</th>
<th>Fine chemicals (C)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C/B</td>
</tr>
<tr>
<td>2000</td>
<td>2,310,905</td>
<td>210,211</td>
<td>45,239</td>
<td>2.0</td>
</tr>
<tr>
<td>2005</td>
<td>2,463,197</td>
<td>247,217</td>
<td>41,456</td>
<td>1.7</td>
</tr>
<tr>
<td>2008</td>
<td>2,452,880</td>
<td>243,761</td>
<td>40,901</td>
<td>1.7</td>
</tr>
<tr>
<td>2010</td>
<td>2,636,177</td>
<td>265,896</td>
<td>43,840</td>
<td>1.7</td>
</tr>
<tr>
<td>2011</td>
<td>2,753,684</td>
<td>287,014</td>
<td>50,828</td>
<td>1.8</td>
</tr>
<tr>
<td>2012</td>
<td>2,813,575</td>
<td>297,918</td>
<td>54,233</td>
<td>1.9</td>
</tr>
</tbody>
</table>

* Source: KOSTAT, KOSIS DB
* Note: The chemical industry includes fertilizer, rubber and plastic manufacturing industries, excluding pharmaceuticals.

Import and export structure of Korea’s fine chemicals
Korea’s fine chemicals exports stood at USD 10.629 billion in 2013, up 6.6% YoY from USD 9.973 billion in 2012, while Korea’s fine chemicals imports amounted to USD 17.555 billion in 2013, down 1.7% YoY from USD 17.864 billion in 2012.

The inorganic chemicals segment was the largest exporter (USD 3.1 bn) in 2013, followed by other fine chemicals (USD 1.92 bn), cosmetics (USD 1.277 bn), dye & pigment (USD 1.224 bn), electronic materials (USD 853 mn) and paint & ink (USD 851 mn).

The inorganic chemicals segment was the largest importer (USD 5.919 bn) as well, followed by other fine chemicals (USD 4.535 bn), dye & pigment (USD 1.648 bn), cosmetics (USD 1.546 bn), electronic materials (USD 1.348 bn) and photographic chemicals (USD 912 mn).

Export and import by segment (USD 1 mn, %)

<table>
<thead>
<tr>
<th>Segment</th>
<th>2005</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>'05 - '13 CAGR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic inorganic chemicals</td>
<td>Export</td>
<td>768</td>
<td>4,304</td>
<td>3,177</td>
<td>3,100</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>2,447</td>
<td>6,402</td>
<td>6,608</td>
<td>5,919</td>
</tr>
<tr>
<td>Dye &amp; pigment</td>
<td>Export</td>
<td>502</td>
<td>780</td>
<td>985</td>
<td>1,224</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>961</td>
<td>1,699</td>
<td>1,594</td>
<td>1,648</td>
</tr>
<tr>
<td>Paint &amp; ink</td>
<td>Export</td>
<td>403</td>
<td>768</td>
<td>802</td>
<td>851</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>422</td>
<td>650</td>
<td>718</td>
<td>706</td>
</tr>
<tr>
<td>Adhesive</td>
<td>Export</td>
<td>178</td>
<td>353</td>
<td>395</td>
<td>398</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>220</td>
<td>368</td>
<td>435</td>
<td>471</td>
</tr>
<tr>
<td>Surfactant</td>
<td>Export</td>
<td>185</td>
<td>390</td>
<td>404</td>
<td>459</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>162</td>
<td>261</td>
<td>267</td>
<td>288</td>
</tr>
<tr>
<td>Photographic chemicals</td>
<td>Export</td>
<td>110</td>
<td>283</td>
<td>303</td>
<td>292</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>740</td>
<td>991</td>
<td>1,020</td>
<td>912</td>
</tr>
<tr>
<td>Agricultural chemicals</td>
<td>Export</td>
<td>59</td>
<td>194</td>
<td>239</td>
<td>273</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>131</td>
<td>163</td>
<td>189</td>
<td>192</td>
</tr>
<tr>
<td>Cosmetics</td>
<td>Export</td>
<td>295</td>
<td>861</td>
<td>1,028</td>
<td>1,277</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>791</td>
<td>1,460</td>
<td>1,495</td>
<td>1,546</td>
</tr>
<tr>
<td>Electro materials</td>
<td>Export</td>
<td>242</td>
<td>1,068</td>
<td>940</td>
<td>853</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>1,211</td>
<td>1,876</td>
<td>1,574</td>
<td>1,348</td>
</tr>
<tr>
<td>Other</td>
<td>Export</td>
<td>781</td>
<td>2,086</td>
<td>1,701</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>2,444</td>
<td>4,679</td>
<td>4,526</td>
<td>4,555</td>
</tr>
<tr>
<td>Total</td>
<td>Export</td>
<td>3,523</td>
<td>10,907</td>
<td>9,973</td>
<td>10,629</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>9,528</td>
<td>18,549</td>
<td>17,864</td>
<td>17,555</td>
</tr>
<tr>
<td>Trade balance</td>
<td>Export</td>
<td>4,006</td>
<td>-7,642</td>
<td>-7,891</td>
<td>-6,927</td>
</tr>
</tbody>
</table>

* Source: KITA, KOSIS DB
* Note: Based on HS Code

Meanwhile, the figure below is of the annual Trade Specialty Indexes (TSI = [X-M] / [X+M], X is export value and M is import value), which is widely used as a simple indicator of industrial competitiveness.

The TSI values suggest that the three segments – surfactant, paint & ink and agricultural chemicals – sharply enhanced their competitiveness, switching from import specialty to export specialty.

The remaining five segments show a gradual increase in competitiveness as well, but their TSI values are still below 0, reflecting their competitive disadvantages.
As the competitiveness of Korea’s fine chemical industry is weak in most segments, it is imperative to attract foreign direct investment (FDI) to enhance self-sufficiency, build closer ties between the downstream and upstream industries and promote a win-win structure in which downstream and upstream industries can grow together and generate higher added value.

At the same time, this indicates that the fine chemical industry needs to enhance its global competitiveness.

Promising outlook for chemical materials used for electronic devices

Although the Korean fine chemical industry lags behind leading competitors from advanced countries, Korea ranks among the world’s top three in various demand-side industries such as LCD, DRAM, semiconductor, rechargeable batteries and handset industries. Therefore, chemicals used for electronic set-products and parts are promising targets for foreign investors.

Samsung Electronics and Hynix are the world’s top players in the DRAM industry.

- Korea’s global DRAM market share steadily increased to 64% in 2012.
- Korean companies continuously held more than 60% of the global NAND flash market.

Korea commanded 40% of the global LCD market in 2001, emerging as a market-leading player just six years after entering the market, in 1995.

- Samsung Electronics and LG Philips LCD (currently LG Display) have competed for the world’s top two positions since 1999.

- Taiwanese companies are rapidly chasing Korean companies. However, Korean companies hold a combined market share of 60 to 70% in the 40” or larger panel segment with high added value, far ahead of their competitors.

Global market share changes: Key electronic devices and parts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAM</td>
<td>Samsung Electronics, Hynix</td>
<td>38.3 (1)</td>
<td>46.7 (1)</td>
<td>49.9 (1)</td>
<td>63.0 (1)</td>
</tr>
<tr>
<td>Display</td>
<td>Samsung Electronics, LG Display</td>
<td>38.0 (1)</td>
<td>40.7 (1)</td>
<td>43.6 (1)</td>
<td>49.1 (1)</td>
</tr>
<tr>
<td>Small rechargeable battery</td>
<td>Samsung SDI, LG Chem</td>
<td>17.4 (2)</td>
<td>22.6 (1,2011)</td>
<td>40.6 (1)</td>
<td></td>
</tr>
<tr>
<td>Handset</td>
<td>Samsung Electronics, LG Electronics, Pantech</td>
<td>5.0 (4)</td>
<td>19.4 (3)</td>
<td>29.9 (2)</td>
<td>29.6 (1)</td>
</tr>
</tbody>
</table>

* Source: KET, Korea Echimbank Global Economy Research Institute (June 23, 2014); Naver Search Statistics

Korea’s Samsung SDI and LG Chem ranked No. 1 and 2, respectively, in the small-size rechargeable battery market.

- Capitalizing on its experience and knowhow in small rechargeable batteries, Samsung SDI focuses on developing mid- to large rechargeable batteries through a joint investment with the global leading automotive parts manufacturer Bosch (Germany).
- In particular, Samsung SDI has pursued the smart grid and energy storage system (ESS) businesses using rechargeable batteries as well as EV (electronic vehicle) batteries.
- LG Chem supplies EV rechargeable batteries to Hyundai Motor and GM.
- SK Innovation became Korea’s first and the world’s third separator developer, a key material for rechargeable batteries. SK Innovation meets 50% of the domestic demand for separators.

Samsung Electronics and LG Electronics, Korea’s leading handset makers, have fast emerged in the global market, joining the global top five handset makers in terms of sales. Samsung Electronics was ranked the world’s number 1 and LG Electronics, the world’s third, in 2012.

However, Samsung and LG rely on imported core chemical materials, parts and manufacturing equipment from advanced countries such as Japan. Given this, it is necessary to reduce such reliance by pursuing joint investments with foreign partners or attracting foreign companies.

- Core materials for semiconductors include single crystal silicon wafers, chemical mechanical polishing (CMP) slurries, semiconductor encapsulants materials (EMC, epoxy molding compound) and photore sistors.
- Key display materials include PVA (polyvinyl alcohol) films for polarizing plates, TAC (triacetate cellulose) base film, compensation films, light guiding plates and ACF (anisotropic conductive film).
- Key rechargeable battery materials include cathode material, anode material, electrolytes and separators.

Japanese companies have a globally dominant position in most of these key material markets. Korean chemical companies have a presence in niche markets, albeit marginally.
In attracting foreign investment, Korea stands at a disadvantageous compared to China and late-comers due to regulations, higher site lease levels and wages.

On the other hand, Korea has advantages thanks to the presence of globally competitive homegrown companies, which have worldwide supply chains with a number of foreign companies, and the Korean market’s role as a test bed.

• In addition, the Korean government has taken steps to overhaul the regulatory framework with the amendment of the Foreign Investment Promotion Act and the release of Foreign Direct Investment Promotion Measures, which should help create favorable conditions for expanding foreign investment.

Moreover, Korea is an ideal place for leading global companies to establish their R&D centers thanks to its superior talent pool in the science and engineering segments compared to latecomers such as China.

• For example, Japanese manufacturing companies chose Korea as an investment destination primarily due to human resources, not due to low cost factors and potential cost reductions (lower wage levels and low raw material costs).

• In other words, Japanese companies cited cheap labor as among the key reasons for choosing China (35.5%, 3rd) or Thailand (44.7%, 2nd) as an investment destination. In contrast, only 6.7% of Japanese companies cited cheap labor as a reason for choosing Korea, and 20% of Japanese companies cited human resources as a reason for choosing Korea (4th), which is much higher than it is for other countries.

This indicates that Japan’s direct investment in Korea mostly goes to high-tech industries and thus the quality of labor is the top priority. The specialty fine chemicals segment with high added value has favorable conditions to attract foreign investment.

Korea’s fine chemical industry is concentrated in the Greater Seoul Area and industrial complexes, which provide easy access to a highly skilled workforce and logistics.

- About 57% of fine chemical clusters are located in Seoul, Gyeonggi Province, and Incheon, and 12% are situated in Chungcheong Province.

**Fine chemicals clusters by region**

- **Greater Seoul Area & central inland:** There are Kyungwon University (nanoparticles) and Soongsil University (molecular design) in the Greater Seoul Area and the Korea Research Institute of Chemical Technology (highly efficient synthetic new materials) in the central region. Small fine chemicals clusters dedicated to SMEs have already been established or are being planned in the Banwol and Sihwa Industrial Complexes in Gyeonggi Province.

- **Gyeongsang Province:** Ulsan Petrochemical Industrial Complex (Fine Chemicals Materials Technology Research Center, Ulsan Fine Chemical Industry Center, Ulsan New Chemical Commercialization Center of the Korea Chemical Research Center, Korea Testing & Research Institute and Biochemical Commercialization Center), Ulsan College (identification of chemicals)

- **Jeolla Province:** The fine chemicals materials cluster to be established in Gwangyang Bay Area near the Yeosu Petrochemical Industrial Complex, Chonnam National University (Development Center for Fine Chemicals) and Sunchon National University (Environment-friendly Materials Process Technology Innovation)

- In particular, the Gwangyang Sepung Industrial Complex will be developed as a fine chemicals materials cluster with the participation of the Korea Research Institute of Chemical Technology, the Korea Testing & Research Institute, Jeonnam Technopark and related companies. The Sepung Industrial Complex, which will be developed from 2015 to 2019 with a KRW 150 billion investment, will evaluate the reliability of specialty fine chemicals and serve as a test bed for general purpose, differentiated and high-end chemicals.

LCD and semiconductor clusters are located close to where demand side industries have production facilities, such as Paju, Icheon and Giheung in Gyeonggi Province, Cheonan and Tangjeong in South Chungcheong Province and Gumi in North Gyeongsang Province.

In the handset segment, Samsung has a cluster in Gumi, North Gyeongsang Province, while LG has a cluster in Pyeongtaek, Gyeonggi Province and Pantech, in Gimpo.

In the rechargeable battery segment, Samsung SDI has production facilities in Cheonan, South Chungcheong Province and LG Chem has a production base in Cheongju, North Chungcheong Province.

- However, key materials for rechargeable batteries have yet to form clusters in connection with demand-side industries, as anode material production facilities are located in Daegu, Jochiwon and Cheongju, but cathode material production sites are situated in Pohang.
According to the Corporate Management Analysis published by the Bank of Korea, the chemical industry has a production cost breakdown as shown in the table below.

- Material costs account for the largest share of total production costs for both the manufacturing and chemicals industries.

- The ratio of R&D expenses to sales is below 1%, which suggests lackluster R&D efforts in the chemical industry.

- However, it is difficult to say that R&D activities are low in all segments of the chemical industry because the price of fine chemicals is relatively higher than that of petrochemicals, and there is a significant gap in R&D investments between large corporations and SMEs even in the same product segment in terms of absolute value or sales portion.

- In addition, the R&D expenses to sales ratio is significantly higher in electronics chemicals, which experience more rapid technological innovation than do other segments.

### Manufacturing and chemical industries: Production cost breakdown (Unit: %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials cost</td>
<td>70.3</td>
<td>72.4</td>
<td>73.1</td>
<td>73.1</td>
<td>75.7</td>
<td>73.9</td>
<td>72.2</td>
<td></td>
</tr>
<tr>
<td>Labor expenses</td>
<td>8.2</td>
<td>7.5</td>
<td>6.8</td>
<td>6.9</td>
<td>6.3</td>
<td>6.6</td>
<td>6.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Employee benefits</td>
<td>1.1</td>
<td>1.1</td>
<td>1.0</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>Electricity cost</td>
<td>1.7</td>
<td>1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>1.2</td>
<td>1.1</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Gas &amp; water costs</td>
<td>0.7</td>
<td>0.5</td>
<td>0.7</td>
<td>0.9</td>
<td>0.8</td>
<td>1.1</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Depreciation</td>
<td>6.0</td>
<td>4.7</td>
<td>4.1</td>
<td>4.3</td>
<td>3.7</td>
<td>3.7</td>
<td>4.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Tax &amp; dues</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Rental costs</td>
<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Insurance</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Ordinary R&amp;D expenses</td>
<td>0.6</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>CoGM</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials cost</td>
<td>74.3</td>
<td>85.2</td>
<td>101.2</td>
<td>100.1</td>
<td>75.5</td>
<td>102.4</td>
<td>102.0</td>
<td>106.4</td>
</tr>
<tr>
<td>Labor expenses</td>
<td>5.9</td>
<td>4.9</td>
<td>3.0</td>
<td>3.7</td>
<td>3.2</td>
<td>3.0</td>
<td>2.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Employee benefits</td>
<td>0.6</td>
<td>0.8</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Electricity cost</td>
<td>3.4</td>
<td>1.6</td>
<td>2.1</td>
<td>1.9</td>
<td>1.3</td>
<td>2.5</td>
<td>2.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Gas &amp; water costs</td>
<td>1.0</td>
<td>1.7</td>
<td>1.9</td>
<td>4.3</td>
<td>1.3</td>
<td>3.1</td>
<td>3.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Depreciation</td>
<td>8.3</td>
<td>5.7</td>
<td>3.7</td>
<td>5.0</td>
<td>2.8</td>
<td>3.8</td>
<td>3.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Tax &amp; dues</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Rental costs</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Insurance</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Ordinary R&amp;D expenses</td>
<td>0.8</td>
<td>0.5</td>
<td>0.6</td>
<td>0.8</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>CoGM</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Source: Bank of Korea ECOS DB

### Manufacturing and chemical industries: Sales and operating margin ratio (Unit: %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>7.4</td>
<td>6.1</td>
<td>5.9</td>
<td>6.1</td>
<td>6.9</td>
<td>5.6</td>
<td>5.1</td>
<td>5.2</td>
</tr>
<tr>
<td>Basic chemicals</td>
<td>8.0</td>
<td>7.9</td>
<td>5.2</td>
<td>10.0</td>
<td>10.7</td>
<td>9.2</td>
<td>3.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Other chemicals</td>
<td>7.0</td>
<td>7.9</td>
<td>6.1</td>
<td>7.0</td>
<td>5.9</td>
<td>6.3</td>
<td>7.6</td>
<td></td>
</tr>
</tbody>
</table>

* Source: Bank of Korea ECOS DB

## In addition, the operating margin ratio of the chemical industry is as follows.

- In general, the chemical industry records a slightly higher operating margin than the manufacturing industry. However, the basic chemicals segment posted a much lower operating margin than the average operating margin of the manufacturing industry in 2012 and 2013.
**Trends in foreign direct investment**

Foreign investment in Korea’s chemicals product industry, including fine chemicals, experienced significant fluctuations from 2009 to 2014, and chemicals products accounted for the largest part of the chemical engineering segment until 2013.

- FDI in Korean chemical products recorded a 24.5% increase YoY in 2014. In contrast, the chemical engineering segment attracted as much as USD 3.18 billion, posting a 3.7-fold increase from the previous year. FDI in chemicals products accounted for 23.4% of the chemical engineering segment.
- The sharp increase in FDI in the chemical engineering segment is due to USD 2.11 billion in foreign investment in petroleum products.

FDI reached USD 19 billion in 2014, a 30.6% increase YoY and a record high on a cumulative basis.

<table>
<thead>
<tr>
<th>FDI trends (USD mn, %)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korean industries</td>
<td>11,484</td>
<td>13,071</td>
<td>13,673</td>
<td>16,286</td>
<td>145.5</td>
<td>19,003</td>
</tr>
<tr>
<td>Chemical engineering</td>
<td>204</td>
<td>927</td>
<td>1,831</td>
<td>1,286</td>
<td>867</td>
<td>3,178</td>
</tr>
<tr>
<td>Chemicals</td>
<td>152</td>
<td>847</td>
<td>1,769</td>
<td>1,087</td>
<td>597</td>
<td>743</td>
</tr>
</tbody>
</table>

* Source: Ministry of Trade, Industry & Energy (April 24, 2014)
* Note: Figures on a notification basis

Korea’s demand side, such as the automobile, shipbuilding, handset, semiconductor and display industries, are globally competitive and expanding their exports thanks to the Korea-U.S. FTA and Korea-EU FTA. As such, the fine chemical industry, a key materials supplier for these industries, is experiencing domestic market growth.

- Demand for electronic chemicals has fast increased thanks to the rapid expansion of demand-side industries. Nevertheless, the Korean electronics chemical materials segment has weak fundamentals and lacks proprietary R&D capacity, which makes continuous imports inevitable. Accordingly, the segment is a promising candidate for green field investments from abroad, such as from Japan and the EU.
Successful FDI in the fine chemicals segment

The Korean manufacturing industry, especially the information electronics segment, has continued on a fast growth path, significantly enhancing its global competitiveness. As such, leading Korean companies such as Samsung and LG have growing demand for specialty chemicals with high added value.

Leading Japanese companies are in desperate need of market expansion due to a sharp decline in their competitiveness in the electronics market, such as semiconductor and display parts and set-products. More effort should be made to attract Japanese investment in Korea’s parts and materials segment.

- It is encouraging that Korea’s electronics parts and materials segments have aggressively sought investments from Japanese companies with successful results.

Japan’s medium-sized parts and materials companies rushed to make investments in Korea in 2011 and 2012 to mitigate the risks of natural disasters and minimize damage from power shortages in the wake of the Japanese earthquake in March of 2011.

- In addition, Japan’s medium-sized parts and materials companies invested in Korea in order to take advantage of Korea’s geographical proximity, the fact that Korea is home to major customer companies, the likelihood of smooth localization due to cultural similarities and Korea’s FTAs with the United States, the EU and India, which remove tariff barriers to these markets.

- Major Japanese investors in Korea include Sumitomo Chemical, Teijin, JX Nippon Oil & Energy and Ibiden Graphite Korea.

As Korea’s demand-side industries, especially automobile, IT device and electronics, have been raising their profile in the global markets, Korea has strong growth potential in the domestic market with its excellent R&D pool and can serve as a gateway to China, a huge and fast-growing market as well as a test bed for new products and services. Given this, Korea’s fine chemical industry is likely to present new opportunities for investors from advanced economies.

- Foreign companies that focus on electronic materials used for semiconductors and displays, battery materials and automotive plastic materials recently established their R&D centers in Korea in order to supply their products to Korean electronics and auto manufacturers.

Western chemicals companies with R&D centers in Korea include DuPont, Rohm & Haas, BASF, Dow Chemical (Giheung OLED R&D Center), Solvay and Merck.

Investment success case: Solvay

Solvay SA is a global chemicals company founded by Ernest Solvay, a Belgian industrial chemist, in Belgium in 1863. Solvay is listed on the NYSE-Euronext Brussels and Paris.

- Solvay operates the chemicals and plastic businesses, making active investments in fuel cells, rechargeable batteries, new and renewable energy, water treatment, organic electronic materials and LED.

- Solvay entered the petrochemical market in the 1960s. It has business operations, production facilities and R&D centers in 50 countries in Europe, Latin America, Africa and Asia. Solvay is a global enterprise with 400 overseas subsidiaries.

- Solvay employed 31,000 people and posted USD 13.768 billion in sales in 2013, ranking 26th among the global top chemical companies. Solvay has its head office in Brussels, Belgium.

Solvay has decided to invest KRW 120 billion in the Greater Seoul Area to establish production facilities measuring 99,000 m² by 2017, which will produce ESS, PV, electronic and display materials.

- In addition, Solvay opened the Ewha-Solvay Research & Innovation (R&I) center at Ewha Womans University in September of 2014. Solvay has relocated its global specialty chemicals business to the R&I center.

- The 6,000 square-meter Ewha-Solvay R&I Center is Solvay’s first research center in Korea and the fourth in Asia.

- The R&D center will house research labs for the development of OLED display technologies, on which Solvay has placed an extra focus.

- In addition, the R&D center will conduct research on lithium-ion battery materials, OLED materials and high-tech automotive materials. Solvay and Ewha Womans University have already implemented joint research projects such as the development of next-generation metal-air batteries.

- Solvay’s specialty chemicals business, relocated to the R&I center, will be responsible for the management and sales of specialty chemicals products produced by Solvay in four continents and serves as a regional center in Asia.

- Asia is Solvay’s second-largest market, with a total sales portion of 31%, following Europe (33%).

- Jean-Pierre Clamadieu, the CEO of Solvay, said, “Korea is the leading country in the high-tech electronics market. Solvay believes it will generate greater synergy to work closely with scientists.”
BASF was founded by Friedrich Engelhorn in Manheim, Germany in 1865.
- BASF is the world’s largest comprehensive chemicals company and headquartered in Germany, employing more than 100,000 people around the world and recording annual sales of USD 78.615 billion in 2013.
- BASF is listed on the stock exchanges in Frankfurt, London and Zurich and is a market-leading company with thousands of chemical products.
- BASF started the production of nitrogen fertilizers, establishing the world’s first ammonia synthesis plant in 1913. BASF successfully expanded its plastics business in the 1950s and the 1960s. In particular, Styropor®, an expandable polystyrene (EPS) invented by BASF in 1951, was a global success.
- BASF has subsidiaries and joint ventures in more than 80 countries around the world, operates around 380 production sites and six integrated production facilities in about 200 locations around the world, including Asia, Australia, the United States and Africa.
- BASF manufactures fine chemicals, functional chemicals, agricultural chemicals, plastic, nylon garn, automotive and industrial coating, dye and pigment and vitamin products, develops crude oil and natural gas and produces related products.
- BASF invested EUR 5.6 billion in Asia, including Shanghai and Nanjing in China and in Mangalore, in India.
- BASF acquired Cognis, a fine chemicals company in Luxemburg, for EUR 3.1 billion in 2010. Cognis supplies raw materials to the health supplement, cosmetics, detergent, mining, lubricant and agricultural sectors, operating production bases and service centers in 33 countries.

BASF signed a letter of intent on the establishment of its new Electronic Materials Research and Development Center Asia Pacific with the Ministry of Trade, Industry & Energy at the 2013 Europe Investment Attraction Ceremony held in Brussels, Belgium in November of 2013.
- BASF agreed to set up its new R&D Center at Sungkyunkwan University’s Suwon Campus in Gyeonggi Province by September 30, 2014. The new R&D Center focuses on researching inorganic materials and formulations for high-performance applications for semiconductors, displays, organic electronics, LEDs and photovoltaics.
- Semiconductor segment: High-tech solutions encompassing chemical mechanical planarization (CMP), slurry manufacturing, wafer cleaning, galvanizing, additives, metal deposition
- Display segment: Display and lighting OLED and flexible printed circuits
- BASF Korea entered into an MOU with local authorities (Gyeonggi Province, Suwon City) and Sungkyunkwan University on April 18, 2014 to promote investment and the regional economy. The 2,400 square-meter facility is expected to employ 42 researchers at the master’s or doctoral level.
- BASF’s investments are expected to generate production worth KRW 220 billion and many high-skill jobs.

Recently, Japanese companies have been working hard to establish R&D bases abroad. In 2014, Japan’s corporate R&D investments increased 4% YoY, indicating that a greater number of companies seek to establish or expand their overseas R&D centers. More than 80% of the beneficiaries of the government’s tax benefits for R&D activities are operating in the manufacturing sector. In particular, the chemicals, transport machine and apparatus segments account for 50%. Given this, Korea’s central and local authorities should place a greater focus on attracting Japanese fine chemicals companies.

Korea’s FTAs will enable tariff differentiation, which will help divert the global chemical industry’s investments in China to Korea.

The implementation of FTAs may worsen the trade balance and make less-competitive companies unviable over the short term. However, its dynamic impacts should create a virtuous circle for Korea, providing a stimulus for the stable growth of the high value-added chemical industry over the mid to long term.
Future investment plans

Following are the FDI promotion policies announced by the Ministry of Trade, Industry & Energy in 2014 that are relevant to the fine chemical industry.

Greater incentives for foreign investors: The government will enhance incentives, such as various discounts with regard to leases according to the job creation impact of foreign-invested companies.
- Discounts on site leases, a higher ceiling on tax cuts, stronger protection for intellectual properties and greater promotion.
- The government will more actively engage foreign-invested companies in its policy decision process and expand English translation services of relevant laws and regulations.

Attract the regional headquarters of global companies
- The regional headquarters of global companies serve as a center for their overseas subsidiaries in the corporate decision-making process and management. The establishment of regional headquarters in Korea will contribute to creating high-quality jobs, increasing domestic purchases and generating investment in manufacturing facilities.
- To attract regional headquarters to Korea, it is important to create attractive living conditions for a highly skilled workforce and to rationalize the taxation system on frequent internal transactions with overseas subsidiaries.
- Given this, the government will maintain a flat income tax rate of 17% for foreigners working at headquarters in Korea. This rate was supposed to expire by the end of December, 2014.
- Internal transactions between headquarters in Korea and their overseas subsidiaries should be subject to more simplified taxation.
- When there is a discrepancy between the national tax and customs standards, the pre-coordination system will ensure that the National Tax Service and the Korea Customs Service work together to reach an agreement on fair prices.
- Transfer price standards related to intangible assets will be clarified, and frequent outsourcing transactions are eligible for broader exemptions from evidence documentation requirements on taxes.
- The maximum visa duration for foreign employees working at headquarters has been extended to five years from the current one to three years.

Attraction of R&D centers
- Eligibility standards: Government support is granted to foreign-invested R&D centers in line with individual-type foreign investment zones, but with a greater focus on attracting highly skilled talent.
- Income tax cuts: closer cooperation between industry and universities, more opportunities to take part in state-financed projects, investment promotion activities and the use of global joint R&D
- Income tax cuts for foreign technicians working at foreign-invested R&D centers will be extended to 2018.
- The tax cut of 50% for the first two years was scheduled to expire at the end of 2014. However, the tax cut has been extended to attract overseas talent.
- Government support for FDI had been restricted to plant site leases, making it difficult to extend support for buildings, a key part of R&D centers. The government has expanded its support for R&D centers to include building leases.

Attraction of high value-added industries through FTAs
- Target areas: Industries that can take advantage of the effects of the Korea-China FTA, and daily consumable goods such as cosmetics, toilet paper, baby products, school supplies and detergent, which have strong brand loyalty and high potential demand.
  *High value-added industries* are mostly concentrated in final consumer goods, which underscores the importance of attracting B2B industries, such as specialty chemicals.

Strategic investment promotion activities
- To attract large-scale investments by expanding JV Investments
  * Job creators, higher added value, technology transfer and greater demand from related parts and equipment industries
- Investment promotion focused on Korea’s role as a center of the oil business in Northeast Asia
- Tighter partnerships between companies: The government seeks customized investment promotion activities in partnership with major Korean corporations and foreign-invested companies, targeting their overseas parts and materials vendors.

Attraction of target companies: Customized efforts to attract investment from major Japanese parts and materials companies.
- Target selection based on an analysis of Korea’s parts and materials imports from Japan to identify Japanese parts and materials companies that should contribute significantly to improving Korea’s trade deficit with Japan and facilitating Korea’s advancement into global markets
  * An analysis of Korea’s parts and materials imports from Japan in 2013 shows that the five key items – organic & inorganic chemicals, steel & metals, machinery, those related to transportation and IT & electronic materials – accounted for 57% of Korea’s imports from Japan.

---

*Japan Knowledge Report (April 24, 2014)*
RELATED COMPANIES AND ASSOCIATIONS

Korea Specialty Chemical Industry Association (KSCIA) (www.kscia.or.kr) → 29, Digital-ro 32-gil, Guro-gu, Seoul, Korea

Korea Petrochemical Industry Association (KPIA) (www.kpia.or.kr) → 601, Christian World Building, 190, Yulgok-ro, Jongno-gu, Seoul, Korea

Major fine chemical companies as of 2014

<table>
<thead>
<tr>
<th>Company</th>
<th>Website</th>
<th>Key business</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG Chem</td>
<td><a href="http://www.lgchem.com/kr/main">www.lgchem.com/kr/main</a></td>
<td>Petrochemicals, construction &amp; electronic materials (polarizer films, rechargeable battery, etc.)</td>
</tr>
<tr>
<td>Dongwoo Finechem</td>
<td><a href="http://www.dwchem.co.kr">www.dwchem.co.kr</a></td>
<td>Semiconductor &amp; LCD materials</td>
</tr>
<tr>
<td>Samsung SDI</td>
<td><a href="http://www.samsungsdid.co.kr/gateway">www.samsungsdid.co.kr/gateway</a></td>
<td>Rechargeable battery, semiconductor, LCD materials</td>
</tr>
<tr>
<td>Daejoo Electronic Materials Co</td>
<td><a href="http://www.daejoo.co.kr">www.daejoo.co.kr</a></td>
<td>Conductive materials, epoxy, PDP-use glass materials, phosphor</td>
</tr>
<tr>
<td>SKC</td>
<td><a href="http://www.skic.kr/ko/main/main.jsp">www.skic.kr/ko/main/main.jsp</a></td>
<td>PET films, PO / SM, EVA, Sheets and industrial films, etc.</td>
</tr>
<tr>
<td>KISCO</td>
<td><a href="http://www.kyungin.co.kr/korea/01homa2-1.php">www.kyungin.co.kr/korea/01homa2-1.php</a></td>
<td>Fluorescent dye and dye intermediates for textile, paper, far and detergents</td>
</tr>
<tr>
<td>LANDF Corp</td>
<td><a href="http://www.landf.co.kr">www.landf.co.kr</a></td>
<td>Cathode materials for rechargeable battery, BLU</td>
</tr>
<tr>
<td>Posco Chemtech</td>
<td><a href="http://www.poscochemtech.com/kr/main.do">www.poscochemtech.com/kr/main.do</a></td>
<td>Anode materials for rechargeable battery, carbon materials, etc.</td>
</tr>
<tr>
<td>Hyosung</td>
<td><a href="http://www.hyosung.co.kr/kr/index.do">www.hyosung.co.kr/kr/index.do</a></td>
<td>LCD TAC films, NF 3, carbon fiber reinforced plastic (CFRP), industrial specialty gas, etc.</td>
</tr>
<tr>
<td>Kolon Industries</td>
<td><a href="http://www.kolonindustries.com">www.kolonindustries.com</a></td>
<td>Industrial materials, films, electronic materials, etc.</td>
</tr>
<tr>
<td>Fosung</td>
<td><a href="http://www.fosung.com">www.fosung.com</a></td>
<td>Electrolyte for rechargeable battery, specialty gas, fluoride</td>
</tr>
</tbody>
</table>

Source: Company website
Invest Korea’s Global Network

Supporting foreign investors worldwide

Headquarters
Address 13, Heolleung-ro, Seocho-gu, Seoul, Republic of Korea
Tel (82-2) 1600-7119 Fax (82-2) 3460-7939
E-mail ikonline@kotra.or.kr
Homepage www.investkorea.org

NORTH AMERICA
New York, USA
Tel (212) 826-0900
E-mail kotrany@hotmail.com
Los Angeles, USA
Tel (323) 954-9500
E-mail info@kotrala.com
Chicago, USA
Tel (312) 644-4323
E-mail info@kotrachicago.com
Dallas, USA
Tel (972) 243-9300
E-mail joongik@kotradallas.com
Washington D.C., USA
Tel (202) 857-7919
E-mail washington@kotra.or.kr
Silicon Valley, USA
Tel (408) 432-5000
E-mail info@kotrasv.org
Detroit, USA
Tel (248) 619-1601
E-mail detroit@kotradtt.org
Vancouver, Canada
Tel (604) 683-1820
E-mail ktc@kotrayvr.com
Toronto, Canada
Tel (416) 368-3399
E-mail info@kotra.ca

EUROPE
Frankfurt, Germany
Tel (49-69) 2429-3029
E-mail frankfurt@kotra.or.kr
Hamburg, Germany
Tel (49-40) 3405-740
E-mail info@kotra.de
Munich, Germany
Tel (49-89) 2424-2630
E-mail munich@kotra.or.kr
Paris, France
Tel (33-1) 5025-8888
E-mail paris@kotra.or.kr
London, U.K.
Tel (44-20) 7520-5300
E-mail kotra@kotra.co.uk
Brussels, Belgium
Tel (32-2) 205-0088
E-mail kotrabru@kotra.or.kr
Milan, Italy
Tel (39-02) 795813
E-mail kotramil@kotra.it
Zurich, Switzerland
Tel (41-44) 202-1232
E-mail ktc@kotra.ch
Stockholm, Sweden
Tel (46-8) 360080
E-mail stockholm@kotra.se
Copenhagen, Denmark
Tel (45) 2567-7221
E-mail info@kotra.dk
Amsterdam, Netherlands
Tel (31-20) 7544888
E-mail info@kotra.nl
Vilnius, Austria
Tel (43-1) 506-3876
E-mail ktc@kotra.at
Madrid, Spain
Tel (34-91) 506-6241
E-mail madrid@kotra.or.kr

ASIA & OCEANIA
Singapore
Tel (65) 6235-7500
E-mail kotraas@bangnet.com.sg
Sydney, Australia
Tel (61-2) 6216-3159
E-mail info@kotra.org.au
Melbourne, Australia
Tel (61-3) 8860-0580
E-mail info@kotra.org.au
Tokyo, Japan
Tel (81-3) 3214-6811
E-mail kotrakanto@kotra.or.jp
Osaka, Japan
Tel (81-6) 6363-2931
E-mail osakadk@kotra.or.jp
Nagoya, Japan
Tel (81-52) 561-7206
E-mail nagoya@kotra.or.jp
Fukuoka, Japan
Tel (81-92) 473-2005
E-mail fukuoka@kotra.or.jp
Beijing, China
Tel (86-10) 6410-5100
E-mail pekktc@kotra.or.kr
Shanghai, China
Tel (86-21) 3108-8730
E-mail shanghai@kotra.or.cn
Guangzhou, China
Tel (86-20) 3238-1688
E-mail cangzhou@kotra.or.cn
Qingdao, China
Tel (86-532) 6620-7389
E-mail kotrakqdtc@kotra.or.cn
Hangzhou, China
Tel (86-571) 8110-3200
E-mail kotrakhtc@kotra.or.cn
Hunan, China
Tel (86-22) 5335-9009
E-mail ally@kotra.hn.gov.cn
Hong Kong, China
Tel (852) 2545-9500
E-mail kotra@hongkongщейин.org
Taipei, Taiwan
Tel (886-2) 2717-2324
E-mail kotra5@kotra.org.hk
Kuala Lumpur, Malaysia
Tel (60-3) 2117-7100
E-mail kotra@kotra.org.my
Jakarta, Indonesia
Tel (62-21) 3714-1322
E-mail kotra@kotra.or.id

MIDDLE EAST
Dubai, United Arab Emirates
Tel (971-4) 453-0080
E-mail kotrakdubai@kotra.or.org

MIDDLE EAST
Dubai, United Arab Emirates
Tel (971-4) 453-0080
E-mail kotrakdubai@kotra.or.org

You want to do business in Korea but don’t know where to start. Where should you turn? Invest Korea. As the national investment promotion organization of Korea, Invest Korea helps foreign companies enter the Korean market. It offers a free one-stop service that includes a wide range of pre-investment, investment and post-investment support, with offices located around the world. Contact the Invest Korea office nearest you.
KOREA,
Where **Success** Knows No Limits