

SILICON

(Data in thousand metric tons of silicon content, unless otherwise noted)

Domestic Production and Use: Estimated value of silicon metal and alloys (excluding semiconductor-grade silicon) produced in the United States in 1998 was about \$580 million. Ferrosilicon was produced by six companies in seven plants, and silicon metal was produced by five companies in eight plants. Three of the eight companies in the industry produced both products. Most of the ferrosilicon and silicon metal plants were east of the Mississippi River or in the Pacific Northwest. Most ferrosilicon was consumed in the ferrous foundry and steel industries, predominantly in the eastern one-half of the United States. The main consumers of silicon metal were aluminum producers and the chemical industry. The semiconductor industry, which manufactures chips for computers from high-purity silicon, accounted for only a few percent of silicon demand.

Salient Statistics—United States:	1994	1995	1996	1997	1998^e
Production	390	396	412	430	433
Imports for consumption	255	250	227	256	250
Exports	32	47	44	50	50
Consumption, apparent	616	609	594	628	632
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	43.9	57.9	64.0	54.8	52
Ferrosilicon, 75% Si	40.8	58.1	62.2	48.0	43
Silicon metal	64.1	69.5	89.7	81.4	71
Stocks, producer, yearend	45	35	35	44	45
Net import reliance ² as a percent of apparent consumption	37	35	31	32	32

Recycling: Insignificant.

Import Sources (1994-97): Norway, 25%; Russia, 15%; Brazil, 12%; Canada, 11%; and other, 37%.

Tariff: Item	Number	Normal Trade Relations (NTR) 12/31/98	Non-NTR³ 12/31/98
Ferrosilicon, 55%-80% Si:			
More than 3% Ca	7202.21.1000	1.1% ad val.	11.5% ad val.
Other	7202.21.5000	1.5% ad val.	11.5% ad val.
Ferrosilicon, 80%-90% Si	7202.21.7500	1.9% ad val.	9% ad val.
Ferrosilicon, more than 90% Si	7202.21.9000	5.8% ad val.	40% ad val.
Ferrosilicon, other:			
More than 2% Mg	7202.29.0010	Free	4.4¢/kg Si.
Other	7202.29.0050	Free	4.4¢/kg Si.
Silicon, more than 99.99% Si	2804.61.0000	0.7% ad val.	25% ad val.
Silicon, 99.00%-99.99% Si	2804.69.1000	5.3% ad val.	21% ad val.
Silicon, other	2804.69.5000	6.2% ad val.	45% ad val.

Depletion Allowance: Quartzite, 14% (Domestic and Foreign); gravel, 5% (Domestic and Foreign).

Government Stockpile: Information on silicon carbide in the National Defense Stockpile is discussed in the "Manufactured Abrasives" chapter.

Events, Trends, and Issues: Domestic apparent consumption of silicon for 1998 is projected as 3% greater than the average for 1994-97. Of the 1998 total, ferrosilicon is estimated to account for 56% and silicon metal 44%. Growth in demand for ferrosilicon is expected to be at an annual rate in the range of 1% to 2%, in line with long-term trends in domestic steel production, which was strong during the first three quarters of 1998. Growth in demand for silicon metal is expected to be greater, as the annual growth rate in demand from the aluminum industry has been about 3% and from the chemical industry about 8%. The chemical industry, principally silicones, may soon overtake the aluminum industry as the largest user of metal. Global economic uncertainties that surfaced during 1998, and a strike at one of the three major U.S. automobile producers, seemed liable to affect domestic demand for silicon metal more than for ferrosilicon.

In terms of contained silicon, domestic production continued on an upward course in 1998, mainly because of increased production of silicon metal. In line with a global trend to emphasize production of silicon metal, one domestic producer restarted a silicon metal furnace and another planned to add one.

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Prices for silicon materials in the U.S. market showed decreases through at least the first three quarters of 1998. Prices as of the end of September versus those at the beginning of the year were lower by 2% for 50% ferrosilicon, 8% for 75% ferrosilicon, and 4% for silicon metal. As of the end of September, the range in dealer import price, in cents per pound of contained silicon, was 50 to 53 for 50% ferrosilicon, 41.25 to 42.75 for 75% ferrosilicon, and 65 to 73 for silicon metal.

The outcome of lawsuits and changes in the status of protective tariffs continued to claim the attention of the domestic industry. Settlements were reached in some of the lawsuits claiming damages from price fixing alleged to have occurred around 1990. Certain of the antidumping duties initially imposed in the early 1990's on imported ferrosilicon and/or silicon from China and various Latin American countries and republics of the Commonwealth of Independent States continued to be receiving annual review by the International Trade Administration of the U.S. Department of Commerce. In the latter part of the year, the U.S. International Trade Commission agreed to conduct a changed circumstances review of its determination regarding antidumping and countervailing duties on ferrosilicon but not silicon metal. This raised the possibility that such duties on imported ferrosilicon eventually might be negated.

World Production, Reserves, and Reserve Base:

	Production ^e		Reserves and reserve base ⁴
	1997	1998	
United States	430	433	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Australia	29	29	
Brazil	271	260	
Canada	58	58	
China	826	880	
Egypt	26	26	
France	157	160	
Iceland	46	46	
India	58	55	
Kazakhstan	65	81	
Macedonia	37	33	
Norway	413	420	
Poland	47	47	
Russia	362	380	
Slovakia	20	20	
South Africa	115	120	
Spain	34	34	
Ukraine	195	195	
Venezuela	39	39	
Other countries	<u>124</u>	<u>110</u>	
World total (rounded)	3,400	3,400	

Production quantities given above are combined totals of estimated content for ferrosilicon and silicon metal, as applicable. For the world, ferrosilicon accounts for about four-fifths of the total. The leading countries for ferrosilicon were Brazil, China, Norway, Russia, Ukraine, and the United States, and for silicon metal Brazil, China, France, Norway, and the United States. China was by far the largest producer of ferrosilicon and may well have been the largest producer of silicon metal. China's production of silicon metal is not included in this tabulation because data are not available.

World Resources: World and domestic resources for making silicon metal and alloys are abundant, and, in most producing countries, adequate to supply world requirements for many decades. The source of the silicon is silica in various natural forms such as quartzite.

Substitutes: Various metals and alloys, such as aluminum and silicomanganese, can be substituted for ferrosilicon in some applications. Germanium and gallium arsenide are the principal substitutes for silicon in semiconductor and infrared applications.

^eEstimated.

¹Based on U.S. dealer import price.

²Defined as imports - exports + adjustments for Government and industry stock changes.

³See Appendix B.

⁴See Appendix D for definitions.