New study finds:

• Demand for acrylic acid in the United States will advance 4.2 percent annually to 2.3 billion pounds in the year 2005, valued at $1.6 billion.

• Demand for acrylic acid used to manufacture acrylate esters will increase 3.5 percent annually to 1.1 billion pounds in 2005. Acrylate esters are used as the base acrylic monomer in a wide range of coatings, adhesives, finishes for paper, leather, and textiles, and floor and wood polishes.

• In 2000, there were four US producers of acrylic acid -- BASF, Celanese, Dow Chemical, and Rohm and Haas. A fifth producer, American Acryl (a joint venture of Total Fina Elf and Nippon Shokubai), is building a new acrylic acid facility in Texas for the captive market, thus not affecting merchant capacity.
Acrylic Acid & Derivatives, a new study from The Freedonia Group, provides you with an in-depth analysis of major trends in the industry and the outlook for product segments and major markets -- critical information to help you with strategic planning.

This brochure gives you an indication of the scope, depth and value of Freedonia’s new study, Acrylic Acid & Derivatives. Ordering information is included on the back page of the brochure.

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• Demand for acrylic acid in the United States will advance 4.2 percent annually to 2.3 billion pounds in the year 2005, valued at $1.6 billion.

• Acrylic acid polymers will consume more than 1.2 billion pounds of acrylic acid. These polymers include superabsorbant polymers (SAPs) used in baby diapers, adult incontinence and feminine hygiene products, detergent polymers and water treatment polymers.

• Demand for acrylic acid used to manufacture acrylate esters will increase 3.5 percent annually to 1.1 billion pounds in 2005. Acrylate esters are used as the base acrylic monomer in a wide range of coatings, adhesives, finishes for paper leather and textiles, and floor and wood polishes.

• The supply of acrylic acid is expected to be ample through 2005, the result of a number of capacity additions in recent years. Even though increasing demand through 2005 will eat into the extra capacity currently online, supply shortages (which have occurred occasionally in the past) are not expected.

• In 2000, there were four US producers of acrylic acid -- BASF, Celanese, Dow Chemical, and Rohm and Haas. A fifth producer, American Acryl (a joint venture of Total Fina Elf and Nippon Shokubai), is building a new acrylic acid facility in Texas for the captive market, thus not affecting merchant capacity.
### Acrylic Acid Demand

(million pounds)

<table>
<thead>
<tr>
<th>Item</th>
<th>1995</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>00/95</th>
<th>05/00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Product (bil 1996$)</td>
<td>7544</td>
<td>9224</td>
<td>10550</td>
<td>12100</td>
<td>4.1</td>
<td>2.7</td>
</tr>
<tr>
<td>lbs acrylic acid/mil $ GDP</td>
<td>202</td>
<td>207</td>
<td>222</td>
<td>238</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Acrylic Acid Demand</td>
<td>1521</td>
<td>1906</td>
<td>2340</td>
<td>2875</td>
<td>4.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Acrylate Esters</td>
<td>829</td>
<td>927</td>
<td>1100</td>
<td>1310</td>
<td>2.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Acrylic Acid Polymers</td>
<td>692</td>
<td>979</td>
<td>1240</td>
<td>1565</td>
<td>7.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Superabsorbent Polymers</td>
<td>469</td>
<td>690</td>
<td>865</td>
<td>1080</td>
<td>8.0</td>
<td>4.6</td>
</tr>
<tr>
<td>Water Treatment Polymers</td>
<td>113</td>
<td>150</td>
<td>195</td>
<td>250</td>
<td>5.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Detergent Polymers</td>
<td>57</td>
<td>71</td>
<td>90</td>
<td>110</td>
<td>4.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Other Acrylic Acid Polymers</td>
<td>53</td>
<td>68</td>
<td>90</td>
<td>125</td>
<td>5.1</td>
<td>5.8</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.60</td>
<td>0.63</td>
<td>0.67</td>
<td>0.72</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Acrylic Acid Demand (mil $)</td>
<td>915</td>
<td>1200</td>
<td>1565</td>
<td>2075</td>
<td>5.6</td>
<td>5.4</td>
</tr>
</tbody>
</table>

% Annual Growth

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*Acrylic Acid & Derivatives #1488*  
Freedonia Industry Study
Market Environment/International Activity

These Sections discuss factors influencing acrylic acid and derivatives demand, including manufacturing trends, industry regulations and international activity.

This information provides you with an understanding and an analysis of the climate in which the acrylic acid and derivatives industry operates.

Environmental & Regulatory Considerations

Acrylic acid is a potentially hazardous chemical, particularly in terms of its corrosive nature and propensity to spontaneously polymerize, with the evolution of considerable heat and pressure. A strong irritant, acrylic acid is extremely corrosive, and can cause rashes and burns on contact with the skin and burns in the lungs through the inhalation of vapors. Acrylic acid must be inhibited during transport and storage in order to improve its stability. The inhibitor used is monomethyl ether of hydroquinone. For some applications (primarily for conversion into polyacrylic acids and salts), refrigerated shipments are used instead of an inhibitor. Acrylic acid polymerizes readily in the presence of water, which accounts for its use in superabsorbent polymers, as these polymers can absorb up to 20 times their weight in water. This spontaneous polymerization also yields considerable heat, making uninhibited transport a fire and explosion hazard.

The most serious safety hazards associated with acrylic acid are related to its instability and its ability to spontaneously polymerize, with the evolution of considerable heat and pressure. Rupture of sealed drums of acrylic acid can occur if spontaneous polymerization occurs, creating explosion and fire hazards. Free radical-producing chemicals such as peroxides. Low oxygen levels can reduce the effectiveness of the inhibitor, which can also increase the probability of an accident.

Environmental hazards associated with acrylic acid are comparable to a number of other chemicals, in that spills of liquid acrylic acid into lakes, rivers or streams and the release of acrylic acid vapors into the air must be reported to federal and state environmental agencies. Acrylic acid is a reportable chemical under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Acrylic Acid Capacity by Region

Total world acrylic acid capacity stood at 7.8 billion pounds in the year 2000. The majority of capacity is located in the developed regions of the world, such as the United States, Western Europe and Japan, although capacity is currently being established or is under consideration in a variety of regions due to growing demand. Currently, the US accounts for 38 percent of total capacity, Western Europe 28 percent, Japan 14 percent and the rest of the Asia/Pacific region 16 percent. The remainder consists of several small plants in Mexico and Brazil; and some older facilities in Eastern Europe. The Africa/Mideast region is currently without acrylic acid capacity, although this is expected to change in the near future.

North America is the largest acrylic acid producing region in the world, accounting for 38 percent of total capacity in the year 2000. The bulk of this capacity is located in the United States, with one small plant operating in Mexico. Canada is dependent upon imports (mostly from the US) for its supplies. There are four producers in the region, several of whom (BASF, Rohm and Haas, and Celanese) are among the largest in the world.

Rohm and Haas is the largest manufacturer of acrylic acid in North America; in fact, the company’s Deer Park, Texas complex is the largest single acrylic acid
**Acrylic Acid**

The Acrylic Acid Section provides capacity data and demand by market through the years 2005 and 2010.

This information helps you:

- Analyze your company’s growth potential in the industry.
- Outline your strategic plans for five and ten years out.
- Establish sales goals.

**Acrylic Acid Demand by Derivative - Ethyl Acrylate**

The consumption of acrylic acid in the manufacture of ethyl acrylate will increase 2.8 percent annually to million pounds in the year 2005, valued at $210 million. Growth will accrue as the result of increasing production of ethyl acrylate in adhesives, paper and textiles markets. Gains in ethyl acrylate production (and therefore acrylic acid consumption) have been impeded in the past by concerns over the potential toxicity of ethyl acrylate. However, in 1998, ethyl acrylate was removed from the Environmental Protection Agency’s (EPA) list of potential carcinogens.

Ethyl acrylate is a soft and flexible acrylic monomer, although it is harder than butyl acrylate, and is often mixed with butyl acrylate to give a slightly harder finish. However, production of ethyl acrylate is generally affected more readily than other acrylates in times of acrylic acid shortages, since it requires 0.72 pounds of acrylic acid per pound of acrylate, compared to butyl acrylate at 0.57 pounds of acrylic acid per pound of acrylate.

---

**Superabsorbent Polymers Markets for Acrylic Acid**

(million pounds)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disp Hygiene Prdts Sales (bil units)</td>
<td>35.5</td>
<td>40.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lbs acrylic acid/000 units</td>
<td>7.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylic Acid in Superabsorbents</td>
<td>260</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby Diapers &amp; Training Pants</td>
<td>218</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Incontinence Products</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feminine Hygiene &amp; Other</td>
<td>20</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$/lb</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylic Acid-Superabsorbents (mil $)</td>
<td>133</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% superabsorbents</td>
<td>60.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylic Acid Demand-Polymers (mil lbs)</td>
<td>431</td>
<td>692</td>
<td>941</td>
<td>1240</td>
<td>1565</td>
</tr>
</tbody>
</table>

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These Sections analyze trends and consider the threats and opportunities for acrylate esters and acrylic acid polymers by market.

The information presented will help you:

- Focus your sales and marketing efforts on high growth areas.

- Propose new areas for development.

**Water Treatment Markets for Acrylic Acid Polymers**

(million pounds)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Water Withdrawal (tril gals)</td>
<td>96.4</td>
<td>94.6</td>
<td>95.3</td>
<td>94.2</td>
<td>93.8</td>
</tr>
<tr>
<td>lbs polymer/mil gals</td>
<td>1.4</td>
<td>2.1</td>
<td>2.9</td>
<td>4.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Acrylic Acid Polymers in Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>135</td>
<td>155</td>
<td>241</td>
<td>330</td>
<td>430</td>
</tr>
<tr>
<td>Nonindustrial</td>
<td>116</td>
<td>171</td>
<td>241</td>
<td>330</td>
<td>430</td>
</tr>
<tr>
<td>$/lb</td>
<td>2.13</td>
<td>2.19</td>
<td>2.31</td>
<td>2.43</td>
<td>2.58</td>
</tr>
<tr>
<td>Acrylic Acid Polymers in Water (mil $)</td>
<td>288</td>
<td>431</td>
<td>635</td>
<td>910</td>
<td>1250</td>
</tr>
<tr>
<td>% water treatment</td>
<td>22.1</td>
<td>20.4</td>
<td>21.4</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>Acrylic Acid Polymers Demand (mil lbs)</td>
<td>610</td>
<td>965</td>
<td>1369</td>
<td>1755</td>
<td>2205</td>
</tr>
</tbody>
</table>

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Industry Structure

Gain a better understanding of your competition and analyze your company’s position in the industry with information about:

• industry concentration
• market share
• competitive strategies
• acrylic acid polymers
• industry sales
• industry restructuring
• cooperative agreements
• marketing & distribution

Competitive Strategies

Competitors in the US acrylic acid industry utilize several competitive strategies, including low cost leadership, vertical integration, globalization and product differentiation. Each of these strategies is utilized by one or more companies in the industry.

Low cost leadership strategies are the aggressive pursuit of manufacturing efficiencies in order to reduce manufacturing costs. This strategy typically entails energy and raw material savings, economies of scale, favorable agreements with raw materials suppliers, vertical integration and control of overhead costs. This sometimes involves avoiding smaller, low-volume customers and limiting product research and development. A low cost leadership strategy can provide producers with a defense against competitors because the lower cost producer can still record a positive return while the next lowest cost producer loses money. This is common throughout the industry, where virtually all producers are engaged in the pursuit of increased operating efficiencies. Those producers with extensive operations, which can reduce manufacturing costs on a per pound basis through economies of scale, can therefore better afford to sell their product at a lower price.

Vertical integration refers to the advantages derived from being involved in an industry from raw materials through the manufacture of higher-value end-use products. This is commonplace, as all four producers of acrylic acid are forward-integrated into acrylate esters, and Dow and BASF are forward-integrated into superabsorbent polymers. This gives them a secure source of acrylic acid for acrylates and superabsorbents production, as well as an assured market for some of their acrylic acid production. The importance of this vertical integration is such that an acrylic acid plant is virtually never built at all unless there is an associated derivatives facility (either acrylates or superabsorbent polymers) built...
Company Profiles

The Profiles Section analyzes 24 companies active in the U.S. acrylic acid and derivatives market. These profiles represent a sampling or cross-section of the types of companies involved in the industry.

Divisions, subsidiaries, joint ventures, etc., are discussed under appropriate parent companies.

Sources for profiles included:

- Information provided by key staff members in the respective companies
- Annual reports
- 10-K reports
- Security analysts reports
- Corporate product literature

COMPANY PROFILES

Nippon Shokubai Company Limited
Kogin Building
1-1, Koraibashi 4-chome
Chuo-ku, Osaka 541
Japan
816-223-9111
http://www.shokubai.co.jp

NA Industries Incorporated
2651 Riverport Road
Chattanooga, TN 37406
423-624-6496


Nippon Shokubai is active in the acrylic resins industry primarily through the Basic Chemicals, Fine and Specialty Chemicals, and Polymers and Resins product groups. In FY 2001, the Basic Chemicals group accounted for $441 million in sales, and the Fine and Specialty Chemicals group accounted for $419 million in sales. The Basic Chemicals group is involved in the manufacture of acrylic acids and esters used primarily in superabsorbent polymers (SAPs). The group also makes methacrylic acid and esters used in applications such as resins and paints. Acrylic acid derivatives and SAPs are produced by the Fine and Specialty Chemicals product group. Nippon Shokubai also offers a variety of acrylic acid-based resins through its Polymers and Resins group. Resins available from the Polymers and Resins group are used for such applications as paints, adhesives and electrical insulating coatings.

Nippon Shokubai manufactures its acrylics at several facilities in Japan for export to the rest of Asia, Europe and the US. Outside of Japan, the Company manufac-
Companies Profiled

Air Products and Chemicals Incorporated
Wacker Polymer Systems GmbH
AMCOL International Corporation
BASF AG
Chenical International
Celanese AG
Clariant Specialty Chemicals Incorporated
Dainippon Ink and Chemicals Incorporated
Dow Chemical Company
Union Carbide Corporation
E.ON AG
Degussa Corporation
Rohm GmbH and Company KG
Stockhausen GmbH and Company KG
StoHaas Monomer GmbH & Company KG
VEBA AG
Formosa Plastics Group
Goodrich Corporation
Henkel KGaA
Cognis Corporation
Loctite Corporation
Imperial Chemical Industries plc
Emerson & Cuming
National Starch and Chemical Company
Permabond International
TRA-CON
Jilin Chemical Industries Company Limited
Mitsubishi Chemical Corporation
Mitsubishi Heavy Industries Limited
Nippon Shokubai Company Limited
American Acryl
NO Industries Incorporated
PT Nisshoku Triplyta Acrylics
Noveon Incorporated
Goodrich (BF) Performance Materials
Petrobras Brasileiro SA
PETROBRAS
Reichhold
Rhodia SA
Albright & Wilson Limited
Rohm and Haas Company
StoHaas Monomer GmbH & Company KG
Sumitomo Chemical Company Limited
Toagosei Company Limited
Tomen Corporation
Total Fine Elf SA
American Acryl
Atofina Chemicals Incorporated
Atoglas
Cook Composites and Polymers

Acrylic Acid & Derivatives #1488

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Freedonia does not just collect and reprint data; Freedonia develops data. Our analysts thoroughly investigate an industry by extensively interviewing key industry participants and analyzing information from sources such as associations, government and trade literature. Once this research is complete, Freedonia establishes one set of forecasts. All writing, editing and forecasting is done in-house to assure quality and consistency. In cases where data does not exist, Freedonia develops the data based on input/output ratios, bills of materials and flow charts. The following chart summarizes Freedonia’s methodology:
The Freedonia Group, Inc. is a leading international industry study/database company.

Since 1985, Freedonia has published over 1,600 titles covering areas such as chemicals, coatings and adhesives, building materials, plastics, industrial components and equipment, health care, packaging, household goods, security, and many other industries.

Freedonia has produced a wide variety of titles, including:

- Water Management Chemicals
- Acrylic Resins
- Powder Coatings
- Paint & Coating Materials

Because Freedonia is a reliable information source, our forecasts are cited in numerous publications such as *The Wall Street Journal*, *Chemical Market Reporter* and *Chemical Week*.

**Advantages of Freedonia Reports**

**In-house operations**
Because all of our staff work at the same location, interaction between analysts and departments provides a strong system of checks and balances.

**Consistency**
Our Economics Group develops indicators that are used by all analysts. Therefore, every Freedonia study is based on a consistent set of economic assumptions (GDP, paper and paperboard production, disposable hygiene product sales, etc.)

**Reliable forecasts**
Because all of our forecasts consider the environment in which a product or industry is operating, as well as threats and opportunities to the market, Freedonia forecasts are reliable indicators of future performance.

**One-on-one interviews**
All studies are produced by conducting interviews with key industry participants and end-users.

**Proprietary electronic database**
Freedonia’s analysts can tap into an extensive in-house electronic database containing corporate literature (including private company information), trade publications, government reports and many other sources of information.

About The Freedonia Group

Advantages of Freedonia Reports

Acrylic Acid & Derivatives #1488

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About Our Customers

Freedonia's clients include major US and international companies in the manufacturing, services, consulting and financial sectors.

Typical purchasers of Freedonia studies:

- Key Executives
- Corporate Planners
- Market Researchers
- Financial Analysts
- Information Centers
- New Product Developers
- Merger & Acquisition Specialists

Since 1985 we have provided research to customers ranging in size from global conglomerates to one person consulting firms. More than 90% of the industrial companies in the Fortune 500 use Freedonia research to help with their strategic planning.

Some of Freedonia's customers in the acrylic acid and derivatives market include: BASF, Celanese, Dow Chemical, Imperial Chemical Industries, Rohm and Haas, and Total Fina Elf.
Water Management Chemicals
Strict clean water rules will continue to drive demand for biocides and other water management chemicals. Closed-loop processing and greater use of recycled water will benefit corrosion inhibitors, chelating agents and other products in pulp and paper, chemical, petroleum, metals processing, commercial and residential markets. This study analyzes the US water management chemical industry to 2005 and 2010 by product, application and market. It also evaluates market share and profiles key companies.
#1499. . . . . . . . . 12/01. . . . . . . . . . $3,700

Acrylic Resins
The US market for acrylic resins is analyzed in this study. It presents historical data for 1990, 1995 and 2000 and forecasts to 2005 and 2010 by type (acrylates and methacrylates) and by market (e.g., paints and coatings, construction, textiles and fibers, plastics, industrial and commercial products, adhesives, transportation equipment, paper and paperboard, consumer products). The study also includes discussions related to foreign trade, international activity and industry structure, and profiles leading companies.
#1492. . . . . . . . . 12/01. . . . . . . . . . $3,600

Nonwovens
Demand for nonwoven roll goods in the US will grow 4.5% annually through 2005. Advances will be driven by consumer and filtration disposables, as well as by nondisposable geotextiles and battery separators. Factors such as product innovation, increased penetration of nonwovens into diapers, and new wiping products will propel market gains. This study analyzes the $3.7 billion US nonwovens industry to 2005 and 2010 by material, product and market. It also evaluates market share and profiles leading companies.
#1487. . . . . . . . . 11/01. . . . . . . . . . $3,700

Radiation-Cured Products
Demand for radiation-cured (radcure) products in the US will grow 9.4% annually. Gains will be driven by intense product development and increased awareness of radcure’s benefits among end users. Coatings and inks will remain the largest products, with packaging the leading outlet. Flooring will replace printing and publishing as the second largest market. This study analyzes the $1 billion US radcure products industry to 2005 and 2010 by type and market. It also presents market share data and profiles key firms.
#1399. . . . . . . . . 8/01. . . . . . . . . . $3,700

Adhesives
Demand for adhesives in the US will reach 15.2 billion pounds in 2004. Gains in value demand will benefit from rising raw material costs and a shift to higher priced hot melts and emulsions. Specialty and engineering adhesives will grow the fastest as they find greater use in construction and durables manufacturing, often at the expense of conventional fasteners. This study analyzes the $8.4 billion US adhesives industry to 2004 and 2009 by market and type. It also details market share and profiles key firms.
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Paint & Coating Materials: Resins, Pigments & Solvents
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