World Textile Fibers: Synthetic & Cellulosic, a new study from The Freedonia Group, is designed to provide you with an in-depth analysis of the major trends in the world market for textile fibers 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, World Textile Fibers: Synthetic & Cellulosic. Ordering information is included on the back page of the brochure.

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World Textile Fibers: Synthetic & Cellulosic #1243

Study Highlights

World Highlights

- Global mill fiber consumption of manufactured fibers is forecast to increase 5.4 percent per year to 37.8 million metric tons in 2003.

- Olefins (primarily polypropylene) will benefit from strong demand as a primary and secondary backing fiber in carpet manufacturing, where it is displacing natural fibers such as jute.

- While cellulosic fibers will continue to lose market share to synthetics, the extended decline seen in this market is forecast to turn around due to greater demand for rayon and acetate in higher end women’s apparel.

- The generally favorable forecast for manufactured fibers reflects a number of distinct trends, including continued strength in the large Chinese and Indian fiber markets, as well as the recovery of demand throughout much of the rest of the Asia/Pacific region.

Industry Structure

- The five leading suppliers -- DuPont (US), Toray Industries (Japan), Teijin (Japan), Acordis (Germany) and Toyobo (Japan) -- held 21 percent of the market in 1999.

- DuPont is by far the world’s dominant fiber producer, with more than double the market share of its next largest competitor and particularly strong positions in nylon and spandex.
## Study Highlights

### World Manufactured Fiber Production, 1989 Versus 1998
(Thousand metric tons)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>World GDP (bil US 1997$) kgs/000$ GDP</td>
<td>26814</td>
<td>34187</td>
<td>39570</td>
<td>47570</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>World Mill Fiber Consumption % manufactured fibers</td>
<td>40130</td>
<td>49609</td>
<td>61200</td>
<td>76500</td>
<td>2.4</td>
<td>4.3</td>
</tr>
<tr>
<td>World Manufactured Fiber Consumption</td>
<td>19706</td>
<td>28991</td>
<td>37800</td>
<td>49500</td>
<td>4.4</td>
<td>5.4</td>
</tr>
<tr>
<td>net exports/stockpiles</td>
<td>761</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Manufactured Fiber Production</td>
<td>20467</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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World Textile Fibers: Synthetic & Cellulosic #1243

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Order form on last page.
Tables and Charts are featured for each region and country. Historical data and forecasts are presented for 1993, 1998, 2003 and 2008.

Charts and Tables include the following for each country and region in metric tons:

- Gross Domestic Product (bil 97 US$) GDP per capita
- Population (mil persons) % urban
- Urban Population (mil persons)
- kgs per capita kgs per 000$ GDP
- Textile Fiber Demand Natural Fibers Manufactured Fibers
- % natural % manufactured
- Manufactured Fiber Demand Synthetic Fiber Cellulosic Fiber net exports & stock piles
- Manufactured Fiber Production Synthetic Fibers Polyester Nylon & Aramid Olefins Acrylic & Modacrylic Other Synthetics Cellulosic Fibers
- Total Manufactured Fibers Synthetic Fibers Cellulosic Fibers

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MARKET ENVIRONMENT

World Natural Fiber Overview

World mill fiber consumption is forecast to increase 2.6 percent per year to more than 23 million metric tons in 2003. In the continuation of a well established trend, natural fibers will continue to lose market share to manufactured fibers, particularly synthetics. By 2003, natural fibers will account for 38 percent of world mill fiber consumption of textile fibers, down from 42 percent in 1998 and 51 percent in 1989. However, natural fibers will continue to hold significant positions in their stronghold markets, particularly apparel. For instance, cotton remains the fiber of choice for most types of casual wear, while silk and wool remain popular in higher end apparel and specialty markets. (It is important to note that “natural fibers” as defined in this study include only cotton, wool and silk, and therefore exclude fibers such as jute, hemp and sisal, among others).

In fact, much of the increased market share for synthetics is arising in applications such as carpeting and industrial textiles, markets in which natural fibers are not widely used. Aside from fashion trends favoring natural fibers in a variety of applications, natural fiber demand will be promoted by rising purchases of products including higher end apparel and home furnishings on the part of expanding middle class populations in emerging regions. Greater use in blends with synthetic fibers such as polyester is also expanding the applications for cotton. Nonetheless, most mill fiber consumption of natural fibers in emerging markets such as the Pacific Rim and Latin America will continue to be related to the production of apparel and home furnishings for export, and overall market expansion will remain primarily reliant on the popularity of these fibers among consumers in North America and Western Europe.

Strongest gains are forecast for North America and Africa and the Mideast (particularly Turkey), but most demand will continue to arise in the Asia/Pacific...
The Manufactured Fibers Supply and Demand Section highlights the key issues that have affected the global textile fibers market over the past ten years and summarizes contributing growth factors.

This information helps you:

- Focus your sales and marketing efforts on high growth areas.
- Propose new areas for development.

Polyester

Global production of polyester fibers is projected to increase 5.5 percent per year to nearly 20 million metric tons in 2003, which is slightly above-average for the manufactured fiber sector as a whole. Polyester prices are expected to remain sufficiently competitive with other alternatives as to stimulate significant downstream demand. Global utilization rates for polyester stood at about 75 percent in 1998 (based on global production of 15.2 million metric tons and capacity of 20.4 million metric tons), which is a good twelve percent below optimum levels. This factor suggests that overcapacity remains a factor in this sector. Therefore, while volume is rising, margins will continue to be squeezed by excess product.

Chemically, polyesters are defined as polymeric resins with ester groups in the main chain. The most widely used polyester in fiber applications is polyethylene terephthalate (PET), commercialized by DuPont in 1953. PET is made by either the reaction of dimethyl terephthalate with ethylene glycol, or the reaction of high-purity terephthalic acid with ethylene glycol. Molten PET is fed directly into spinnersets and spun into fibers of the desired weight and thickness. This fairly simple manufacturing process contributes to the fiber’s relative cost effectiveness, with polyester filament yarn prices averaging less than one dollar per pound in recent years. Production capacity is designated as either bottle grade, which is used to make packaging materials, particularly beverage containers, or fiber grade, which is not interchangeable.

Polyester fiber is strong, stretch resistant, easy to dye, resistant to most chemicals, quick drying, wrinkle- and abrasion-resistant, able to retain pleats and creases, easily washed, and crisp and resilient when wet or dry. As a result, the fabric finds widespread use in apparel, children’s wear, and home furnishings. World Cellulosic Fiber Demand by Country/Region (thousand metric tons):

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulosic Fiber Demand</td>
<td>2611</td>
<td>2438</td>
<td>2390</td>
<td>2472</td>
<td>2472</td>
</tr>
<tr>
<td>North America</td>
<td>320</td>
<td>311</td>
<td>222</td>
<td>220</td>
<td>220</td>
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<tr>
<td>Latin America</td>
<td>80</td>
<td>84</td>
<td>72</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>Western Europe</td>
<td>675</td>
<td>682</td>
<td>758</td>
<td>845</td>
<td>970</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>559</td>
<td>201</td>
<td>267</td>
<td>282</td>
<td>282</td>
</tr>
<tr>
<td>Africa/Mideast</td>
<td>41</td>
<td>41</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Asia/Pacific:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>282</td>
<td>282</td>
<td>282</td>
<td>282</td>
<td>282</td>
</tr>
<tr>
<td>Taiwan</td>
<td>116</td>
<td>116</td>
<td>116</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>Other Asia/Pacific</td>
<td>538</td>
<td>689</td>
<td>701</td>
<td>816</td>
<td>995</td>
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</tbody>
</table>

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The Supply and Demand Sections analyze demand trends and consider the threats and opportunities in each country and region.

**EASTERN EUROPE**

**Hungary - Overview**

Hungary features a fairly high degree of industrialization, with primary metals and other heavy industry, transportation equipment, engineered products and nondurable goods all well represented. After a significant contraction in the early 1990s related to the economic turmoil rocking Eastern Europe, the Hungarian economy bottomed out in 1993 and posted only marginal gains through about 1996. In 1997 and continuing into 1999, however, the country’s economy has embarked on a sturdy recovery, with real (inflation-adjusted) GDP rising five percent in both 1997 and 1998. In fact, the country’s performance in this period was one of the strongest in the OECD area. This recovery has been based primarily upon a resurgence in domestic demand for goods and services, with consumers benefiting from good wage growth and relatively low unemployment (about eight percent in 1998). Even more heartening, Hungary’s economy felt only limited fallout from Russia’s dire financial crisis of 1998 and 1999, suggesting that Hungary’s fortunes may finally be linked more closely with the West than with its former “ally.” However, concerns remain, including the fact that wages are rising significantly faster than productivity, suggesting inflation will continue to be an issue. Nonetheless, Hungary’s real (inflation-adjusted) GDP is forecast to expand 4.2 percent per year through 2003.

Demand for textile fibers in Hungary totaled 64,000 metric tons in 1998, after a significant decline in the early years of the decade and then a modest recovery (at least in manufactured fibers) in the mid- to late-1990s. Intensity of fiber utilization — at six kilograms per capita in 1998 — is above the regional average. Hungary maintains moderate-sized textile mill and apparel products industries, which generate most fiber demand in the country. Demand for textile fibers in Hungary is forecast to increase 6.1 percent per year to 86,000 metric tons in 2003, with manufactured fibers continuing to dominate the market.

**Mexico - Manufactured Fiber Capacity by Type, Year-End 1998**

(Thousand metric tons per year)

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Actual Production in 1998</th>
<th>% of Total</th>
<th>Capacity</th>
<th>Capacity Utilization Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Manufactured Fibers</td>
<td>1759</td>
<td>100.0</td>
<td>1524</td>
<td>1124</td>
</tr>
<tr>
<td>Synthetic Fibers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyester</td>
<td>1124</td>
<td>74.4</td>
<td>836</td>
<td>622</td>
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<tr>
<td>Nylon &amp; Aramid</td>
<td>216</td>
<td>14.0</td>
<td>148</td>
<td>106</td>
</tr>
<tr>
<td>Olefins</td>
<td>88</td>
<td>5.6</td>
<td>67</td>
<td>49</td>
</tr>
<tr>
<td>Acrylic &amp; Modacrylic</td>
<td>182</td>
<td>12.0</td>
<td>134</td>
<td>90</td>
</tr>
<tr>
<td>Other Synthetics</td>
<td>3</td>
<td>0.2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Cellulosic Fibers</td>
<td>148</td>
<td>8.5</td>
<td>116</td>
<td>85</td>
</tr>
<tr>
<td>net exports &amp; stock piles</td>
<td>235</td>
<td>13.6</td>
<td>166</td>
<td>120</td>
</tr>
</tbody>
</table>

**Taiwan - Supply of Manufactured Fibers**

(Thousand metric tons)

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Manufactured Fiber Demand</td>
<td>1524</td>
<td>1578</td>
<td>1795</td>
<td>2020</td>
<td>2285</td>
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<tr>
<td>Synthetic Fiber</td>
<td>1408</td>
<td>1480</td>
<td>1680</td>
<td>1900</td>
<td>2150</td>
</tr>
<tr>
<td>Cellulosic Fiber</td>
<td>116</td>
<td>98</td>
<td>115</td>
<td>120</td>
<td>135</td>
</tr>
<tr>
<td>net exports &amp; stock piles</td>
<td>235</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufactured Fiber Production</td>
<td>1759</td>
<td>2460</td>
<td>2836</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>Synthetic Fiber:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyester</td>
<td>1611</td>
<td>2275</td>
<td>2836</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>Nylon &amp; Aramid</td>
<td>216</td>
<td>242</td>
<td>304</td>
<td>370</td>
<td>460</td>
</tr>
<tr>
<td>Olefins</td>
<td>88</td>
<td>151</td>
<td>132</td>
<td>160</td>
<td>190</td>
</tr>
<tr>
<td>Acrylic &amp; Modacrylic</td>
<td>182</td>
<td>131</td>
<td>119</td>
<td>130</td>
<td>141</td>
</tr>
<tr>
<td>Other Synthetics</td>
<td>134</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cellulosic Fiber</td>
<td>148</td>
<td>131</td>
<td>153</td>
<td>175</td>
<td>190</td>
</tr>
</tbody>
</table>

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Industry Structure

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

- industry composition & market share
- product development & manufacturing
- mergers and acquisitions
- marketing and distribution

INDUSTRY STRUCTURE

Product Development & Manufacturing

Although manufactured fibers are not considered a high technology-type industry, product development and innovation are key competitive variables, and constitute significant barriers to entry. Although generic manmade fiber designs (polyester, nylon, rayon, etc.) and production processes are well established and well understood, achieving competitive advantage in the business requires continually seeking ways to improve upon existing methods or designs. This can take the form of modifications to product design to improve performance and/or aesthetics, new production methods for improving the efficiency of manufacturing, or innovations along other parameters. Most developed world-based manmade fiber producers spend over three percent of annual sales on research and product development, which compares favorably with most manufacturing industries.

Manufacturing requirements comprise another barrier to entry into the manmade fiber business. Although, as indicated, production processes tend to be well known, economies of scale are significant, and replacement and expansion costs substantial. For example, a state-of-the-art manufactured fiber plant built from the ground up requires a capital investment of $100 million or more for the process plant and related storage and other facilities.

In addition, raw materials costs (e.g., for acrylonitrile, glycols, caprolactam, dimethyl terephthalate, terephthalic acid, dyestuffs, wood pulp, plastic resins, fuels and the like) typically account for between 50 and 60 percent of the value of industry output. Equally important, materials costs tend to be highly volatile in this business. To hedge against rising costs and to assure feedstock and supply sources, many large firms are vertically integrated backwards into chemical intermediates, although it might be more accurate to say that they are forwardly integrated from

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The profiles section analyzes 37 companies active in the world textile fibers industry. 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

Toyobo Company Limited
2-8, Dojima Hama 2-chome
Kita-ku, Osaka 530
Japan
816-6348-3137

Toyobo America Incorporated
40 East 52nd Street, 20th Floor
New York, NY 10022
212-317-9245

Toyobo is a manufacturer of fibers, textiles and technologically advanced goods for apparel and industrial uses. For financial purposes, the Company has three business segments: Fibers and Textiles, Plastics and Other. Toyobo operates through four divisions: Chemical Fibers, Natural Fibers, Films, and Functional and Biomedical. In the US, the Company operates through Toyobo America and had FY 1999 sales of $3.5 billion. Toyobo employs 5,500.

Toyobo has fiber and textile operations in Japan, Indonesia, Malaysia, Thailand, China, Hong Kong, Australia, the US, Brazil and Costa Rica. The segment operates through two divisions: Chemicals Fibers and Natural Fibers.

Through the segment’s Chemical Fibers division, Toyobo produces polyester, nylon, acrylic, spandex, protein-grafted, polynosic and specialty fibers. The Company’s polyester fiber is marketed under the TOYOBO POLYESTER brand name. The TOYOBO POLYESTER line includes staple fibers, spun yarns, and filament yarns and fabrics for apparel and industrial end uses. Toyobo manufac-
Companies Profiled

Acordis AG
Kuagtexil GmbH
Novaceta
Alfa SA de CV
Alpek SA de CV
Fibras Quimicas SA (Fiqusa)
Nylon de Mexico
Polycron
Tereftalatos Mexicanos SA
Univex SA
Asahi Chemical Industry Company Limited
Hangzhou Asahikasei Textiles
Ningbo Asahikasei Textiles
PT Indonesia Asahi Chemical Industry
BASF AG
Bayer AG
BP Amoco plc
Tereftalatos Mexicanos SA
Bridgestone Corporation
Firestone Fibers and Textiles
China Petrochemical Corporation
Jinyong Acrylic Fiber
Shanghai Petrochemical
Cookson Group plc
Daicel Chemical Industries Limited
DuPont (E.I.) de Nemours
Nylon de Mexico
Polycron
Univex SA
Eastman Chemical Company
Formosa Plastics Group
Nan Ya Plastics Corporation
Globe M Manufacturing Company
Grupo Cydsa SA de CV
Crysel
Guilford Mills Incorporated
Hercules Incorporated
FiberVisions LLC
FiberVisions (Suzhou) Nonwovens Products
Honeywell International Incorporated
AlliedSignal Incorporated
AlliedSignal-SYSKO
Evergreen Nylon Recycling
Inti Indorayon Utama PT
Kaneka Corporation

KoSa
Kuraray Company Limited
Lenzing Group
Martin Color-Fi Incorporated
Mitsubishi Rayon Company Limited
Nitto Chemical Industry
PT Vonex Indonesia
Qingdao Lingtong Textile
Rhodia SA
Filtec Industrial Yarns
Novamyl NV
Sanlong Nylon Company Limited
Saehan Industries Incorporated
SK Corporation
AlliedSignal-SYSKO
Snia SpA
Novaceta
Novamyl NV
Solutia Incorporated
Sterling Chemicals Holdings Incorporated
Teijin Limited
Fibras Quimicas SA (Fiqusa)
Toray Industries Incorporated
PT Easterntex
Toyobo Company Limited
Trevira GmbH & Company
Unitika Limited
Wellman Incorporated

World Textile Fibers: Synthetic & Cellulosic #1243

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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 1,500 titles covering areas such as plastics, chemicals, coatings and adhesives, building materials, industrial components and equipment, health care, packaging, household goods, security, and many other industries.

Freedonia has produced a wide variety of titles, including:

- World Dyes & Organic Pigments
- Coated Fabrics
- Textile Processing & Finishing Chemicals
- Floor Coverings - Private Companies Report

Because Freedonia is a reliable information source, our forecasts are cited in numerous publications such as The Wall Street Journal, The Financial Times and USA Today.

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 (fixed investment trends, gross domestic product, world population, 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 Our Customers

Freedonia's clients include major U.S. 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 textile fibers industry include: BASF AG, DuPont, Solutia Incorporated and Rhodia SA.
World Textile Fibers: Synthetic & Cellulosic #1243

Dyes & Organic Pigments - Private Companies Report
Seven private firms have global dye and pigment sales of at least $50 million, two of which have titanium dioxide sales of over $850 million. Private firms are also leaders in individual segments (e.g., zinc oxides, carbon black). This report profiles over 150 US privately-held firms including Aveca, CDR Pigments & Dispersions, Horsehead Industries, Huntsman, Kronos, Rite Industries, Shepherd Color. The report also forecasts industry demand, reviews acquisitions and lists firms by product and location.
#1222 . . . . . . . . 1/00 . . . . . . . . . . $3,000

Coated Fabrics - Private Companies Report
Private firms account for five of the top ten spots in this $2.5 billion US industry. In addition, over 20 private producers have total sales of at least $50 million, including products other than coated fabrics. This report profiles over 100 private firms (e.g., Avondale, Bradford Industries, Canadian General-Tower, Hartz, Highland Industries, Industrial Coatings Group). It also evaluates market share, forecasts industry demand, examines acquisition trends, and lists companies by product, market and location.
#1203 . . . . . . . . 12/99 . . . . . . . . . $3,000

Dyes & Organic Pigments
The US market for dyes and organic pigments will approach $3 billion in 2003, driven by the use of more expensive, higher performance pigments and the displacement of heavy metal-based inorganic colorants. Demand for dyes will be hindered by sluggish growth in the large textile market, global overcapacity and import competition. This study analyzes the $2.5 billion US dye and organic pigment industry to 2003 and 2008 by type and market. It also presents market share data and profiles key firms.
#1162 . . . . . . . . 10/99 . . . . . . . . . $3,500

Coated Fabrics
Demand for coated fabrics in the US will reach 635 million square yards in 2003. Advances will be driven by continued strong demand in motor vehicle air bags and upholstery, protective clothing, and awnings and canopies. Polyester will remain the dominant substrate, but nylon will grow faster. This study analyzes the $2.4 billion US coated fabrics industry to 2003 and 2008 by type, substrate and market. It also evaluates market share and profiles key firms.
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Textile Processing & Finishing Chemicals
Demand for textile chemicals in the US will reach $3.5 billion in 2002. Gains will be driven by the increased use of high-value formulations that help US textile producers compete internationally, by consumer demands for better clothing and natural fibers, and by regulations favoring expensive eco-friendly formulations. This study analyzes the US textile processing and finishing chemicals industry to 2002 and 2007 by type, function and end use. The study also presents market share and profiles key companies.
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Glass Fibers
Textile glass fibers will grow faster than glass wool (fiberglass) insulation as a result of opportunities in reinforced plastics used in construction and motor vehicles. Fiberglass insulation will be stimulated by rising energy standards and residential aftermarket activity, yet be constrained by declining housing starts and competition from foamed plastics. This study analyzes the 5.8 billion pound US glass fiber industry to 2003 and 2008 by product and market. It also evaluates market share and profiles key firms.
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