SILICON

By Larry D. Cunningham

Silicon (Si) is a light chemical element having metallic and nonmetallic characteristics. In nature, silicon combines with oxygen and other elements to form silicates. Silicon in the form of silicates constitutes more than 25% of the Earth's crust. Silica is a silicate consisting entirely of silicon and oxygen. Silica (SiO_2) as quartz or quartzite is used to produce silicon-base products for the aluminum, chemical, and iron and steel industries.

Silicon metal and ferrosilicon are referred to by the approximate percentage of silicon contained in the material and by the maximum amount of trace impurities present. There are two standard grades of ferrosilicon; one grade is approximately 50% silicon, and the other 75% silicon by weight. Almost all ferrosilicon products are consumed by the iron and steel industry.

Metallurgical-grade silicon metal is used by the primary aluminum, secondary aluminum, and chemical industries. The products sold to these industries vary considerably in their specifications. The chemical and primary aluminum industries generally require more stringent specifications than those of the secondary aluminum industry. In addition, the chemical industry requires that the metal be ground into a fine powder rather than the lump form used by the aluminum industry.

The average annual dealer import price for ferrosilicon and silicon metal increased from that of 1994. Based on contained silicon, overall domestic silicon production increased slightly to about 396,000 metric tons, and consumption of silicon decreased to about 609,000 tons.

Overall U.S. trade volume, gross weight, of silicon exports was up by more than 30%, while overall trade volume of silicon imports increased by about 4%. The U.S. net import reliance for silicon products was estimated to be about 35%.

Legislation and Government Programs

The General System of Preferences (GSP) program expired on July 31, 1995. The program had not been extended by yearend. Under GSP, the United States grants duty-free access to goods from more than 140 developing countries and territories. In 1995, U.S. import duties for selected silicon materials ranged from duty free to 9% ad valorem for most-favored-nation (MFN) status and from $0.044 per kilogram of contained silicon to 45% ad valorem for non-MFN status.

In August, the U.S. Department of Commerce (DOC) announced in the Federal Register the revocation, in part, of its countervailing duty order on ferrosilicon from Venezuela. The DOC revoked the 22.08% countervailing duty on ferrosilicon categorized as containing 80% to 90% silicon and more than 90% silicon, respectively. The DOC will refund with interest any estimated duties collected since January 1, 1995. The 22.08% countervailing duty assessed on all other categories of ferrosilicon from Venezuela remained unchanged.

Additionally, the DOC in December announced in the Federal Register an amendment to its June 1993 final antidumping duty order on ferrosilicon from Venezuela. In May, the DOC submitted to the Court of International Trade (CIT) final results of its redetermination pursuant to a court remand in the case. The CIT affirmed DOC's redetermination in September, and there were no appeals of the decision from interested parties. Subsequently, DOC raised the dumping margin for ferrosilicon from Venezuela from 9.55% to 15.01%. The DOC will determine, and the Customs Service will assess, antidumping duties on all appropriate entries of ferrosilicon from Venezuela.

The DOC in March announced in the Federal Register preliminary results of its administrative review of the antidumping duty order on silicon metal from Brazil. DOC's review of Brazil covered four manufacturers during the period July 1, 1992, through June 30, 1993: Companhia Brasileira Carbureto de Calcio (CBCC), Companhia Ferroligas Minas Gerais, Eletrosilex Belo Horizonte (Eletrosilex), and Rima Electrometalurgia S.A. (RIMA). DOC preliminarily determined that a margin of 21.39% exists for CBCC, a margin of 11.28% exists for Eletrosilex, and a margin of 20.83% exists for RIMA.

In July, the DOC announced in the Federal Register an amendment to its September 1991 final determination and antidumping duty order on silicon metal from Argentina. The amendment/redetermination was in response to a remand order from the CIT. The DOC's redetermination resulted in the dumping margin for silicon metal from Argentina being raised from 8.65% to 17.87%. In December, the DOC also announced in the Federal Register final results of its administrative review of the antidumping duty order on silicon metal from Argentina. As a result of its review, DOC determined that a margin of 24.62% existed for Silarsa S.A. for the period September 1, 1993, through August 31, 1994.

Production

Overall gross production and shipments of silicon products in the United States increased slightly compared with that of 1994. Producer stocks of silicon-containing materials were down by about 26% overall.

Domestic production data for the silicon commodity are developed by the U.S. Geological Survey by means of monthly and annual voluntary surveys, and Survey estimates for

nonrespondents. The "Silicon Alloys" survey canvasses the operations listed in table 3. The figures in table 2 represent 100% of the production and shipments from these operations. *(See tables 1, 2, and 3.)*

Production of silicon metal and silicon alloys is extremely power intensive, requiring a power input, for some operations, of up to 14,000 kilowatthours per ton of silicon content.

The location of ferrosilicon and silicon metal smelters is normally determined by balancing marketing costs against processing costs. Principal elements in the cost of silicon and ferrosilicon production are (1) delivered costs of the ore (quartz or quartzite), (2) energy cost, (3) cost of reductant coke or low ash coal, (4) cost of iron in the form of steel scrap, if required, and (5) labor.

Recovery of silicon from secondary sources is not normally practiced. The only secondary possibility is recovery from scrap metal. However, any value of contained silicon is incidental to the value of the primary metal. In 1995, the average price for ferrosilicon was about $0.58 per pound, and the average price for silicon metal was about $0.69 per pound. For the future, recycling of silicon in the form of ferrosilicon and silicon metal is expected to be insignificant.

In February, Simetco Inc., headquartered in Canton, OH, consummated its chapter 11 plan of reorganization, approved by the U.S. Bankruptcy Court in December 1994, by selling all of its operating assets to Simcala Inc., Canton, OH. The purchase price of approximately $20 million (including cash, deferred payments, and preferred stock of Simcala) will be dispensed through a distribution trust for the benefit of Simetco's unsecured creditors.[1] Assets purchased by Simcala include Simetco's silicon metal production facility in Montgomery, AL. Simcala plans to invest in excess of $8 million to upgrade the plant and restore operation of a third silicon metal furnace, which has been idle for a number of years.[2]

Late in the year, it was reported that Witco Corp., Greenwich, CT, a speciality chemicals producer, had completed its tender offer for the acquisition of OSi Specialties, Inc., Danbury, CT, a silicone products producer. Witco reportedly would acquire 100% of OSi's equity through a cash merger with DLJ Merchant Banking Partners LP, New York, for about $486 million. Also, Witco would assume OSi's debt of $276 million. In 1993, DLJ and investors had purchased from Union Carbide Corp., Danbury, CT, its OrganoSilicon Products, Systems and Services business (now known as OSi Specialties, Inc.). OSi's worldwide sales in 1995 were expected to be about $400 million, with about 50% of the sales outside the United States.[3]

In May, it was reported that Dow Corning Corp., Midland, MI, a joint venture between Dow Chemical Co. and Corning Inc., had filed for protection from its creditors under chapter 11 of the U.S. Bankruptcy Code. The bankruptcy filing is not expected to have a major impact on the company's day-to-day operations. Dow had been faced with mounting costs relating to silicone breast implant litigation. The company makes numerous silicone products, including fluids, gels, greases, elastomers, and resins. However, Dow discontinued the manufacture of silicone gel-filled breast implants in March 1992, following a moratorium on the sale of the product by the Food and Drug Administration (FDA).[4] The FDA moratorium was prompted by safety and health concerns surrounding leaky and (or) ruptured implants allegedly causing autoimmune diseases.

Cabot Corp., Boston, MA, announced plans to build a $50 million fumed silica plant in Midland, MI, on property leased from Dow Corning Corp. The plant will have an annual capacity to produce 16 million pounds of fumed silica, with commercial production anticipated in the first quarter of 1999. Much of the plant's production will be used by Dow, Cabot's largest fumed silica customer, to produce silicone rubber products.[5]

GE Silicones reportedly plans a $48 million expansion of its silicones plant in Waterford, NY. The expansion will increase the plant's capacity to produce siloxane, a silicone intermediate, by 22%. The company makes sealants, fluids, rubbers, and resins at the plant. Startup of the new facility is planned for late 1996.[6]

Consumption

The aluminum industry continued to use silicon metal in the production of wrought and cast products, while ferrosilicon continued to be used primarily as a deoxidizing and alloying agent in the production of iron and steel products. Metallurgical-grade silicon metal also was used as the basic raw material in the manufacturing of many chemical products and intermediates such as silicones and silanes. Overall reported consumption of silicon alloys and metal continued to rise. *(See table 4.)*

U.S. apparent consumption of silicon metal and silicon-containing ferroalloys was estimated to be about 609,000 tons of contained silicon, down from that in 1994. Consumption of silicon metal was estimated to be about 228,000 tons, while consumption of ferrosilicon and miscellaneous silicon alloys was estimated to be about 381,000 tons. Compared with that of 1994, consumption of silicon metal decreased by more than 10%, while consumption of ferrosilicon and miscellaneous silicon alloys increased by about 6%. Ferrosilicon and miscellaneous silicon alloys accounted for over 60% of all the silicon materials consumed, based on silicon content.

Prices

Demand for metallurgical-grade silicon alloys and metal is determined by the level of activity in the steel, ferrous foundry, aluminum, and chemical industries and is little affected in the short term by prices for these materials. As a result, prices tend to vary widely with changes in demand and supply.

The overall Platt's Metals Week "dealer import" price, posted in cents per pound of contained silicon, for 50%- and 75%-grade ferrosilicon increased by about 30% and 40%, respectively, compared with that in 1994. *(See table 1.)* The import price for 50%-grade ferrosilicon increased progressively from a range of $0.44 to $0.45 per pound to a range of $0.64 to

$0.66 by yearend. The import price for 75%-grade ferrosilicon started the year at a range of $0.42 to $0.43 per pound, peaked in August at $0.65 to $0.67, then fell to $0.63 to $0.645 by yearend.

The overall Metals Week "dealer import" price, posted in cents per pound of contained silicon, for silicon metal increased by about 8% compared with that of 1994. *(See table 1.)* The import price for silicon metal rose from a range of $0.65 to $0.67 per pound to $0.73 to $0.75 by yearend.

The escalating prices for both ferrosilicon and silicon metal were influenced by the respective tight markets, antidumping duties imposed in the United States and Europe on certain producing countries, and declining exports to the West from China and producing countries of the former U.S.S.R.

Foreign Trade

U.S. exports of ferrosilicon increased by about 9% compared with that of 1994, based on gross weight, while total value of the exports was up by about 12%. *(See table 5.)* About 45% of the exported material was shipped to Canada compared with about 50% shipped to Canada in 1994. Silicon metal exports increased twofold based on gross weight, with total value of the exports up by about 40%. Canada, Japan, and Mexico continued to be major recipients of the materials, with about 70% of the total.

U.S. imports of silicon-containing alloys were up by about 7% compared with that of 1994. *(See table 6.)* Total value of the exports was up by more than 30%. Imports of ferrosilicon categorized as "55% to 80% silicon, other" increased by about 10% based on gross weight, with the total value for this category increasing by about 35%. Brazil, Iceland, and Norway continued to be the leading suppliers for this category, with almost 80% of the total. Imports of ferrosilicon categorized as "Other," which included all ferrosilicon of less than 55% silicon content, decreased by about 20%, with Canada accounting for most of the imports. Norway continued to account for over 30% of total ferrosilicon imports.

Overall imports of silicon metal products declined by 4%, with total value of imports up by about 17%. Imports of silicon metal categorized as "99.00% to 99.99% silicon" increased by about 20%, with Brazil and Canada providing over 60% of both total volume and value. Imports of "Other" silicon metal decreased by about 20%, with Russia supplying almost 80% of both volume and value for this category. Brazil, Canada, and Russia accounted for over 70% of total silicon metal imports.

The schedule of applied tariffs during 1995 to U.S. imports of selected silicon materials can be found in the U.S. International Trade Commission's (USITC's) 1995 Harmonized Tariff Schedule of the United States, USITC Publication 2690.

The U.S. net import reliances for ferrosilicon and silicon metal products were estimated to be 38% and 30%, respectively, compared with 36% and 38% in 1994. The overall import reliance for silicon products was estimated to be 35% compared with 37% in 1994.

World Review

In 1995, world production of ferrosilicon was about 3.9 million tons, little change from that produced in 1994. In order of magnitude, China, Norway, the United States, Russia, Kazakstan, Ukraine, and Brazil, were the major producers, accounting for about 80% of total production. For the same period, production of silicon metal, excluding China, was about 524,000 tons, down slightly from that produced in 1994. The United States, Brazil, France, Norway, Russia, South Africa, and Australia accounted for about 90% of total production. The reader is referred to table 18 of the Iron and Steel Mineral Industry Surveys for annual world production of ferrosilicon and silicon metal, by country.

Statistics published by CRU International LTD (CRU) indicated that Western World consumption of ferrosilicon in 1995 increased to about 2.2 million tons from about 2.1 million tons in 1994. Major consuming countries, notably Japan, the United States, Germany, Italy, France, and the United Kingdom accounted for about 60% of the total. For silicon metal, CRU reported that Western World consumption was 776,000 tons compared with 766,000 tons in 1994. The United States, Japan, Germany, the United Kingdom, France, and Italy were the major consuming countries, accounting for about 80% of the total.

In Brazil, Italmagnesio S.A., a major silicon producer in Minas Gerais state, announced that the company had taken final steps for recovery from Concordata, similar to U.S. chapter 11 bankruptcy protection. The company reportedly settled all its pending supplier debts and was concluding creditor bank renegotiations.[7] Italmagnesio had entered into a 2-year period of Concordata in September 1993 for the purpose of restructuring the company's debt. Italmagnesio's has an annual silicon production capacity of about 60,000 tons at its facilities in the Minas Gerais and Sao Paulo states. Brazil's Eletrosilex S.A., another silicon metal producer in Minas Gerais state, indicated plans to form a consortium, along with other Minas Gerais-based metal producers and the state energy authority, to build a hydroelectric power station in the state at Igarapava. Eletrosilex plans to issue shares in the company to raise $25 million to finance its 13% stake in the venture. The new power station is expected to be operational by 1997 and will provide about 65% of Eletrosilex's energy requirements.[8]

According to The TEX Report, production of ferrosilicon in China in 1995 was expected to be in the range of 750,000 tons to 800,000 tons. The TEX Report also reported that Chinese exports of ferrosilicon in 1995 totaled about 390,000 tons valued at more than $210 million, compared with about 300,000 tons valued at about $148 million in 1994.

Japan's production of ferrosilicon was about 3,650 tons, down significantly from the 12,200 tons produced in 1994. According to The TEX Report, imports of ferrosilicon by Japan totaled about 560,000 tons, compared with about 484,000 tons the previous year. China remained as the leading supplier accounting for about 330,000 tons of total imports. Japan's production of high-purity silicon metal was about 3,330 tons, compared with about 3,030 tons produced in 1994. Imports of

silicon metal by Japan totaled about 180,000 tons compared with about 152,000 tons in 1994. China accounted for almost 60% of total silicon metal imports. Consumption of silicon metal by the Japanese aluminum alloy sector decreased slightly to about 52,000 tons, while the production of secondary aluminum alloys was down by about 2%.

Outlook

Demand for silicon metal will continue to be driven by consumption in the aluminum and chemical industries. Consumption by these industries is expected to increase by about 4% annually through the year 2000. Contributing to this growth will be increased use of primary aluminum and aluminum alloys in the automotive industry. Within the chemical industry, silicon metal is used to produce a wide variety of silicone-base products and intermediates. Industry sources, as reported by Ryan's Notes, indicates that demand for silicon metal in the chemical sector has been growing by more than 7% annually. Future growth in this sector will be aided by increased demand for silicones from countries such as China, India, and Russia; new silicones products; and silicones substitution for other materials. For 1996, industry sources indicate that Western World silicon metal demand will be about 850,000 tons. By the year 2000, overall silicon metal demand is expected to be about 1 million tons.

The demand trend for ferrosilicon will continue to follow the trend of the iron and steel industry. The industry uses ferrosilicon for deoxidation of molten metal and as an alloying agent. The reader is referred to the outlook section of the Iron and Steel Annual MIS for discussion on the outlook for the steel industry. Additionally, industry sources indicate that world demand for steel in 1996 will be minimal. However, demand growth in 1997 could approach 5% as a result of a recovery in the global economy and demand strength in Eastern Europe and Southeast Asia. Through the year 2000, annual steel consumption growth in North America was projected at about 1%; while annual growth in Latin America and Central and Eastern Europe was projected at about 4%, respectively. Steel consumption in Japan in the year 2000 was projected to be slightly higher than in 1995.[9]

For 1996, it is estimated that domestic production of silicon-containing ferroalloys and metal will be about 410,000 tons, and U.S. apparent consumption will be about 600,000 tons.

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[1]Simcala Inc. SEC Form 8-K Report, Feb. 10, 1995.

[2]Platt's Metals Week. V. 66, No. 7, Feb. 20, 1995, p. 9.
American Metal Market. V. 103, No. 35, Feb. 22, 1995, p. 5.
[3]Chemical and Engineering News. V. 73, No. 51, Dec. 18, 1995, p. 12.
Chemical Marketing Reporter. V. 248, No. 12, Sept. 18, 1995, p. 3.
[4]Chemical Week. V. 156, No. 20, May 24, 1995, p. 9.
Chemical and Engineering News. V. 73, No. 21, May 22, 1995, p. 6.
[5]Cabot Corp. 1995 Annual Report. 44 pp.
Chemical Marketing Reporter. V. 248, No. 7, Aug. 14, 1995, p. 5.
[6]—. V. 248, No. 18, Oct. 30, 1995, p. 4.
[7]The TEX Report. V. 27, No. 6463, Oct. 23, 1995, p. 1.
[8]American Metal Market. V. 103, No. 142, July 26, 1995, p. 5.
Metal Bulletin. No. 8003, Aug. 10, 1995, p. 11.
[9]Iron and Steelmaker. V. 22, No. 12, Dec. 1995, pp. 41-42.

OTHER SOURCES OF INFORMATION

U.S. Geological Survey Publications

Metal Prices in the United States through 1991.
Silicon. Ch. in Mineral Commodity Summaries, annual.
Silicon. Ch. In Minerals Facts and Problems, 1985 ed.
Silicon. Ch. in Minerals Yearbook, annual.
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Ultra-High Purity Silicon for Infrared Detectors, IC 9237.

Other Sources

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Chemical and Engineering News, weekly.
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Chemical Week, weekly.
Company Annual and Quarterly Reports, and News Releases.
CRU Metal Monitor, Bulk Ferroalloys (London).
Engineering and Mining Journal, monthly.
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Ferroalloy Directory and Data Book, 3d ed., Metal Bulletin Books Ltd.
Industrial Minerals (London), monthly.
Metal Bulletin (London), semiweekly and monthly.
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Mining Journal (London), weekly.
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Platt's Metals Week, weekly.
Roskill's Letter from Japan, monthly.
Ryan's Notes.
The Economics of Silicon and Ferrosilicon 1994, Roskill Information Services Ltd. (London).
The TEX Report (Tokyo; daily issues and annual ferroalloy manual).

TABLE 1
SALIENT SILICON STATISTICS 1/

(Thousand metric tons of silicon content unless otherwise specified)

	1991	1992	1993	1994	1995
United States:					
Production	363	370	367	390	396
Exports:					
Ferrosilicon	27	30	21	20	22
Silicon metal	8	8	10	12	25
Imports for consumption:					
Ferrosilicon	121	161	141	147	158
Silicon metal	43	32	71	108	92
Apparent consumption:					
Ferrosilicon	325	337	335	360	381
Silicon metal	175	195	222	256	228
Price, average per pound Si: 2/					
Ferrosilicon, 50% Si	$0.383	$0.369	$0.408	$0.439	$0.579
Ferrosilicon, 75% Si	$0.370	$0.354	$0.406	$0.408	$0.581
Silicon metal	$0.615	$0.600	$0.664	$0.641	$0.695
World production (gross weight): e/					
Ferrosilicon	4,300	4,100	4,000 r/	3,900 r/	3,900
Silicon metal	590	560	550	530 r/	520

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

2/ Platt's Metals Week dealer import prices.

TABLE 2
PRODUCTION, SHIPMENTS, AND STOCKS OF SILVERY PIG IRON,
FERROSILICON, AND SILICON METAL IN THE UNITED STATES IN 1995 1/

(Metric tons, gross weight, unless otherwise specified)

Material	Silicon content (percentage)		Producers' stocks, Dec. 31, 1994	Gross production 2/	Net shipments	Producers' stocks, Dec. 31, 1995
	Range	Typical				
Silvery pig iron	5-24	18	W	W	W	W
Ferrosilicon	25-55	48	35,400	181,000	130,000	19,900
Do.	56-95	76	20,100	128,000	131,000	19,300
Silicon metal (excluding semiconductor grades)	96-99	98	6,360	163,000	161,000	5,080
Miscellaneous silicon alloys (excluding silicomanganese)	32-65	--	13,400	108,000	99,500	11,400

W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits.

2/ Ferrosilicon production includes material consumed in the production of miscellaneous silicon alloys.

TABLE 3
PRINCIPAL PRODUCERS OF SILICON ALLOYS AND/OR SILICON METAL
IN THE UNITED STATES IN 1995

Producer	Plant location	Product 1/
American Alloys Inc.	New Haven, WV	FeSi and Si.
American Silicon Technologies	Rock Island, WA	Si.
Applied Industrial Minerals Corp.	Bridgeport, AL	FeSi.
Elkem Metals Co.	Alloy, WV	Si.
Globe Metallurgical Inc.	Beverly, OH	FeSi and Si.
Do.	Niagara Falls, NY	FeSi and Si.
Do.	Selma, AL	Si.
Do.	Springfield, OR	Si.
Keokuk Ferro-Sil Inc.	Keokuk, IA	FeSi and silvery pig iron.
Simcala Inc. 2/	Montgomery, AL	Si.
SKW Metals and Alloys Inc.	Calvert City, KY	FeSi.

1/ FeSi, ferrosilicon; Si, silicon metal.

2/ Formerly Simetco Inc., Feb. 1995.

TABLE 4
REPORTED CONSUMPTION, BY MAJOR END USE, AND STOCKS OF SILICON ALLOYS
AND METALS IN THE UNITED STATES IN 1995 1/ 2/

(Metric tons, gross weight, unless otherwise specified)

Silicon content (percentage)	Silvery pig iron	Ferrosilicon 3/				Silicon metal	Miscellaneous silicon alloys 4/	Silicon carbide 5/
Range	5-24	25-55	56-70	71-80	81-95	96-99	--	63-70
Typical	18	48	65	76	85	98	48	64
End use								
Steel:								
Carbon	--	30,400	(6/)	20,500	(6/)	(6/)	(6/)	(6/)
Stainless and heat-resisting	--	(6/)	(6/)	34,100	(6/)	(6/)	--	--
Other alloy	(6/)	(6/)	--	(6/)	(6/)	(6/)	(6/)	--
Tool	--	--	--	(6/)	(6/)	--	--	--
Unspecified	22	20,200	59	25,100	662	11,400	2,410	21
Total	22	50,600	59	79,700	662	11,400	2,410	21
Cast irons	23,100	108,000	2,880	19,000	456	W	W	34,800
Superalloys	--	W	W	W	33	W	--	--
Alloys (excluding superalloy and alloy steel)	W	W	--	W	--	W	--	W
Miscellaneous and unspecified	11	2,450	3	847	--	232,000 7/	110,000	5
Grand total	23,100	161,000	2,940	99,500	1,150	244,000	112,000	34,800
Consumers' stocks, December 31	1,230	6,830	196	9,310	54	2,670	9,490	1,250

W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous and unspecified."
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes U.S. Geological Survey estimates.
3/ Includes briquets.
4/ Primarily magnesium-ferrosilicon but also includes other silicon alloys.
5/ Does not include silicon carbide for abrasive or refractory uses.
6/ Included in "Steel: Unspecified."
7/ Includes silicones, silanes, fumed silica, and other chemicals.

TABLE 5
U.S. EXPORTS OF FERROSILICON AND SILICON METAL, BY GRADE AND COUNTRY, IN 1995 1/

(Metric tons)

Country	Gross weight	Contained weight	Value
Ferrosilicon:			
Over 55% silicon:			
Argentina	54	33	$43,300
Australia	174	105	280,000
Canada	7,440	4,470	6,090,000
Germany	61	43	100,000
India	140	85	236,000
Japan	388	233	498,000
Korea, Republic of	77	46	75,000
Mexico	1,680	1,140	1,660,000
Taiwan	508	305	489,000
United Kingdom	41	25	72,000
Other	161	100	183,000
Total	10,700	6,580	9,720,000
Other ferrosilicon:			
Australia	1,040	519	1,390,000
Canada	11,100	5,570	7,600,000
India	1,090	545	1,610,000
Japan	4,150	2,070	7,890,000
Korea, Republic of	2,240	1,120	1,980,000
Mexico	1,380	688	1,390,000
Spain	294	147	242,000
Taiwan	492	246	483,000
Turkey	502	251	450,000
United Kingdom	7,360	3,680	6,420,000
Other	1,190	591	1,420,000
Total	30,900	15,400	30,900,000
Total ferrosilicon	41,600	22,000	40,600,000
Metal:			
Over 99.99% silicon:			
China	85	85	3,580,000
Czech Republic	23	23	990,000
Denmark	41	41	3,260,000
Germany	103	103	5,290,000
Italy	72	72	3,950,000
Japan	1,630	1,630	93,000,000
Korea, Republic of	382	382	16,700,000
Malaysia	123	123	29,600,000
Poland	26	26	761,000
Taiwan	32	32	1,460,000
Other	131	131	6,530,000
Total	2,650	2,650	165,000,000
99.00% - 99.99% silicon:			
China	51	50	71,700
Germany	105	104	208,000
Ghana	146	145	250,000
Israel	356	353	523,000
Japan	38	38	86,000
Malaysia	1,720	1,710	3,230,000
Mexico	105	104	152,000
Thailand	32	32	49,400
United Kingdom	483	479	682,000
Venezuela	142	141	244,000
Other	124	122	181,000
Total	3,300	3,270	5,680,000
Other silicon:			
Canada	4,650	4,510	4,920,000
China	57	55	80,500
Germany	483	469	647,000
Japan	2,210	2,150	3,450,000
Korea, Republic of	320	311	437,000
Malaysia	982	954	1,420,000
Mexico	9,160	8,900	12,300,000
Sweden	85	83	136,000
Taiwan	555	539	738,000
United Kingdom	163	158	215,000
Other	484	470	808,000
Total	19,200	18,600	25,200,000
Total silicon metal	25,100	24,500	196,000,000

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF FERROSILICON AND SILICON METAL, BY GRADE AND COUNTRY, IN 1995 1/

(Metric tons)

Country	Gross weight	Contained weight	Value
Ferrosilicon:			
55% - 80% silicon, over 3% Ca:			
Brazil	100	60	$99,500
France	16	9	32,000
Total	116	70	131,000
55% - 80% silicon, other:			
Argentina	1,810	1,360	1,570,000
Brazil	50,700	38,300	39,800,000
Canada	6,360	4,850	4,770,000
Egypt	5,210	3,010	2,850,000
Iceland	34,700	26,700	25,000,000
Macedonia	8,560	6,440	6,870,000
Norway	71,500	53,700	53,800,000
Poland	9,200	6,860	5,760,000
Romania	640	480	557,000
South Africa	9,300	6,880	6,270,000
Other	1,480	1,020	3,310,000
Total	199,000	150,000	151,000,000
80% - 90% ferrosilicon	--	--	--
Over 90% ferrosilicon:			
Romania	658	606	255,000
Magnesium ferrosilicon:			
Brazil	3,060	1,420	2,480,000
Canada	1,460	708	1,020,000
Germany	196	109	762,000
Japan	110	58	250,000
Norway	1,140	517	1,260,000
Total	5,960	2,810	5,770,000
Other ferrosilicon:			
Brazil	60	28	85,500
Canada	12,600	4,370	7,540,000
Norway	41	19	48,900
United Kingdom	5	2	19,500
Total	12,700	4,420	7,690,000
Total ferrosilicon	219,000	158,000	164,000,000
Metal:			
Over 99.99% silicon:			
China	22	22	3,000,000
Germany	576	576	23,000,000
Italy	218	218	15,800,000
Japan	316	316	14,900,000
Kenya	13	13	196,000
Korea, Republic of	17	17	2,630,000
Russia	4	4	462,000
Taiwan	7	7	170,000
Ukraine	9	9	387,000
United Kingdom	12	12	1,210,000
Other	12	12	1,170,000
Total	1,210	1,210	62,900,000
99.00% - 99.99% silicon:			
Australia	7,210	7,160	9,410,000
Brazil	13,600	13,500	17,600,000
Canada	13,900	13,800	20,100,000
China	120	119	115,000
France	4,470	4,440	6,210,000
India	100	99	109,000
Macedonia	80	79	84,600
Norway	2,660	2,640	4,330,000
Russia	32	32	43,900
South Africa	2,360	2,330	2,930,000
Other	48	47	174,000
Total	44,500	44,200	61,100,000

See footnotes at end of table.

TABLE 6--Continued
U.S. IMPORTS FOR CONSUMPTION OF FERROSILICON AND SILICON METAL, BY GRADE AND COUNTRY, IN 1995 1/

(Metric tons)

Country	Gross weight	Contained weight	Value
Metal--Continued:			
Other silicon:			
Brazil	953	934	1,160,000
Canada	964	908	1,350,000
China	2,160	2,060	2,100,000
Finland	1,030	1,010	1,080,000
Hong Kong	349 2/	136	305,000
Macedonia	2,580	2,530	2,920,000
Romania	1,090	1,070	1,190,000
Russia	39,300	36,300	41,600,000
South Africa	410	402	455,000
Ukraine	981	952	1,050,000
Other	371	359	524,000
Total	50,200	46,600	53,800,000
Total silicon metal	95,900	92,000	178,000,000

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Silicon content of material not yet verified.

Source: Bureau of the Census.