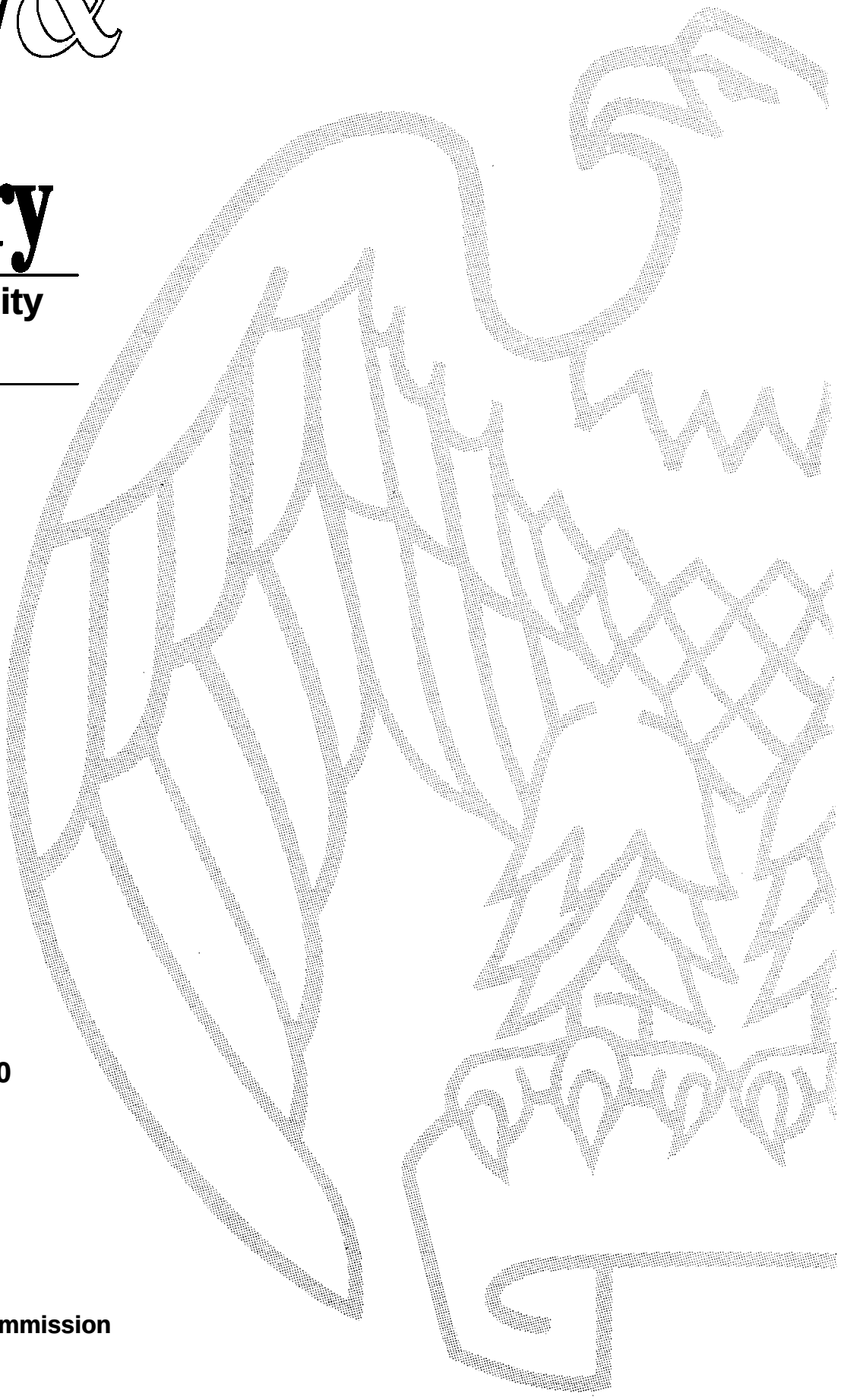
Industry & Trade Summary

Organic Commodity Chemicals



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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.[1] This report on organic commodity chemicals covers the period 1997-2001.

[1] The information and analysis provided in this report are for the purposes of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

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ABSTRACT

This report addresses trade and industry conditions for the organic commodity chemicals, also known as petrochemicals, a category of chemicals derived from crude petroleum. These chemicals are used primarily as intermediates in the production of a wide variety of downstream goods, including plastics and apparel. The period of study is from 1997 through 2001.

- The U.S. organic commodity chemicals industry produced an average $18.9 billion of these goods each year during 1997-2001. The average annual trade surplus during this period was $600 million.

- The largest U.S. export markets of these products were Mexico and Canada, which accounted for approximately 41 percent of all exports by value (or $3.17 billion) in 2001. Major U.S. import sources included Canada, Venezuela, and Nigeria, which together accounted for approximately 53 percent of these imports by value (or $2.49 billion) in 2001.

- Consumers of these chemicals typically use them as intermediates in numerous products, including plastics, adhesives, and nylon fibers. There is little or no quality differentiation between domestically-produced commodity chemicals and U.S. imports. The global market is highly competitive and large fluctuations in domestic production, imports, and exports regularly occur**.** These fluctuations are caused by a variety of factors that include demand for downstream goods**,** cost of feedstocks, transportation costs, and producer efficiency. In particular, the general economic decline in 2001 contributed to the decline in U.S. production levels for that year.

INTRODUCTION

The organic commodity chemicals are a group of petroleum-derivative chemicals (also known as petrochemicals) used as intermediates to produce other chemicals, which, in turn, are used to manufacture a wide variety of end-use products, including construction materials, apparel, adhesives, plastics, and tires (figures 1 and 2). The majority of the organic commodity chemicals are derived from benzene, a petroleum derivative itself, which has an unsaturated ring of six carbon atoms (also known as an aromatic ring).[1] Examples of specific compounds in this group include ethylbenzene, styrene, cumene, phenol, cyclohexane, aniline, *ortho*-xylene, *meta*-xylene, *para*-xylene, and terephthalic acid.

As commodities, the chemicals produced by one manufacturer are virtually indistinguishable from those of another manufacturer, given the same levels of purity. This fungibility of goods allows consumers to purchase similar product from a wide variety of suppliers, making price the dominant economic factor in purchasing decisions. Total domestic production of the organic commodity chemicals in 2001 approached $18.2 billion. A brief summary of the six largest organic commodity chemicals, ranked by domestic production value in 2001, follows (for more information on production levels, see the section later in this report entitled "U.S. Market").

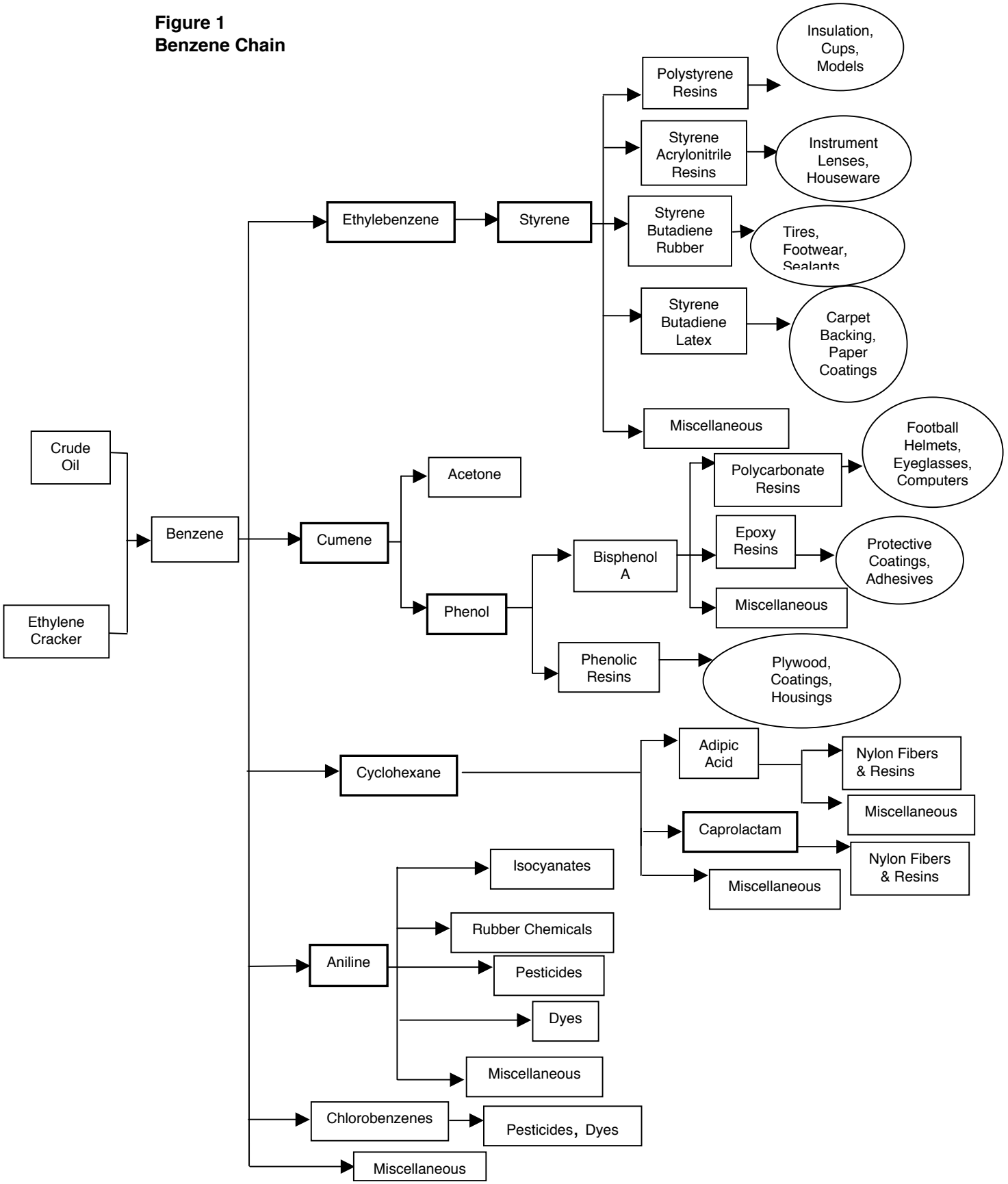
Ethylbenzene is an intermediary chemical, 99 percent of which is used in the production of styrene monomer,[2] which is itself a precursor of polystyrene and other materials. Ethylbenzene is commonly produced by the alkylation of benzene with ethylene in the presence of aluminum chloride catalyst. Recently, several manufacturers have begun using zeolite catalysts in place of aluminum chloride to improve yields and purity levels. In addition to the various manufacturing processes, it can also be separated directly from crude petroleum, although industry sources state that this method of production is seldom used because of typically higher production costs.[3] Ethylbenzene is primarily used captively, with little reaching the merchant market. As a result, U.S. price data are not readily available, although some plants use an internal charge to allocate costs. Domestic production in 2001 was valued at $2.5 billion.

[1] Although the xylenes are usually produced directly from crude petroleum or toluene rather than from benzene, they share the aromatic ring structure of the other benzene derivatives and are sold in a similar fashion, and are thus included in the scope of this report. Highly specialized benzene derivatives, usually produced in smaller quantities, are not included in the organic commodity chemicals classification and are not considered in this report.

[2] "Ethylbenzene," Apr. 30, 2001, found at *http://www.chemexpo.com/news/ profile010430.cfm*, retrieved Jan. 7, 2002.

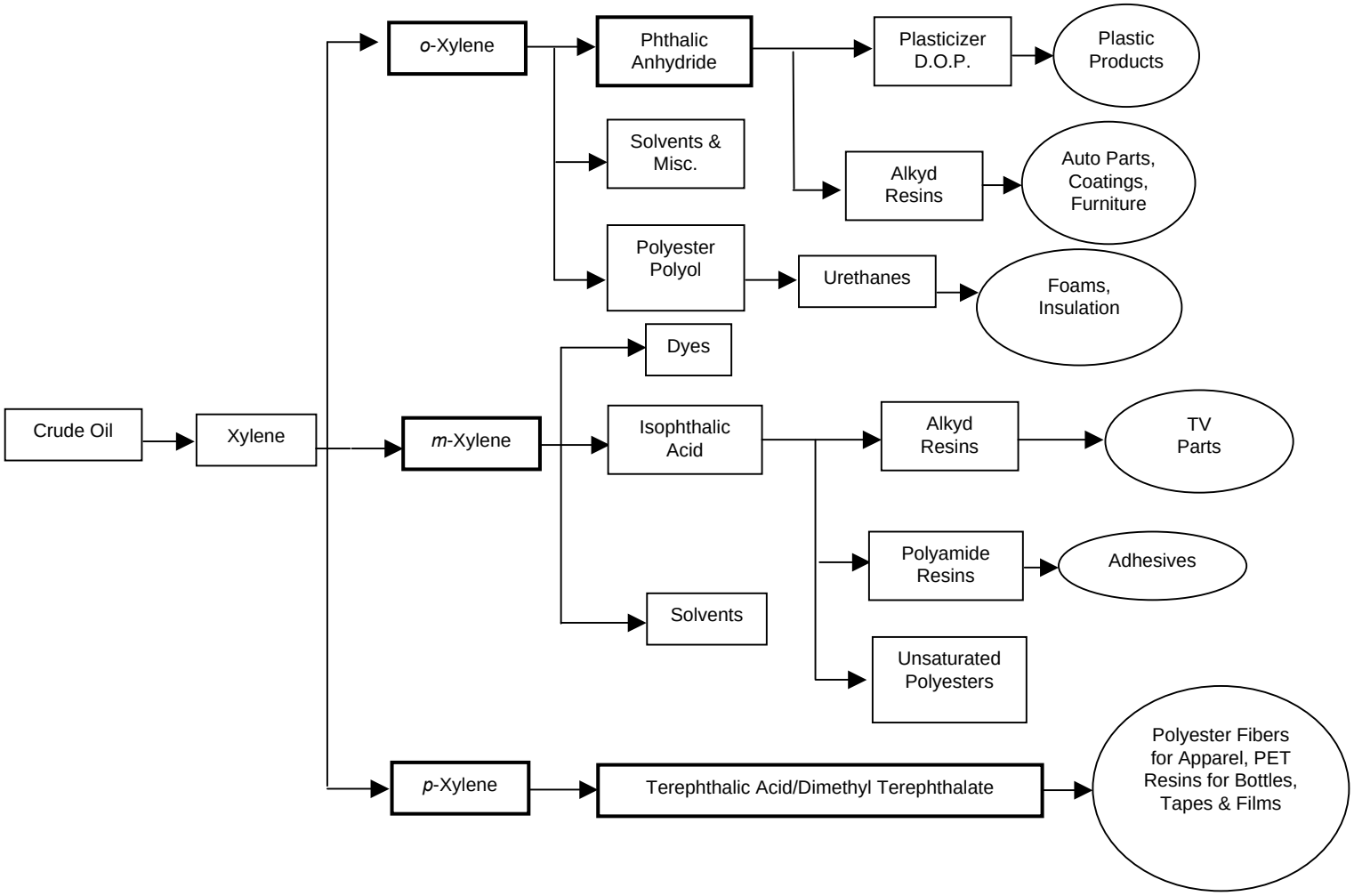
[3] Commission telephone conversations with industry sources.

Figure 1
Benzene Chain



Source: American Chemistry Council (ACC). Modified by staff of the U.S. International Trade Commission. Reprinted with permission of the ACC.

Figure 2
Xylene Chain



Source: American Chemistry Council (ACC). Modified by staff of the U.S. International Trade Commission. Reprinted with permission of the ACC.

Styrene monomer (or simply "styrene") is made predominantly through dehydrogenation of ethylbenzene, although a major producer uses an alternative method of oxidation of ethylbenzene, which produces co-products propylene oxide and styrene. Uses for styrene are varied, including the production of polystyrene (accounting for 66 percent of styrene consumption), plastics, rubber, and resins.[4] These secondary products are then used in the manufacture of automotive interiors, boat hulls, paper coatings, pipes, and CD cases. Domestic styrene production in 2001 was valued at $1.9 billion.

Terephthalic acid is produced primarily from *para*-xylene feedstocks. As an intermediate chemical, it is further processed into purified terephthalic acid (PTA). Approximately 50 percent of PTA is used for the production of polyethylene terephthalate (PET) resins and 43 percent is used for the production of polyester fibers.[5] Domestic production in 2001 was valued at $2.1 billion.

Para-xylene (*p*-xylene) is one of three distinct isomers[6] of the xylene molecule, the other two being *ortho*-xylene (*o*-xylene) and *meta*-xylene (*m*-xylene). *p*-Xylene is used almost exclusively for production of purified terephthalic acid and dimethyl terephthalate, which, in turn, are used in polyester fiber for textiles, PET resins for beverage containers, and a variety of films and other resins.[7] Domestic production in 2001 was valued at $1.8 billion.

Virtually all domestic cumene production is oxidized to cumene hydroperoxide, which is then cleaved catalytically to produce phenol and acetone.[8] This method results in approximately 0.62 pounds of acetone per pound of phenol produced. Domestic cumene production in 2001 was valued at $1.5 billion. End-uses for phenol include bisphenol-A (primarily used in the manufacture of epoxy resins and polycarbonates), phenolic resins, and caprolactam. Domestic phenol production in 2001 was valued at $1.4 billion.

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[4] "Styrene," May 14, 2001, found at *http://www.chemexpo.com/news/profile010430.cfm*, retrieved Jan. 7, 2002.

[5] "PTA/DMT," *Chemical Market Reporter*, Oct. 22, 2001.

[6] Isomers are compounds that have the same molecular formula but different structural formulas.

[7] "Paraxylene," May 11, 1998, found at *http://www.chemexpo.com/news/ profile980515.cfm*, retrieved Jan. 7, 2002.

[8] "Cumene," Mar. 22, 1999, found at *http://www.chemexpo.com/news/profile990322.cfm*, retrieved Jan.7, 2002.

U.S. INDUSTRY PROFILE

Organic commodity chemicals, as defined in this report, are classified in chapter 29 of the Harmonized Tariff Schedule (HTS) of the United States. A complete listing can be found in table 1. Applicable North American Industry Classification System (NAICS) U.S. National Industry codes include 325110, Petrochemical Manufacturing, and 325199, All Other Basic Organic Chemical Manufacturing.

Table 1
Organic commodity chemicals: Harmonized Tariff Schedule classification, 2001

HTS subheading	Chemical name
2902.11.00	Cyclohexane
2902.19.00	Dicyclopentadiene and other cyclanes, cyclenes, and cycloterpenes
2902.41.00	*ortho*-Xylene
2902.42.00	*meta*-Xylene
2902.43.00	*para*-Xylene
2902.50.00	Styrene
2902.60.00	Ethylbenzene
2902.70.00	Cumene
2902.90.10	Pseudocumene
2902.90.20	Acenaphthene, chrysene, cymene, dimethylnapthalenes, fluoranthene, fluorene, indene, mesitylene, methylanthracene, methylnaphthalene, phenanthrene and pyrene
2902.90.30	Alkylbenzenes (including dodecylbenzene) and polyalkylbenzenes
2902.90.40	Anthracene; and 1,4-di-(2- methylstyryl)benzene
2902.90.60	Biphenyl (diphenyl), in flakes
2902.90.90	Other cyclic hydrocarbons
2906.12.00	Cyclohexanol, methylcyclohexanols and dimethylcyclohexanols
2907.11.00	Phenol (hydroxybenzene) and its salts
2917.35.00	Phthalic anhydride
2917.36.00	Terephthalic acid and its salts
2917.37.00	Dimethyl terephthalate
2921.41.10	Aniline
2921.41.20	Aniline salts
2933.71.00	6-Hexanelactam (epsilon-caprolactam)

Source: USITC, Harmonized Tariff Schedule of the United States, 2002.

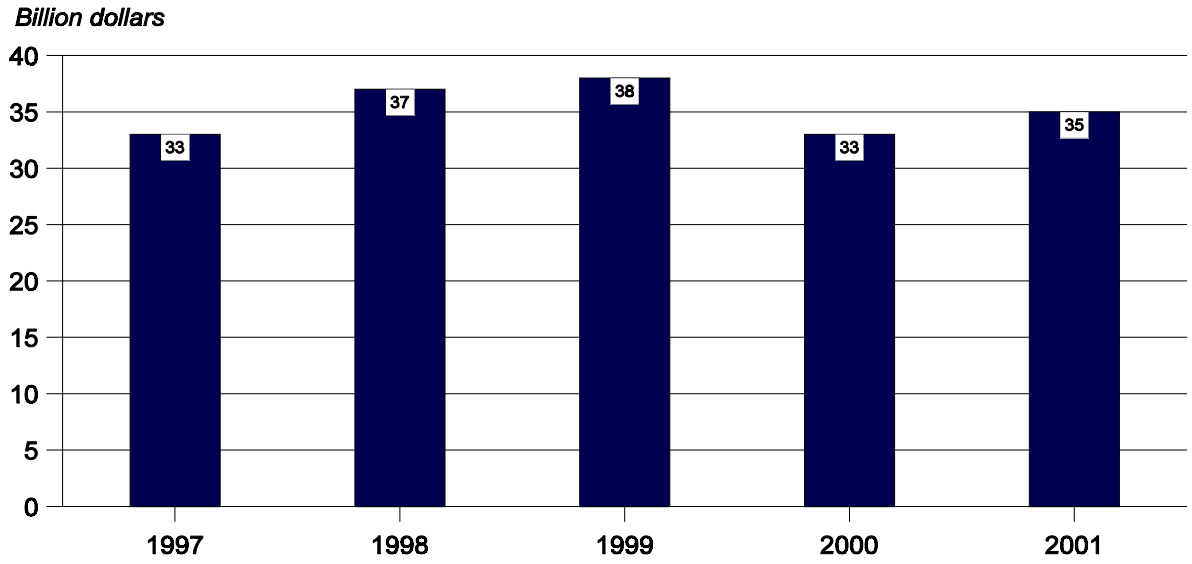
Producers of these chemicals include a combination of petroleum refineries and traditional chemical manufacturers. For example, refineries are the major producers of the xylene isomers, which are direct derivatives of crude petroleum, and of the immediate downstream products of crude petroleum. Chemical manufacturers are the major producers of styrene, caprolactam, and aniline. However, both types of firms do produce both groups of products.

The domestic chemical industry has undergone significant consolidation via mergers and acquisitions during 1997-2001. In this period, *Chemical and Engineering News* changed its annual overview of domestic chemicals producers from the top 100 producers to the top 75.[9] This change was a result of the extensive consolidation in the chemicals industry of companies of all sizes. The annual value of mergers and acquisitions among chemical producers worldwide ranged from $33 billion in 1997 and 2000 to $38 billion in 1999 (see

[9] William J. Storck, "Top 100 Shrinks to 75," *Chemical & Engineering News*, May 3, 1999, p. 19.

figure 3). The largest acquisition in the United States during this period was Dow's $9 billion purchase of Union Carbide, which was announced in 1999 but did not close until 2001. Other notable consolidations among the petrochemical producers included the creation of ExxonMobil Chemical (1999), Lyondell Chemical's acquisition of Arco Chemical (1998), and the creation of two joint ventures (Chevron Phillips Chemical LP (2000) and Equistar Chemicals LP (1997)).[10] Because of economies of scale and the highly competitive marketplace, midlevel companies are often unable to compete effectively in the petrochemicals markets.[11] Small companies (corporations with sales under $200 million) often do not produce organic commodity chemicals but instead produce specialty chemicals. These specialty chemicals are marketed on factors other than price. Specialty chemicals are not included in the scope of this summary.

Figure 3
Chemical mergers and acquisitions worldwide, 1997-2001



Source: Compiled from data provided by Young and Partners, LLC. Reprinted with permission of Young and Partners, LLC.

[10] Joseph Chang, "The Forecast for Petchems," *Chemical Market Reporter,* Oct. 15, 2001, p. e32.

[11] Sean Milmo, "Taking on the Petchems Challenge," *Chemical Market Reporter,* Oct. 15, 2001, p. e22.

In addition to consolidation within the domestic industry during 1997-2001, there was also an increase in joint ventures in foreign production facilities, particularly in the Middle East, given the large indigenous supplies of crude petroleum. Two examples of such investment include the startup in 2000 of Saudi Chevron's cyclohexane facility in Al Jubail, Saudi Arabia,[12] and the prospective startup in 2004 of an aniline production facility in Shanghai, China.[13] Globalization is likely to continue because of economies of scale and to ensure reliable access to crude petroleum.[14]

Most of the organic commodity chemicals have more than 10 domestic producers, even after the recent increase in mergers. No single company is a major producer of all of the organic commodity chemicals. Instead, firms tend to focus on a few of the related products. For example, the largest producers of styrene are also the largest producers of ethylbenzene, a precursor of styrene. The petroleum refineries, such as BP, ExxonMobil, Shell, and Sunoco, tend to be the major producers of the xylene isomers, since these products are usually produced directly from crude petroleum.

Domestic manufacturing of organic commodity chemicals is centered in the Louisiana/Texas area. Close proximity to a deep water port, natural stores of crude petroleum, and refining facilities all serve to minimize transportation costs and allow for multiple processing steps to take place in a single location. A large majority of the major domestic producers have production facilities in this area.

Overall, the domestic chemical manufacturing industry produced $420 billion in industry shipments in 1997.[15] Chemicals and allied products ranged from 1.9 percent to 2.0 percent of gross domestic product (GDP) between 1997 and 2000.[16] The domestic petrochemical manufacturing sector produced $20.5 billion in industry shipments in 1997, with 54 establishments within the United States.[17] The U.S. petrochemical manufacturing industry had 10,943 paid employees and an average payroll of $60,611 per employee.[18]

Many of the commodity chemicals are available for purchase at specific purity levels, which minimizes the difficulty of switching supply sources. As a result, pricing and currency fluctuations are major determinants in choosing suppliers.[19] Because most product is sold free on board, freight costs and, by extension, distance between buyer and seller, are also

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[12] "Healthy Demand Is Boosting Fibres on the Mend," *Chemical Market Reporter*, Oct. 2, 2000, pp. 62-63. The facility is a joint venture between Chevron Phillips Chemical Company LLC (CPChem) and Saudi Industrial Investment Group. CPChem, in turn, is a joint venture of ChevronTexaco Corp. and Phillips Petroleum Co. "Saudi Chevron Phillips Company Expands Cyclohexane Capacity," Chevron Phillips Chemical Company LLC, press release, Mar. 7, 2002.

[13] "Aniline," *Chemical Week*, Dec. 12, 2001, p. 31. The planned project would be a joint venture between BASF, Huntsman, Shanghai Chlor-Alkali Chemical, Shanghai Hua Yi, Sinopec, and Sinopec Shanghai Gao Quiao.

[14] Sean Milmo, "Taking on the Petchems Challenge," p. e22.

[15] U.S. Census Bureau, *1997 Economic Census*, NAICS subsector code 325 -- Chemical Manufacturing.

[16] U.S. Department of Commerce, Bureau of Economic Analysis, *Gross Domestic Product by Industry in Current Dollars As a Percentage of Gross Domestic Product, 1994-2000,* Nov. 2, 2001, p. 4.

[17] U.S. Census Bureau, *1997 Economic Census*, NAICS U.S. National Industry code 325110 -- Petrochemical Manufacturing.

[18] Ibid.

[19] McGraw Hill Companies and U.S. Department of Commerce, International Trade Administration, *U.S. Industry & Trade Outlook 2000*, p. 11-6.

relevant. Pricing of the organic commodity chemicals products is often closely tied to benzene prices, which are similarly tied to crude petroleum feedstock prices. The industry uses a combination of long-term pricing contracts and a spot market to conduct sales. Several periodicals regularly publish trade list prices for a variety of these chemicals; however, these prices do not always accurately reflect true contract prices, as many companies consider purchasing terms to be confidential information.

Research and development (R&D) spending in the basic industrial chemicals industry, which includes both organic and inorganic chemicals, increased from $3.95 billion in 1994 to $5.69 billion in 2000.[20] However, R&D spending in 2001 decreased by 7 percent to $5.3 billion, primarily as a result of the poor market conditions in that year.[21] Typically, R&D spending is approximately 5 percent of annual sales and is divided into three different categories: basic research aimed at discovering new scientific facts in the general realm; applied research performed with the intent of using known compounds to achieve a specific goal or result; and developmental research converting scientific knowledge into a form usable by consumers.[22] From 1991 to 2000, total research expenditures in the chemical industry have been divided as follows on average: 11 percent toward basic research, 33 percent toward applied research, and 56 percent toward developmental research.[23]

Feedstock costs are the highest variable cost in production of the organic commodity chemicals.[24] The larger producers integrate feedstocks and derivatives production in order to minimize production costs and price fluctuations. Smaller firms do not possess this integration flexibility, making them more susceptible to variations in feedstock price swings. When feedstock prices rise, manufacturers often lower operating rates or suspend production if price increases are not possible.[25] Some producers have the ability to switch feedstocks in order to obtain better market prices.

The industry has faced numerous challenges during the past few years, many of which continue today, including issues related to the environment, fluctuations in energy prices, varying global demand levels, and changes in the strength of the U.S. dollar.[26] One ongoing environmental challenge that could affect domestic producers' competitiveness in world markets is the required reduction of nitrogen oxides (NO_x) emissions in Texas.[27] In 2000, the U.S. Environmental Protection Agency asked the Texas Natural Resources Conservation Commission (TNRCC) to develop a state implementation plan for the Houston, Dallas-Fort

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[20] T. Kevin Swift et al, *Guide to the Business of Chemistry*, American Chemistry Council (ACC), 2001, p. 85.

[21] Neil Franz, "Economic Woes Hurt Investment in R&D," *Chemical Week*, Dec. 5, 2001, p. 57; also based on conversations with industry sources.

[22] *Guide to the Business of Chemistry*, ACC, 2001, p. 84.

[23] Ibid.

[24] Based on Commission telephone conversations with industry sources.

[25] Malini Hariharan, "Demand Rises as Economies Recover," *Chemical Market Reporter,* May 22, 2000, p. S52.

[26] T. Kevin Swift and Martha Moore, "US Chemical Industry Outlook: Trade and Domestic Demand," *Chemical Market Reporter,* June 18, 2001, p. 33.

[27] "Nitrogen oxides, or NO_x, is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. However, one common pollutant, nitrogen dioxide (NO_2) along with particles in the air can often be seen as a reddish-brown layer over many urban areas. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels." U.S. Environmental Protection Agency, "NO_x: What Is It? Where Does It Come From?", Mar. 22, 2002, found at Internet address *http://www.epa.gov/air/urbanair/nox/what.html,* retrieved Mar. 14, 2003.

Worth, Beaumont, and San Antonio areas to improve air quality.[28] The initial TNRCC proposal to cut NO_x emissions by 90 percent by 2007 would, according to some sources, require significant expense for chemical producers with no corresponding return on investment.[29] In December 2002, however, the Texas Commission on Environmental Quality passed new regulations calling for an 80 percent reduction in NO_X emissions.[30]

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

Consumers of the organic commodity chemicals are producers of downstream chemical derivatives. Most of the commodity chemicals are available on the merchant market, although some of the these chemicals, such as ethylbenzene, are consumed almost entirely on a captive basis. The markets utilize a combination of long-term contracts and a spot market. In times of excess supply, consumers will utilize the lower-priced spot market to build up inventory levels.

Demand for organic commodity chemicals is closely tied to demand for derivative products, including end products such as nylon, coatings, rubber and plastics. The demand for these, in turn, is linked to established business sectors, such as automobiles and tires, whose economic viability is linked to gross domestic product (GDP) and the state of the world economy. Therefore, the GDP in any year can result in substantial changes in demand for the chemicals covered in this report.

Consumption

Because of the globalization of the markets for organic commodity chemicals, buyers are able to purchase virtually identical product from many different producers, domestic or foreign. As shown in table 2, the import-to-consumption ratio increased from 4.9 percent in 1997 to 5.9 percent in 2000, before declining to 5.8 percent in 2001. According to one industry source, much of the increase from 1997 to 2000 was due to increased imports of styrene. These imports, primarily from Canada, were the result of increased investment in petrochemical manufacturing in Canada in the mid-1990s because of newly discovered stores of natural gas.[31] Ethylbenzene and terephthalic acid have import-to-consumption ratios of 1.2 percent or less because consumers are more likely to import the precursor chemicals (benzene and *para*-xylene, respectively) and then produce the two products onsite.

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[28] Carol Cole, "Lawmakers Propose Tax Break for NO_x Reduction Effort," *Octane Week*, Apr. 23, 2001, p. 1.

[29] Suzanne McElligott, "TNRCC to Decide NO_x Emission Cuts Soon," *Chemical Week*, May 15, 2002, p. 21; and Peck Hwee Sim, " "Gulf Coast: Will Environmental Costs Crimp Growth?", *Chemical Week*, May 15, 2002, p. 19.

[30] "Texas Expects Swift EPA Approval of New Clean Air Rules," *Platt's Oilgram News*, Dec. 18, 2002, p. 6; and "New Ozone Findings Drive Strong Pollution Reduction Plan," Texas Commission on Environmental Quality, Press Release, Dec. 13, 2002. The revised plan, which was expected to be approved by the U.S. Environmental Protection Agency, would also call for a reduction of 64 percent in emissions of certain highly reactive volatile organic compounds.

[31] Peter Fairley, "Canadian Chemicals: Running on Empty," *Chemical Week,* July 19, 2000.

Table 2
Organic commodity chemicals: import-to-consumption ratio, 1997-2001
(Percent, based on dollar values)

Item	1997	1998	1999	2000	2001
Styrene	5.8	5.1	8.9	15.9	24.7
Cumene	13.3	9.6	11.7	14.0	12.4
para-Xylene	13.2	14.2	10.0	12.7	9.4
Cyclohexane	5.7	1.5	1.4	0.1	4.1
Ethylbenzene	([1])	([1])	([1])	([1])	0.8
Phenol (hydroxybenzene)	4.8	5.4	6.0	1.8	0.6
6-Hexanelactam (epsilon-caprolactam)	5.0	4.3	1.6	1.0	0.5
Terephthalic acid and its salts	0.4	0.3	0.7	1.0	1.2
All others	3.7	3.4	3.2	3.0	2.5
Total	4.9	4.3	4.5	5.9	5.8

[1] Less than 0.05 percent.
Source: Based on official statistics from the U.S. Department of Commerce, American Chemistry Council, National Petrochemical & Refiners Association, and U.S. International Trade Commission staff estimates.

Future demand for the organic commodity chemicals depends on the conditions of the world economy. As an example, in September 2000, industry analysts predicted a styrene growth rate of 4.6 percent for the next 5 years, with operating rates as high as 99 percent of capacity.[32] However, the international economic downturn in 2001 resulted in an unforseen decline in demand of 2.6 percent, the first decline in demand in almost 20 years.[33] Operating rates for styrene production declined from 92 percent to 86 percent. Demand decreased to such an extent that industry sources estimate that operating rates and consumption volume in this market will not recover until at least 2006.[34]

Production

Production levels vary in relation to changes in supply and demand. Production levels increased irregularly during 1997-2000, from $19.0 billion to $21.3 billion, before decreasing to $18.2 billion in 2001. Most of the chemicals followed this trend (see table 3), with the exceptions of terephthalic acid, phenol, and cyclohexane.

As noted previously, half of the domestic terephthalic acid output is used in the production of PET resins, and these resins continued to maintain their historical annual growth rate of 15 percent in 2000.[35] As a result, purified terephthalic acid maintained an annual growth rate of 7.4 percent from 1997 through 2000, with a projected rate of 6 percent annually through 2004.[36] Phenol production reached $1.7 billion in 1997, but ranged between $1.2 and $1.6 billion for the period 1998 through 2001.[37] Industry sources state that producers are trying to keep production levels as low as possible because of high feedstock costs in

[32] Peck Hwee Sim, "Warning: Styrene Capacity Shortage Ahead," *Chemical Week*, Sept. 13, 2000, p. 68.
[33] "Styrene Industry to Recover after Dismal 2001," *Oil & Gas Journal*, Feb. 4, 2002, p. 52.
[34] Ibid.
[35] Robert Brown, "PET Market is Resilient Despite U.S. Economic Drop," *Chemical Market Reporter*, July 2, 2001, p. 16.
[36] "PTA/DMT," *Chemical Market Reporter,* Oct. 22, 2001, p. 31.
[37] "Phenol," *Chemweek,* Jan. 9, 2002, p. 31.

Table 3
Organic commodity chemicals: U.S. production, exports of domestic merchandise,[1] imports for consumption,[2] and apparent consumption, 1997-2001

(1,000 dollars)

Item	1997	1998	1999	2000	2001
Ethylbenzene:					
Production	3,200,000	3,192,500	3,291,500	3,302,500	2,505,560
Exports	32,003	19,227	5,561	18,745	3,758
Imports	1,545	269	54	97	19,129
Consumption	3,169,542	3,173,542	3,285,994	3,283,851	2,520,932
Terephthalic acid and its salts:					
Production	1,999,998	1,553,698	1,671,891	2,032,262	2,105,340
Exports	191,064	190,060	144,939	89,492	128,262
Imports	7,613	3,489	10,857	20,481	24,971
Consumption	1,816,546	1,367,127	1,537,809	1,963,251	2,002,048
Styrene:					
Production	3,192,000	2,856,500	2,981,500	3,465,500	1,857,473
Exports	391,039	351,068	627,894	922,257	432,977
Imports	173,427	135,127	231,177	482,223	466,679
Consumption	2,974,388	2,640,560	2,584,784	3,025,466	1,891,175
para-Xylene:					
Production	1,720,400	1,273,800	1,501,100	2,035,500	1,750,000
Exports	234,965	227,558	260,747	440,708	343,664
Imports	226,199	172,838	138,277	232,310	145,758
Consumption	1,711,634	1,219,080	1,378,631	1,827,102	1,552,094
Cumene:					
Production	1,270,500	1,400,700	1,317,840	1,763,000	1,495,887
Exports	44,793	69,482	62,537	123,284	68,371
Imports	188,130	141,985	165,704	265,954	201,185
Consumption	1,413,837	1,473,203	1,421,008	1,905,670	1,628,701
Phenol (hydroxybenzene):					
Production	1,704,010	1,555,840	1,182,500	1,515,000	1,431,000
Exports	96,797	108,867	82,512	157,939	171,069
Imports	81,916	82,689	70,319	25,045	7,793
Consumption	1,689,129	1,529,662	1,170,307	1,382,106	1,267,725
6-Hexanelactam (epsilon-caprolactam):					
Production	1,222,500	1,260,000	1,216,800	1,332,100	1,224,000
Exports	119,004	108,172	86,205	96,867	98,916
Imports	58,362	52,207	18,582	12,282	6,213
Consumption	1,161,858	1,204,035	1,149,177	1,247,515	1,131,297
Cyclohexane:					
Production	487,256	419,566	457,812	516,250	585,000
Exports	58,208	67,304	78,461	137,584	87,343
Imports	25,718	5,452	5,241	526	21,127
Consumption	454,766	357,714	384,592	379,192	518,784
All others:					
Production	4,225,376	4,320,826	4,328,869	5,303,220	5,231,380
Exports	115,524	124,540	124,667	159,389	159,972
Imports	159,857	146,601	137,568	161,754	127,927
Consumption	4,277,097	4,348,801	4,344,296	5,309,152	5,203,098
Total:					
Production	19,022,040	17,833,430	17,949,812	21,265,332	18,185,640
Exports	1,283,396	1,266,276	1,473,522	2,146,265	1,494,331
Imports	922,767	740,657	777,781	1,200,671	1,020,782
Consumption	18,661,411	17,307,811	17,254,071	20,319,738	17,712,091

[1] FAS value.

[2] Customs value.

Source: Based on official statistics from the U.S. Department of Commerce, American Chemistry Council, National Petrochemical & Refiners Association, and U.S. International Trade Commission staff estimates.

upstream cumene, weak demand, and increased global capacity in 1999 and 2000.[38] Although demand for nylon fibers has decreased, demand for nylon resins has increased, creating a balanced market for cyclohexane.[39]

Worker productivity levels for the organic chemicals industry varied over the 5-year period (table 4). Using a base level of 100 in 1992, productivity ranged a low of 104.4 in 1998 to a high of 120.1 in 2000 before declining to 106.4 in 2001. The decrease from 2000 to 2001 resulted primarily from a 14.5-percent decrease in production, despite only a 2.5-percent reduction in production employment levels.[40]

The basic feedstocks and energy source for production of the organic commodity chemicals include naphtha and natural gas. Whereas natural gas historically has been the lower priced feedstock for domestic industries, with supplies readily available, many foreign producers rely on naphtha, or crude petroleum, as a feedstock. For example, 70 percent of domestic ethylene producers have the ability to use natural gas; in comparison, 70 percent of foreign producers utilize naphtha.[41] Although prices for both are variable, industry sources state that natural gas historically has been a relatively less expensive domestic feedstock, allowing U.S. producers a competitive advantage in world markets.[42] However, since 1997, the relative price of natural gas has increased compared to that of crude petroleum (table 5). Higher natural gas feedstock prices reportedly have made the domestic gulf coast-based producers less competitive than producers that use naphtha.[43] In addition, the economic downturn in many of the world markets has reduced, or at least slowed, the growth rate of global demand for organic commodity chemicals. Because of high feedstock costs, slowing demand, and overseas competition, domestic producers have faced a challenging environment in recent years.[44]

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[38] John Hoffman, "Phenol and Acetone Under Pressure," *Chemical Market Reporter,* Feb. 19, 2001, p. 3.

[39] "Cyclohexane," *Chemical Market Reporter,* May 28, 2001, p. 27.

[40] William J. Storck, "Productivity Boost For Chemical Firms," *Chemical & Engineering News,* Mar. 18, 2002, p. 16.

[41] "US Chemical Industry Outlook: Trade and Domestic Demand," p. 33.

[42] Ibid.

[43] Ibid.

[44] John Hoffman, "U.S. Petrochemical Industry Continues to Face Structural Challenges," *Chemical Market Reporter*, Aug. 13, 2001, p. 22; and T. Kevin Swift and Martha Moore, "US Chemical Industry Outlook: Trade and Domestic Demand," p. 33.

Table 4
Organic commodity chemicals: productivity and unit labor costs, 1997-2001
(1992=100)

Item	1997	1998	1999	2000	2001
All manufacturing:					
Productivity	121.8	129.5	137.1	145.4	150.3
Unit labor costs	94.3	90.9	88.4	86.3	86.1
Organic chemicals:					
Productivity	113.1	104.4	114.6	120.1	106.4
Unit labor costs	101.6	113.6	105.2	105.0	119.1

Source: "Productivity Boost For Chemical Firms," *Chemical & Engineering News*, Mar. 18, 2002.

Table 5
Relative price history of crude petroleum and natural gas, 1987-2001

	Average for 1987-1996	1997	1998	1999	2000	2001
Crude petroleum annual average price[1]	15.69	17.23	10.87	15.56	26.72	22.35
Natural gas annual average price [2]	1.77	2.32	1.96	2.19	3.68	4.27
Ratio of crude petroleum price to natural gas price	8.9	7.4	5.5	7.1	7.3	5.2

[1] Price is in dollars per barrel, domestic first purchase price.

[2] Price is dollars per thousand cubic feet, wellhead price.

Source: Energy Information Administration, Monthly Energy Review.

U.S. TRADE

Overview

Trade in organic commodity chemicals is intrinsic in today's global marketplace. Because these chemicals are usually transported by ship, proximity to a deep water port is said to be a major determinant in the ability of producers in a given region to compete. For example, the United States ships most imports and exports through Houston, while northern Europe primarily uses Rotterdam and Antwerp.[45] From these and other ports worldwide, truck and rail are used to transport product to and from manufacturing plants.

[45] Patricia Short, "Europe's Nexus," *Chemical & Engineering News*, May 28, 2001, p. 18.

The domestic organic commodity chemicals industry maintained a positive net trade balance throughout the period 1997-2001, increasing from $361 million in 1997 to $946 million in 2000, before declining to $474 million in 2001. A significant part of this variation reflects the trade balance in styrene. The styrene trade balance increased from $218 million in 1997 to $440 million in 2000, only to decrease to a negative trade balance of $34 million in 2001. Although the styrene market averaged 4 percent annual growth through 1999, industry sources estimated a 10-percent decline in demand in 2001.[46] Polystyrene demand, which accounts for two-thirds of styrene demand, slowed in the second half of 2000 to match the slowdown in the domestic economy.[47] Some analysts suggest, however, that styrene demand in 2000 was artificially high, and demand in 2001 was artificially low because of buildups in inventory in 2000 and subsequent depletions in 2001.[48] Table 6 shows the trade balance for several major commodity chemicals.

Table 6
Trade balance of certain commodity chemicals, 1997-2001
(*1,000 dollars)*

Item	1997	1998	1999	2000	2001
para-Xylene	100,050	105,203	130,228	209,354	197,904
Phenol (hydroxybenzene)	5,588	12,364	4,057	111,611	145,884
Terephthalic acid and its salts	192,805	190,681	134,307	69,947	124,242
6-Hexanelactam (epsilon-caprolactam)	60,640	55,963	67,623	84,584	92,705
Cyclohexane	32,489	61,852	73,221	137,056	66,216
Aniline and its salts	(11,027)	(516)	3,346	13,056	12,310
meta-Xylene	(7,168)	20,303	16,915	18,120	10,908
Phthalic anhydride	5,568	3,766	6,619	6,867	7,803
Dicyclopentadiene and other cyclanes, cyclenes, and cycloterpenes	11,506	(3,934)	(17,976)	(4,840)	6,545
Cyclohexanol, methylcyclo-hexanols and dimethylcyclo-hexanols	(8,415)	(4,988)	(4,451)	(968)	700
Dodecylbenzene	(737)	(2,649)	(3,053)	(3,133)	(3,669)
Dimethyl terephthalate	3,102	3,541	918	835	(3,722)
ortho-Xylene	(31,940)	(37,899)	(35,245)	(26,300)	(13,445)
Ethylbenzene	30,457	18,959	5,508	18,650	(15,373)
Styrene	217,611	215,941	396,716	440,034	(33,701)

Source: Compiled from official statistics of the U.S. Department of Commerce.

[46] John Hoffman, "Styrene Demand and Prices Remain Weak," *Chemical Market Reporter,* Sept. 10, 2001, p. 1.
[47] Ibid.
[48] "CMAI Publishes Results of 2002 World Styrene Analysis," *PRNewswire*, Dec. 28, 2001.

U.S. Imports

Principal Suppliers and Import Levels

U.S. imports of organic commodity chemicals increased irregularly during 1997-2001, from $923 million in 1997 to $1.2 billion in 2000, before declining to $1.0 billion in 2001. The principal organic commodity chemicals imported into the United States during this period, based on value, were styrene, cumene, and *para*-xylene. Together, these three products accounted for 72 percent of the imported organic commodity chemicals during 1997-2001.

Styrene imports account for a significant portion of the fluctuation in the overall import levels of the organic commodity chemicals. Styrene imports grew from $173 million in 1997 to $482 million in 2000 before declining to $467 million in 2001. Cumene mirrored the overall import level fluctuations, increasing irregularly from $188 million in 1997 to $266 million in 2000, before declining to $201 million in 2001. Phenol production, which accounts for 95 percent of cumene demand, experienced a significant decline in demand in 2001.[49]

The primary suppliers of U.S. organic commodity chemical imports were Canada, Venezuela, Saudi Arabia and Nigeria, all countries with domestic reserves of crude petroleum. Canada exported $514 million of these goods in 2001 to the United States, $462 million of which was styrene. Venezuela exported $83 million, including $47 million in cumene and $21 million in *para*-xylene. Saudi Arabia exported $81 million, $40 million of which was *para*-xylene. Nigeria exported $21 million in 2001, $13 million of which was cumene.[50] Combined, these four countries contributed a minimum of 51 percent of U.S. imports of these products in 1997 to a maximum of 70 percent of imports in 2000. See table B-1 for a list of imports by country.

Tariff and Nontariff Measures

Table 7 shows the tariff rates of duty as of January 1, 2002, for imports of the organic commodity chemicals under the Harmonized Tariff Schedule (HTS) of the United States. The United States currently has zero tariffs on eight of the organic commodity chemicals imported from countries with normal trade relations status; these eight products accounted for 87 percent of imports of organic commodity chemicals in 2001**.** Eligible imports from Canada, which accounted for 50 percent of organic commodity chemical imports in 2001, enter the United States duty free under the North American Free Trade Agreement (NAFTA). Eligible goods from Venezuela and Nigeria, accounting for 8.1 percent and 2.1 percent respectively of 2001 U.S. imports of these products, enter duty free under the Generalized System of Preferences. Saudi Arabia supplied 7.9 percent of U.S. imports of

[49] "Cumene," *Chemical Week,* Mar. 20, 2002, p. 47.
[50] Nigerian exports from 1997 through 2000 ranged from $65 million to $127 million.

Table 7
Organic commodity chemicals: Harmonized Tariff Schedule subheading; description; U.S. column 1, Special, and column 2 rates of duty as of Jan. 1, 2002; U.S. imports, 2001; and U.S. exports, 2001

HTS	Description	Column 1 rate of duty as of Jan. 1, 2002– General	Column 1 rate of duty as of Jan. 1, 2002– AVE for Compound Rates	Special	Column 2 rate of duty as of Jan. 1, 2002–	U.S. imports, 2001	U.S. exports, 2001
						1,000 dollars	
2902.11.00	Cyclohexane	0.4¢/kg + 2.5%	3.48%	Free (A*, CA, E, IL, J, MX)	15.4¢/kg + 40%	21,127	87,343
2902.19.00	Cyclanic hydrocarbons (except cyclohexane), cyclenic hydrocarbons and cycloterpenes	Free			25%	27,458	34,003
2902.41.00	*o*-Xylene	Free			Free	37,348	23,903
2902.42.00	*m*-Xylene	Free			Free	3,808	14,716
2902.43.00	*p*-Xylene	Free			Free	145,759	343,663
2902.50.00	Styrene	Free			15.4¢/kg + 45%	466,678	432,977
2902.60.00	Ethylbenzene	0.2¢/kg +3.5%	3.89%	Free (A*, CA, E, IL, J) 0.1¢/kg +1.7% (MX)	15.4¢/kg + 55%	19,129	3,756
2902.70.00	Cumene	Free			Free	201,184	68,371
2902.90.10	Pseudocumene	Free			Free	2,867	(1)
2902.90.20	Acenaphthene, chrysene, cymene, dimethylnaphthalenes, fluoranthene, fluorene, indene, mesitylene, and other specified cyclic hydrocarbons	Free			Free	7,173	(1)
2902.90.30	Alkylbenzenes and polyalkylbenzenes	0.2¢/kg + 3.5%	3.78%	Free (A+, CA, D, E, IL, J) 0.1¢/kg +1.7% (MX)	15.4¢/kg + 55%	4,156	34,691
2902.90.40	Anthracene and 1,4-di-(2-methylstyryl)benzene	2.1%		Free (A*, CA, E, IL, J) 1% (MX)	15.4¢/kg + 68.5%	26	(1)
2902.90.60	Biphenyl (diphenyl), in flakes	2.1%		Free (A*, CA, E, IL, J)	15.4¢/kg + 68.5%	169	(1)
2902.90.90	Cyclic hydrocarbons, nesoi	2.1%		Free (A+, CA, D, E, IL, J, K) 1% (MX)	15.4¢/kg + 68.5%	29,341	(1)

See footnote at end of table.

Table 7–*Continued*
Organic commodity chemicals: Harmonized Tariff Schedule subheading; description; U.S. column 1, Special, and column 2 rates of duty as of Jan. 1, 2002; U.S. imports, 2001; and U.S. exports, 2001

HTS	Description	Column 1 rate of duty as of Jan. 1, 2002– General	AVE for Compound Rates	Special	Column 2	U.S. imports, 2001	U.S. exports, 2001
						1,000 dollars	
2906.12.00	Cyclohexanol, methylcyclohexanols and dimethylcyclohexanols-	0.7¢/kg + 7.8%	7.80%	Free (A+, CA, D, E, IL, J, MX) 0.9¢/kg + 6% (JO)	15.4¢/kg + 53.5%	19	719
2907.11.00	Phenol (hydroxybenzene) and its salts	5.5%		Free (A*, CA, E, IL, J, MX) 2.7% (JO)	15.4¢/kg + 44%	7,793	153,677
2917.35.00	Phthalic anhydride	0.5¢/kg + 6.9%	7.76%	Free (A*, CA, E, IL, J, K, MX) 0.5¢/kg + 3.6% (JO)	15.4¢/kg + 49%	7,353	15,156
2917.36.00	Terephthalic acid and its salts	0.7¢/kg + 8.8%	16.24%	Free (A+, CA, D, E, IL, J) 0.3¢/kg +1.7% (MX) 0.5¢/kg + 3.6% (JO)	15.4¢/kg + 57%	4,019	128,261
2917.37.00	Dimethyl terephthalate	0.6¢/kg + 7.8%	7.99%	Free (A*, CA, E, IL, J, MX) 0.7¢/kg +5.4% (JO)	15.4¢/kg + 42%	5,672	1,950
2921.41.10	Aniline	0.7¢/kg + 7.9%	9.37%	Free (A+, CA, D, E, IL, J) 0.3¢/kg +1.3% (MX) 0.9¢/kg + 5.5% (JO)	15.4¢/kg + 43.5%	2,516	([1])
2921.41.20	Aniline salts	0.5¢/kg + 9%	9.04%	Free (A+, CA, D, E, IL, J) 0.2¢/kg +1.8% (MX) 0.6¢/kg + 6.8% (JO)	15.4¢/kg + 60%	14	([1])
2933.71.00	6-Hexanelactam (epsilon-caprolactam)	0.7¢/kg + 7.2%	7.83%	Free (A*, CA, E, IL, J, MX) 0.6¢/kg +3.9% (JO)	15.4¢/kg + 40%	6,212	98,917

[1] Official statistics for U.S. exports of the products classified under this HTS subheading are not collected at a similar level of aggregation.

Programs under which special tariff treatment may be provided and the corresponding symbols for such programs as they are indicated in the “Special” subcolumn are as follows: Generalized System of Preferences (A or A*); North American Free Trade Agreement, eligible goods of Canada (CA); African Growth and Opportunity Act (D); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Agreement (IL); the Andean Trade Preference Act (J); United States-Jordan Free Trade Area Implementation Act (JO); Agreement on Trade in Pharmaceutical Products (K); and the North American Free Trade Agreement, eligible goods of Mexico (MX).

Source: Harmonized Tariff Schedule of the United States. U.S. import and export data compiled from official statistics of the U.S. Department of Commerce.

these products in 2001, although products with zero tariffs accounted for 97 percent of these imports, including *para*-xylene, cumene, and styrene. No nontariff measures restricting imports have been reported to Commission staff.

U.S. Government Trade-Related Investigations

During the period 1997 through 2001, there were no trade investigations conducted by the Commission on any of the organic commodity chemicals addressed in this report.

U.S. Exports

Because of the establishment of specific grade and purity levels, the organic commodity chemicals are of uniform quality and move in a global market. As a result, export levels can fluctuate because of a variety of factors, including the choice of feedstock and currency valuations. As previously mentioned, because U.S. producers can avail themselves of lower cost natural gas, U.S. commodity chemicals often are priced competitively, making them attractive internationally. However, because of the relatively strong valuation of the U.S. dollar in recent years, domestic producers reportedly have found it more difficult to export goods in a profitable manner.[51]

[51] Based on Commission telephone conversations with industry sources.

Principal Markets and Export Levels

Total U.S. exports of organic commodity chemicals increased from $1.28 billion in 1997 to a high of $2.15 billion in 2000 and then decreased to $1.49 billion in 2001. The four largest U.S. export markets for these products in 2001 were Mexico (35 percent of exports), Canada (21 percent), Taiwan (9 percent), and the Netherlands (6 percent). From 1997 through 2001, these four countries accounted for 63 to 70 percent of U.S. exports of organic commodity chemicals. The two largest organic commodity chemical exports were styrene and *para*-xylene, which together accounted for 55 percent of all exports of commodity chemicals in the period 1997-2001.

Mexico accounted for 42 percent of U.S. styrene exports in 2001. Although the country possesses indigenous stores of crude petroleum, the Mexican Government has recognized the need to increase efficiency and productivity within Petroleos Mexicanos (Pemex), the state-owned crude petroleum producer.[51] For example, Pemex Petroquimica president Rafael Beverido Lomelin cited the need to improve Pemex's cost structure in order to reduce Mexico's dependency on chemical imports.[52]

Asia has also been a large market for U.S. exports of these products. For example, strong polyester demand in Asia contributed to U.S. *para*-xylene exports to this region in the past. Increased Asian production capacity and decreasing global polyester demand, however, may affect the future trade balance of this chemical.[53] See table B-2 for a list of exports by country.

Foreign Trade Measures

In general, duty rates on the organic commodity chemicals worldwide are low or free. Under NAFTA, qualifying U.S. exports enter Canada and Mexico free of duty. The European Union (EU) has no tariffs for cyclohexane, styrene, xylene isomers, cumene, or ethylbenzene. The remainder of the organic commodity chemicals entering the EU are dutiable at rates ranging from 3.0 to 8.5 percent. Japan's duty rates for the major organic commodity chemicals for World Trade Organization (WTO) members range from free to 5.3 percent. In 2001, China maintained rates of 6 to 14 percent for their "normal trade relations" partners, and rates of 20 to 30 percent for other countries. However, the Chinese Government, under its WTO accession agreement, has committed to lowering chemical tariffs to 6.9 percent by 2004.[54] Taiwan currently imposes tariff rates of 5 percent or less on most organic commodity imports.

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[51] Simon Webb, "Pemex Shake-up," *Business Mexico,* Apr. 2001, p. 26.

[52] Robert Westervelt and Kara Sissel, "Pemex to Invest $1 Billion in Petchems," *Chemical Week,* Apr. 3, 2002, p. 9.

[53] Malini Hariharan, "Looking Up," *Chemical Market Reporter,* May 22, 2000, p. 45.

[54] Ibid.

In the Uruguay Round of trade negotiations, the Chemical Tariff Harmonization Agreement (CTHA) was developed, which would reduce maximum chemical tariffs to levels between 5.5 and 6.5 percent.[55] North America, Europe and Japan have committed to eliminating chemical tariffs by 2010, but with the condition that all other WTO members make similar commitments, even if such a commitment is phased in over a longer period of time.[56] Countries that have not agreed to the CTHA account for approximately 30 percent of worldwide chemical production, including Argentina, Brazil, Malaysia, and Venezuela. These countries appear to want similar agreements in textiles and agriculture before agreeing to the chemicals proposal.[57]

FOREIGN INDUSTRY PROFILE

Major producers of the organic commodity chemicals typically are located either near large sources of crude petroleum or near major markets of industrialized and rapidly industrializing nations. As a result, the dominant countries in this market are in North America, western Europe, and the Asian rim. The members of the Organization of Petroleum Exporting Countries (OPEC) are also major producers.

North America

The Canadian organic chemicals industry depends on large petroleum reserves in Alberta and Saskatchewan and is an export-oriented industry. The Canadian Chemical Producers Association reported that 55 percent of chemical gross output was exported in 1998.[58] A new set of production facilities in 2000 was designed for 80 percent of the output to be exported, primarily to the United States and Southeast Asia. The organic commodity chemicals trade deficit with Canada was $20.7 million in 1997 and $201 million in 2001.[59] U.S. styrene imports from Canada ranged from $170 million in 1997 to $223 million in 1999. However, these imports increased to $449 million in 2000 and $462 million in 2001. This increase is a result of both increased volume and higher unit values.[60] Canadian ethane feedstock costs rose in 1999 and 2000, but this increase was less than the increase of U.S. gulf coast ethane, increasing the Canadian producers' competitiveness versus that of the U.S. producers.[61]

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[55] Neil Franz, "Huge Chemical Markets Hinge on WTO Decisions," *Chemical Week*, Dec. 1, 1999, p. 50.

[56] Sean Milmo, "European Chem Industry Is Wary of Trade Talks," *Chemical Market Reporter*, Nov. 29, 1999, p. 6.

[57] Ibid.

[58] Canadian Chemical Producers Association, "Think Investment - Chemicals," Oct. 29, 1999.

[59] Trade balances are based on official statistics of the U.S. Department of Commerce for the HTS numbers at the six-digit level of the chemicals covered in this report. Imports are imports for consumption value and exports are domestic exports FAS value.

[60] Based on official statistics of the U.S. Department of Commerce, U.S. imports from Canada averaged 276 million kilograms of styrene in 1997-1998 and 505 million kilograms between 1999-2001. The customs unit value per first unit of quantity averaged $0.527 per kilogram in 1997-1998 and $0.748 between 1999-2001.

[61] Peter Fairley, "Canadian Chemicals: Running on Empty," *Chemical Week,* July 19, 2000, p. 20.

Between 1997 and 2001, the trade surplus in organic commodity chemicals with Mexico increased 214 percent from $159 million to $499 million. A significant portion of this increase resulted from increased exports of *para*-xylene (from $113 million in 1997 to $252 million in 2001) and styrene ($78 million in 1997 to $182 million in 2002). Despite ample crude petroleum resources, Mexican petrochemical production has declined in recent years and Mexico faces the possibility of becoming a net importer of these goods in the near future.[62] The dominant producer in this market is Pemex, a national petroleum monopoly, which varies between the third- and fifth-largest petroleum producer globally, depending on output fluctuations. According to industry sources, Mexico's President, Vicente Fox, has made it clear that there are no plans currently in place to privatize Pemex,[63] but he wishes to improve the company's competitiveness.[64] These sources report that this will necessitate increasing the company's efficiency and productivity through various means, including fiscal reform.[65] Currently, for example, profits are returned to Mexico's Government, and reinvestment capital is distributed in annual budgets by the Mexican Government, reportedly resulting in little incentive for the company to operate in an efficient and profitable manner.[66]

Asia

Asian Pacific countries currently account for one-third of global chemical consumption, but industry sources predict this level will increase to one-half in the future.[67] Capacity increases coming onstream between 1998 and 2010, however, may satisfy some of the increased demand in the region. Multi-national corporations, including Shell, BP, BASF, and Dow, have invested in petrochemical projects in this region.[68]

With China's entrance into the WTO in November 2001, the increased availability of Chinese markets has major producers worldwide expressing interest.[69] The planned removal of reported *de facto* trade barriers, including restrictions on import, resale, and distribution by existing foreign ventures, and the lowering of import tariffs are designed to open markets to foreign producers.[70] Chemical Market Associates, Inc., (CMAI) estimates that China's share of the world styrene market by weight grew from 2 percent in 1994-1995 to approximately 8 percent in 1999-2000.[71] In 2001, China's styrene demand continued to grow, increasing 22 percent (by weight), despite a decline in world styrene demand of 2.6 percent.[72] The country is expected to account for 11 percent of the world's styrene consumption by weight in 2003, exceeding Asian production capacity by 1.2 million tons ($612 million based on 5-year average domestic price).[73]

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[62] "Pemex Teeters on the Edge," *Chemical Market Reporter*, Mar. 25, 2002, p. N27.

[63] Ibid.

[64] Webb,"Pemex Shake-up," p.26.

[65] Ibid; "Pemex Teeters on the Edge," p. N27.

[66] Webb, "Pemex Shake-up," p. 26.

[67] Natasha Alperowicz, "Asia Still Offers the Most Growth," *Chemical Week*, Mar. 20, 2002, p. 34.

[68] Eleanor Van Savage, "Asia Petrochemical Industry Faces Challenges in 2001 and Beyond," *Chemical Market Reporter,* Jan. 1, 2001, p. 4.

[69] Sigmund Floyd, "Cracking the Chemical Sector," *China Business Review,* Mar./Apr. 2002, p. 32.

[70] Ibid.

[71] Malini Hariharan, "Pull and Push of the West," *Chemical Market Reporter*, May 28, 2001, p. S54.

[72] "Styrene Industry to Recover After Dismal 2001," *Oil & Gas Journal*, Feb. 4, 2002, p. 52. As noted in the article, however, some of this growth may have been a result of improved record-keeping of imports and improved antismuggling efforts, rather than actual increase in demand.

[73] Ibid.

With China's average tariffs on chemical imports dropping from 14.7 percent to 6.9 percent, imports of $30.2 billion in chemicals in 2000,[74] and a predicted GNP growth rate of 7.6 percent in 2002,[75] organic commodity chemicals producers worldwide are reportedly examining the Chinese market closely for opportunities. One estimate by the American Chemical Council shows an increase in U.S. exports to China of more than $300 million in the initial years following China's accession to the WTO.[76] The U.S. organic commodity chemicals trade balance with China has irregularly increased from $7.9 million in 1997 to $11.5 million in 2001.

Taiwan has built several organic commodity chemicals production facilities in recent years. As these plants have come online, U.S. exports of these goods to Taiwan have decreased. In 1999, U.S. exports of organic commodity chemicals to Taiwan were $239 million, 16 percent of total U.S. exports of these goods. In 2001, exports were $135 million, accounting for 9 percent of exports. In 2000, Formosa Chemicals and Fibre Corporation began production in a new aromatics plant capable of annual output of 450,000 metric tons of *para*-xylene, 100,000 metric tons of *ortho*-xylene, 200,000 metric tons of phenol, and 250,000 tons of styrene.[77] Taiwan was accepted into the WTO in 2001 with China, but industry sources do not predict major changes from Taiwan's entry. A decline of 2.5 percent in Taiwan's GDP in 2001[78] may have slowed the domestic demand for the organic commodity chemicals as well. The U.S. trade balance with Taiwan was $183 million in 1997 and $134 million in 2001.

According to industry sources, Singapore has attracted significant foreign investment because of its stable government and probusiness environment, despite a lack of domestic feedstocks.[79] Without a substantial home market, however, production is largely export-dominated and is dictated primarily by world demand for these goods.[80] The U.S. trade balance with Singapore for these products increased irregularly from $94 thousand in 1997 to $10 million in 2000, before declining to $2.7 million in 2001.

Japan has reportedly never concentrated on an export market, using only marginal tonnage for exports.[81] However, because of stagnant growth domestically, Japanese producers are said to be exploring export opportunities, especially to China and other Asian countries.[82] The U.S. trade deficit with Japan in these products declined from $58.4 million in 1997 to $17.7 million in 2001.

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[74] Ian Young, "China Launches Probe Into Alleged Caprolactam Dumping," *Chemical Week,* Dec. 19-26, 2001, p. 16.

[75] John Richardson, "Some Spots Brighten Up for Asian Petrochemicals," *Chemical Market Reporter,* Jan. 21, 2002, p. 9.

[76] Andrew Wood, "Free Trade Secrets," *Chemical Week*, Aug. 23, 2000, p. 3.

[77] Malini Hariharan, "Crossroads," *Chemical Market Reporter*, May 28, 2001, p. S48.

[78] Richardson, "Some Spots Brighten Up For Asian Petrochemicals," p. 9.

[79] Stephen Moore, "Fighting the Tide: a Big Buildup in Singapore," *Chemical Week,* Feb. 6, 2002, p. 21.

[80] Ibid.

[81] "Annus Horribilis," *Chemical Market Reporter*, Mar. 25, 2002, p. N29.

[82] "Japanese Chemical Industry Turning to China Market," *Asiainfo Daily China News,* Mar. 19, 2002.

Europe

The European petrochemical industry has recently faced poor margins, excess capacity, and weak demand growth.[83] In addition, according to a CMAI analyst, current investment levels in the Middle East petrochemicals industry are "a major factor stopping anyone putting any money on the table for European expansions at the moment."[84] With an estimated 7 million metric tons per year of ethylene production coming on stream between 2005 and 2010 in the Middle East, industry sources state that it is likely that substantial amounts of this output will be exported to Europe.[85]

The two major determinants in plant location are access to feedstocks and proximity to growth markets. The European market for organic commodity chemicals is extremely competitive, with very low margins. As a result, there are very few new facilities being constructed in the area beyond 2004.[86] European producers, including BP, Shell, and TotalFinaElf, are entering into strategic alliances in the Middle East, especially Saudi Arabia and Iran, rather than building new facilities in Europe.[87] Industry sources predict continued restructuring and rationalization in European production, supported by indications from producers DSM and Eni that they are looking to divest their European petrochemicals activities.[88]

The European transportation infrastructure has been described as operating with less-than-optimal efficiency.[89] For example, the rail infrastructure, built prior to European unification, contains 15 different nationalized railroads. The majority of European chemical shipments travel by road (88 percent); the remainder are shipped by waterway (4 percent) and by rail (7 percent). In contrast, 56 percent of U.S. shipments travel by road, 15 percent by waterway, and 29 percent by rail.[90] The European Chemical Industry Council is seeking to increase transportation efficiency by increasing use of rail and waterways.[91]

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[83] "European Petrochemicals Industry Appears in Need of Further Rationalization," *Chemical Market Reporter,* Feb. 25, 2002, p. 9.

[84] Ibid.

[85] "Europeans Question Impact of Major Petrochem Expansions in Middle East," *Chemical Market Reporter,* June 18, 2001, p. 6.

[86] "Facing Competition," *Chemical Market Reporter*, Mar. 25, 2002, p. N33.

[87] "Europeans Question Impact of Major Petrochem Expansions in Middle East," p. 6.

[88] "Facing Competition," *Chemical Market Reporter*, Mar. 25, 2002, p. N33.

[89] Mike Corkhill, "Moving More Efficiently," *Chemical Week*, Sept. 29, 1999, p. S56.

[90] Ibid.

[91] Ibid.

Middle East

The Middle Eastern members of OPEC include Iran, Iraq, Kuwait, Saudi Arabia, the United Arab Emirates, and Qatar. Each of these countries possesses significant crude petroleum reserves. As a result, it is economically advantageous to base production of the organic commodity chemicals near these reserves. Proximity minimizes transportation costs and delays and permits vertical integration and reliable access to feedstocks. This area received large influxes of capital investment recently by foreign multinationals such as BP, ExxonMobil, and Shell, especially during the period 2000-2001.[92] These new facilities, in addition to new production facilities in the Asia/Pacific area, have contributed to significant increases in worldwide capacity.

Others

According to industry sources, Russia has the potential to become an important factor in the international chemicals marketplace.[93] This region has only recently raised production levels back to the levels of the 1980s.[94] However, Russia possesses lower cost and reliable feedstocks and generally incurs lower labor costs, which, under certain circumstances, are said to be as low as 10 percent of labor costs in Western Europe.[95] Industry sources state that the two largest Russian petroleum and natural gas producers, Lukoil and Gazprom, have begun integration efforts from crude petroleum exploration to aromatics production.[96] With strict government controls on energy prices, these firms have turned to the manufacture and processing of downstream products in order to maximize profits.[97] Gazprom currently owns a 51-percent interest in the Siberian-Ural Petrochemical and Gas Company (Sibur), the largest petrochemical group in Russia.[98] Although its plants are based primarily on technology from the 1970s and 1980s, Sibur is negotiating a joint venture with BASF and plans an initial public offering on the New York Stock exchange in 2004.[99] According to company president Yakov Goldovskii, Sibur aims to become a leading petrochemicals player in Central and Eastern Europe, with eventual plans of expanding into Asia.[100]

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[92] Ibid.

[93] Sean Milmo, "Russia Emerges as a Potential Power in European Chemicals," *Chemical Market Reporter,* Mar. 26, 2001, p. FR6.

[94] Ibid.

[95] Ibid.

[96] Ibid.

[97] Ibid.

[98] Natasha Alperowicz, "Sibur: A New Power in the East," *Chemical Week,* Aug. 1, 2001, p. 45.

[99] Ibid.

[100] Ibid.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

APPENDIX A
TARIFF AND TRADE AGREEMENT TERMS

In the ***Harmonized Tariff Schedule of the United States*** (HTS), chapters 1through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the ***general*** subcolumn of HTS column 1 are normal trade relations rates; many general rates have been eliminated or are being reduced due to concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those listed in HTS general note 3(b) (Cuba, Laos, and North Korea) plus Serbia and Montenegro, which are subject to the statutory rates set forth in ***column 2***. Specified goods from designated general-rate countries may be eligible for reduced rates of duty or duty-free entry under preferential tariff programs, as set forth in the ***special*** subcolumn of HTS rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not list countries covered by a total or partial embargo.

The ***Generalized System of Preferences*** (GSP) affords nonreciprocal tariff preferences to designated beneficiary developing countries. The U.S. GSP, enacted in title V of the Trade Act of 1974 for 10 years and extended several times thereafter, applies to merchandise imported on or after January 1, 1976, and before the close of December 31, 2006. Indicated by the symbol "A", "A*", or "A+" in the special subcolumn, GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries (see HTS gen. note 4). Eligible products of listed sub-Saharan African countries may qualify for duty-free entry under the ***African Growth and Opportunity Act*** (AGOA) (see HTS gen. note 16) through September 30, 2008, as indicated by the symbol “D” in the special subcolumn; see subchapter XIX of chapter 98.

The ***Caribbean Basin Economic Recovery Act*** (CBERA) affords nonreciprocal tariff preferences to designated Caribbean Basin developing countries. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to goods entered, or withdrawn from warehouse for consumption, on or after January 1, 1984. Indicated by the symbol "E" or "E*" in the special subcolumn, CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries (see HTS gen. note 7). Eligible products of listed beneficiary countries may qualify for duty-free or reduced-duty entry under the

Caribbean Basin Trade Partnership Act (CBTPA) (see HTS gen. note 17), through September 30, 2008, as indicated by the symbol "R" in the special subcolumn; see subchapter XX of chapter 98.

Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free Trade Area Implementation Act*** of 1985 (IFTA), as provided in general note 8 to the HTS; see also subchapter VIII of chapter 99.

Preferential nonreciprocal duty-free treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles from designated beneficiary countries under the ***Andean Trade Preference Act*** (ATPA), enacted as title II of Public Law 102-182 (effective July 22, 1992; see HTS gen. note 11) and renewed through December 31, 2006, by the ***Andean Trade Promotion and Drug Eradication Act*** of 2002.

Preferential free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement*** (NAFTA), as provided in general note 12 to the HTS and implemented effective January 1, 1994, by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Preferential rates of duty in the special subcolumn followed by the symbol "JO" are applicable to eligible goods of Jordan under the ***United States-Jordan Free Trade Area Implementation Act***, (JFTA) effective as of Dec. 17, 2001; see HTS gen. note 18 and subchapter IX of chapter 99.

Other special tariff treatment applies to particular ***products of insular possessions*** (gen. note 3(a)(iv)), ***products of the West Bank and Gaza Strip*** (gen. note 3(a)(v)), goods covered by the ***Automotive Products Trade Act*** (APTA) (gen. note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (gen. note 6), ***articles imported from freely associated states*** (gen. note 10), ***pharmaceutical products*** (gen. note 13), and ***intermediate chemicals for dyes*** (gen. note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), pursuant to the Agreement Establishing the World Trade Organization, is based upon the earlier GATT 1947 (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) as the primary multilateral system of discipline and principles governing international trade. The agreements mandate most-favored-nation treatment, maintenance of scheduled concession rates of duty, and national treatment for imported goods; GATT provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. Results of the Uruguay Round of multilateral tariff negotiations are set forth in separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as Schedule XX. Pursuant to the **Agreement on Textiles and Clothing** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could

take unilateral action to control shipments. Quantitative limits were established on textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 and the phase-out of quotas over a ten-year period, or by Jan. 1, 2005.

APPENDIX B
STATISTICAL TABLES

Table B-1
Organic commodity chemicals: U.S. imports for consumption, by principal sources, 1997-2001
(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Cyclohexane:					
Argentina	7,282	4,569	3,321	0	6,793
United Kingdom	0	0	0	0	6,688
Belgium	0	16	0	0	3,225
Saudi Arabia	0	0	0	0	2,357
Netherlands	0	14	891	0	1,669
Indonesia	0	0	0	0	265
All others	18,436	853	1,028	526	129
Total	25,718	5,452	5,241	526	21,127
Dicyclopentadiene:					
Japan	6,062	5,229	5,261	4,947	5,620
Canada	3,685	6,411	14,057	6,954	4,229
Brazil	710	1,256	2,155	2,325	3,513
Korea	0	138	390	406	236
Austria	0	29	18	34	54
Spain	0	0	5	0	49
All others	797	332	11	2	39
Total	11,254	13,394	21,898	14,669	13,740
Other cyclanes, cyclenes, and cycloterpenes:					
Japan	3,598	4,846	8,653	8,444	7,081
Brazil	592	799	974	621	1,270
Canada	126	80	1,500	4,189	1,260
Germany	573	794	1,459	1,589	1,155
Chile	903	585	711	445	712
Spain	447	437	641	666	506
All others	9,114	8,575	5,885	2,764	1,735
Total	15,353	16,116	19,823	18,719	13,720
ortho-Xylene:					
Venezuela	4,519	3,127	11,845	26,788	11,913
Canada	11,168	7,425	6,413	7,779	7,935
Iraq	0	2,495	7,005	2,611	5,211
Colombia	2,667	1,355	3,241	5,174	4,500
Saudi Arabia	9,137	11,820	6,058	619	2,380
Nigeria	8,655	8,742	3,967	12,695	2,318
All others	15,367	11,375	4,881	3,615	3,091
Total	51,513	46,339	43,409	59,282	37,349
meta-Xylene:					
Canada	79	104	75	484	3,808
Belgium	0	0	0	22	0
Colombia	0	0	0	1,016	0
Iraq	0	0	768	309	0
Korea	0	0	1,079	0	0
Netherlands	1	2	0	0	0
All others	7,163	12,296	5,256	3,466	0
Total	7,243	12,402	7,178	5,298	3,808

Table B-1–*Continued*
Organic commodity chemicals: U.S. imports for consumption, by principal sources, 1997-2001
(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
para-Xylene:					
Saudi Arabia	28,155	21,201	9,174	41,135	40,325
Venezuela	12,074	6,719	17,000	48,051	21,281
India	0	0	0	0	19,841
Iraq	0	9,901	20,071	8,206	18,163
Colombia	10,298	7,850	22,618	38,012	12,964
Korea	0	0	0	1,112	8,546
All others	175,672	127,167	69,415	95,794	24,638
Total	226,199	172,838	138,277	232,310	145,758
Styrene:					
Canada	169,913	121,032	223,396	448,597	462,430
Saudi Arabia	0	0	0	0	4,134
Netherlands	0	0	3,986	468	45
India	0	0	0	0	28
Italy	58	44	0	0	18
Iraq	0	0	0	0	14
All others	3,456	14,052	3,795	33,158	10
Total	173,427	135,127	231,177	482,223	466,679
Ethylbenzene:					
Canada	826	255	35	97	16,108
Netherlands	0	0	0	0	3,016
Spain	0	0	0	0	5
Brazil	0	0	0	0	0
Germany	0	14	0	0	0
Saudi Arabia	0	0	14	0	0
All others	719	0	5	0	0
Total	1,545	269	54	97	19,129
Cumene:					
Venezuela	43,643	34,081	29,466	62,552	47,174
Norway	13,035	12,628	12,539	25,668	36,151
Saudi Arabia	24,146	22,536	22,019	35,952	31,483
Iraq	0	0	17,095	18,307	30,074
Colombia	6,086	7,976	12,034	21,662	27,261
Nigeria	26,106	32,479	46,486	68,735	13,339
All others	75,115	32,285	26,064	33,079	15,703
Total	188,130	141,985	165,704	265,954	201,185
Pseudocumene:					
Iraq	0	0	1,287	971	1,289
Colombia	507	579	156	1,233	799
Algeria	0	0	172	0	386
Nigeria	632	5,943	473	2,819	348
United Kingdom	536	643	334	700	31
China	0	0	209	688	14
All others	2,131	1,493	484	1,537	0
Total	3,806	8,658	3,114	7,948	2,868

Table B-1–*Continued*
Organic commodity chemicals: U.S. imports for consumption, by principal sources, 1997-2001
(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Acenaphthene, chrysene, cymene, dimethylnaphthalenes, fluoranthene, fluorene, indene, mesitylene, and other specified cyclic hydrocarbons:					
China	3	178	0	5	3,665
Germany	2,879	2,885	1,351	2,612	2,046
Italy	1,621	2,089	474	1,436	937
Japan	632	1,207	1,097	2,284	465
Ecuador	0	0	0	0	23
Austria	0	0	0	0	11
All others	204	323	237	55	27
Total	5,339	6,682	3,159	6,392	7,175
Dodecylbenzene:					
Japan	1,911	2,430	3,350	3,534	3,666
Venezuela	0	15	91	0	200
Canada	0	0	9	18	9
Belgium	0	0	0	3	8
China	0	0	0	2	7
France	308	104	0	0	0
All others	29	538	0	0	0
Total	2,248	3,087	3,449	3,556	3,891
Other alkyl and polyalkyl benzenes:					
Spain	0	0	0	0	124
Netherlands	0	112	194	0	76
Israel	0	0	11	25	25
United Kingdom	434	13	471	16	19
Switzerland	17	7	7	3	15
Japan	1,942	539	145	15	5
All others	10,946	2,855	941	995	2
Total	13,339	3,527	1,769	1,054	267
Anthracene and 1,4-di-(2-methylstyryl) benzene:					
Netherlands	0	0	13	20	14
China	0	0	4	3	6
India	0	0	0	0	3
Japan	0	0	0	0	3
Germany	56	12	12	5	0
Hungary	12	106	82	0	0
All others	0	0	0	0	0
Total	68	118	110	28	26
Biphenyl (diphenyl), in flakes:					
United Kingdom	23	92	71	104	138
Japan	19	43	53	20	17
Canada	0	0	20	2	12
Lithuania	0	0	0	0	2
Austria	8	0	0	0	0
Germany	0	6	0	0	0
All others	0	59	0	0	0
Total	50	199	144	126	170

Table B-1–*Continued*
Organic commodity chemicals: U.S. imports for consumption, by principal sources, 1997-2001
(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Other cyclic hydrocarbons:					
Canada	6,010	4,894	1,894	16,062	17,827
Germany	2,096	1,054	6,772	7,669	6,214
Netherlands	1,844	1,255	805	861	1,327
Japan	777	958	1,322	1,432	1,047
Belgium	554	1,593	961	539	951
Spain	0	0	0	0	415
All others	1,746	1,145	1,808	1,508	1,559
Total	13,027	10,899	13,562	28,070	29,341
Cyclohexanol, methylcyclohexanols and dimethylcyclohexanols:					
Germany	3	18	3	4	15
India	0	0	0	0	4
France	0	841	677	0	0
Japan	7,916	4,621	4,056	1,215	0
Netherlands	841	0	0	0	0
Canada	0	9	0	0	0
All others	34	23	4	0	0
Total	8,794	5,512	4,739	1,220	19
Phenol (hydroxybenzene) and its salts:					
Mexico	13,748	11,456	7,522	12,848	5,779
South Africa	0	0	341	0	1,261
Japan	28,168	27,245	10,972	0	382
Canada	253	261	361	336	329
Indonesia	0	0	42	26	19
United Kingdom	19	17	15	10	13
All others	39,728	43,710	51,067	11,825	10
Total	81,916	82,689	70,319	25,045	7,793
Phthalic anhydride:					
Mexico	6,594	6,179	4,826	5,216	3,335
Venezuela	2,978	793	1,566	2,081	1,800
Israel	57	0	25	1,243	1,205
Brazil	106	0	32	845	654
Korea	33	10	0	0	113
Turkey	0	190	0	296	90
All others	2	51	267	265	157
Total	9,769	7,223	6,714	9,947	7,353
Terephthalic acid and its salts:					
Belgium	0	3	4	0	20,952
Mexico	7,340	3,140	10,574	20,468	3,388
Spain	0	0	0	0	336
Indonesia	14	0	0	0	276
Korea	0	179	280	0	14
Canada	21	0	0	0	5
All others	238	167	0	13	0
Total	7,613	3,489	10,857	20,481	24,971

Table B-1–*Continued*
Organic commodity chemicals: U.S. imports for consumption, by principal sources, 1997-2001
(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Dimethyl terephthalate:					
Italy	0	0	0	0	4,672
Mexico	424	418	954	1,781	946
Germany	19	19	17	53	32
Spain	56	171	213	128	22
Brazil	0	13	294	583	0
Netherlands	0	0	0	4	0
All others	1	40	24	7	0
Total	500	661	1,502	2,556	5,672
Aniline:					
Germany	0	0	908	0	2,473
China	0	0	0	42	25
United Kingdom	5,868	7,596	6,062	0	9
Mexico	0	0	0	0	6
Japan	7,405	4,176	13	6	3
France	329	0	0	0	0
All others	3,757	0	3	2,835	0
Total	17,360	11,772	6,987	2,884	2,517
Aniline salts:					
Japan	190	10	10	0	5
China	0	0	0	0	3
Sweden	0	0	0	0	3
Germany	4	3	0	5	3
Total	194	13	10	5	14
6-Hexanelactam (epsilon-caprolactam):					
Brazil	4,008	3,138	1,824	3,642	2,668
Poland	149	1,629	1,780	837	2,097
Russia	13,432	25,784	811	685	523
Germany	22,765	2,003	95	4,709	337
Japan	0	117	254	253	253
Colombia	6,099	11,011	9,201	350	202
Belgium	7,105	21	102	43	123
All others	4,805	8,504	4,514	1,763	9
Total	58,362	52,207	18,582	12,282	6,213
Grand totals	922,767	740,657	777,781	1,200,671	1,020,782

Note.—Due to rounding, totals may not match the sum of all entries.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table B-2
Organic commodity chemicals: U.S. exports of domestic merchandise, by principal markets, 1997-2001

(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Cyclohexane:					
Canada	41,465	33,485	37,793	55,355	47,506
Mexico	7,854	10,023	9,011	37,771	27,729
Belgium	1,995	8,635	15,911	25,257	7,071
India	35	92	134	4,337	1,414
Venezuela	878	10	1,269	430	1,368
Netherlands	3,226	11,576	12,201	12,847	928
All Others	2,755	3,483	2,143	1,586	1,327
Total	58,208	67,304	78,461	137,584	87,343
Cyclanes, cyclenes and cycloterpenes (excluding cyclohexane):					
Netherlands	113	1,526	536	2,534	6,967
Brazil	411	223	460	1,030	4,948
France	11,992	9,901	5,777	3,547	3,255
United Kingdom	2,578	2,836	2,239	1,558	2,890
Mexico	4,149	1,037	1,716	2,644	2,625
Belgium	3,981	2,256	4,380	4,079	2,599
All others	14,889	7,797	8,635	13,151	10,719
Total	38,113	25,576	23,743	28,542	34,003
ortho-Xylene:					
Mexico	1,686	2,027	2,546	15,741	16,577
Netherlands	7,460	2,107	1,300	12,623	2,646
Venezuela	0	0	570	3,099	2,496
India	5,469	1,547	990	0	1,315
Canada	230	575	496	518	831
El Salvador	0	0	0	0	9
All others	4,727	2,184	2,262	1,000	30
Total	19,572	8,441	8,164	32,982	23,903
meta-Xylene:					
Belgium	0	21,615	16,297	23,193	14,644
Egypt	0	0	0	69	32
Korea	0	11,074	3,411	0	24
Canada	6	0	6	3	7
Trinidad and Tobago	0	0	8	17	6
Mexico	0	6	3,094	6	3
All others	63	10	1,278	130	0
Total	69	32,705	24,094	23,418	14,716
para-Xylene:					
Mexico	112,815	98,628	121,167	239,020	251,845
Taiwan	31,651	37,609	30,645	69,917	24,569
Brazil	6,674	14,676	2,101	18,672	17,441
Pakistan	0	3,972	3,632	4,831	12,277
Malaysia	7,185	10,990	13,966	32,704	10,155
Korea	43,511	18,558	23,561	51,369	9,743
All others	33,130	43,125	65,675	24,195	17,634
Total	234,966	227,558	260,747	440,708	343,664

Table B-2–*Continued*
Organic commodity chemicals: U.S. exports of domestic merchandise, by principal markets, 1997-2001

(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Styrene:					
Mexico	77,870	92,138	133,104	209,143	182,237
Taiwan	65,050	38,361	154,230	168,763	59,997
Colombia	47,562	39,377	38,999	57,473	44,277
Canada	21,484	21,646	32,596	42,984	36,289
Venezuela	25,871	12,876	18,199	29,237	25,816
Netherlands	54,297	75,939	117,636	125,832	24,804
All others	98,905	70,729	133,130	288,825	59,558
Total	391,039	351,068	627,894	922,257	432,977
Ethylbenzene:					
Netherlands	19,488	14,229	1,790	4,713	2,956
Japan	445	589	475	458	340
Mexico	187	282	53	157	226
Canada	4	131	126	118	85
Thailand	111	136	109	147	82
Germany	0	0	0	63	34
All others	11,768	3,860	3,009	13,090	33
Total	32,003	19,227	5,561	18,745	3,758
Cumene:					
Belgium	8,762	2,892	4,834	15,184	24,258
Netherlands	21,108	28,072	22,340	41,993	11,928
Mexico	4,143	10,900	17,505	22,786	10,392
India	7,263	1,455	6,235	11,031	8,639
Italy	0	0	0	0	5,575
United Kingdom	0	2,540	6,799	0	4,443
All others	3,517	23,623	4,822	32,291	3,136
Total	44,793	69,482	62,537	123,284	68,371
Dodecylbenzene:					
Mexico	1,137	0	20	11	110
Italy	61	142	332	121	60
Korea	46	0	0	22	34
United Kingdom	0	0	0	0	8
Japan	0	0	0	0	5
Barbados	0	0	0	0	4
All others	268	296	45	270	0
Total	1,512	438	397	424	221
Other alkyl and polyalkyl benzenes:					
Mexico	1,333	422	3,934	49	15,923
Netherlands	2,389	2,524	2,882	2,125	3,890
Thailand	3	9	2,222	90	3,756
France	462	269	509	52	1,848
India	54	2,390	5	49	1,402
Japan	930	1,043	907	1,284	1,324
All others	6,185	3,739	8,439	4,220	6,326
Total	11,355	10,395	18,897	7,868	34,470

Table B-2–*Continued*
Organic commodity chemicals: U.S. exports of domestic merchandise, by principal markets, 1997-2001

(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Anthracene, biphenyl and cyclic hydrocarbons not elsewhere specified or included:					
Mexico	819	1,466	5,440	1,579	4,348
Netherlands	4,773	2,611	1,375	3,587	3,763
Canada	2,597	2,560	2,066	3,042	3,077
Belgium	414	89	648	5,977	1,796
Brazil	206	229	76	1,102	1,574
Italy	1,107	1,162	1,332	2,432	1,418
All others	9,140	11,325	12,048	12,035	4,013
Total	19,056	19,441	22,985	29,755	19,989
Cyclohexanol, methylcyclohexanols and dimethylcyclohexanols:					
Japan	0	0	32	131	470
Taiwan	0	10	0	0	157
Mexico	56	97	49	13	50
Nauru	0	0	0	0	16
Qatar	0	0	0	0	10
Chile	0	0	0	0	4
All others	324	418	208	107	13
Total	380	525	289	251	721
Phenol (hydroxybenzene) and its salts:					
Canada	63,144	68,547	49,820	61,367	79,808
Netherlands	7,933	9,971	4,183	24,126	21,251
Brazil	2,012	829	140	12,898	12,324
Korea	2,249	950	3,103	7,814	11,111
China	924	0	3,323	8,783	8,232
Argentina	1,048	5,862	3,169	2,282	5,188
All others	19,487	22,709	18,774	40,670	33,154
Total	96,797	108,867	82,512	157,939	171,069
Phthalic anhydride:					
Canada	12,122	9,477	12,740	14,779	12,444
Taiwan	2,473	1,117	0	0	2,375
Indonesia	238	127	31	130	151
Mexico	333	9	383	1,862	138
Philippines	18	15	6	26	20
Korea	10	0	6	12	18
All others	144	244	169	4	10
Total	15,338	10,990	13,336	16,813	15,157
Terephthalic acid and its salts:					
Canada	80,992	83,199	82,614	79,816	91,001
Argentina	3	10,744	21,115	0	36,350
Indonesia	11,989	397	0	0	523
Brazil	9,752	8.969	5,776	2,713	363
Mexico	0	11	0	24	14
Dominican Republic	0	0	0	0	11
All others	88,329	86,740	35,434	6.940	0
Total	191,064	190,060	144,939	89,492	128,262

Table B-2–*Continued*
Organic commodity chemicals: U.S. exports of domestic merchandise, by principal markets, 1997-2001

(1,000 dollars)

Item/country	1997	1998	1999	2000	2001
Dimethyl terephthalate:					
Brazil	4	9	52	12	985
Taiwan	275	0	393	2,297	645
Mexico	0	0	167	879	246
Colombia	0	0	0	0	33
Israel	0	0	0	0	22
United Kingdom	0	0	0	11	12
All others	3,323	4,751	1,808	192	7
Total	3,603	4,760	2,420	3,391	1,949
Aniline and its salts:					
Korea	686	0	3,269	9,375	11,863
India	0	2,206	0	42	690
Japan	2,854	3,584	2,594	3,291	483
China	158	767	0	0	474
Mexico	1,783	1,517	1,770	893	433
Netherlands	216	1,402	1,987	1,431	359
All others	829	1,793	722	912	538
Total	6,526	11,269	10,343	15,944	14,842
6-Hexanelactam (epsilon-caprolactam):					
Taiwan	75,928	64,593	45,092	58,262	41,535
Canada	39,679	38,438	31,878	29,388	39,423
Korea	3,303	5,022	4,668	3,043	11,834
Indonesia	0	0	0	0	3,111
China	0	3	540	6	1,624
Argentina	0	0	0	1,303	1,146
All others	94	116	4,026	4,865	244
Total	119,004	108,172	86,205	96,867	98,916
Grand totals	1,283,396	1,266,276	1,473,522	2,146,265	1,494,331

Note.—Due to rounding, totals may not match the sum of all entries.

Source: Compiled from official statistics of the U.S. Department of Commerce.