

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 2001 was about \$300 million. Ferrosilicon was produced by five companies in five plants, and silicon metal was produced by three companies in four plants. Two of the six companies in the industry produced both products. All but one of the active ferrosilicon and silicon metal plants were east of the Mississippi River. 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 producers of aluminum and aluminum alloys 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:	1997	1998	1999	2000	2001^e
Production	430	429	423	367	301
Imports for consumption	256	241	286	361	235
Exports	50	47	61	41	25
Consumption, apparent	628	616	643	689	518
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	54.8	52.1	49.1	45.0	43
Ferrosilicon, 75% Si	48.0	43.1	40.2	35.4	31
Silicon metal	81.4	70.5	58.1	54.8	52
Stocks, producer, yearend	44	50	54	52	45
Net import reliance ² as a percentage of apparent consumption	32	30	34	47	42

Recycling: Insignificant.

Import Sources (1997-2000): Norway, 27%; South Africa, 15%; Russia, 11%; Canada, 10%; and other, 37%.

Tariff: Item	Number	Normal Trade Relations 12/31/01
Ferrosilicon, 55%-80% Si:		
More than 3% Ca	7202.21.1000	1.1% ad val.
Other	7202.21.5000	1.5% ad val.
Ferrosilicon, 80%-90% Si	7202.21.7500	1.9% ad val.
Ferrosilicon, more than 90% Si	7202.21.9000	5.8% ad val.
Ferrosilicon, other:		
More than 2% Mg	7202.29.0010	Free.
Other	7202.29.0050	Free.
Silicon, more than 99.99% Si	2804.61.0000	Free.
Silicon, 99.00%-99.99% Si	2804.69.1000	5.3% ad val.
Silicon, other	2804.69.5000	5.5% ad val.

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

Government Stockpile: None.

Events, Trends, and Issues: Domestic apparent consumption of silicon for 2001 is projected to be the least since 1991. Of the 2001 total, the share accounted for by ferrosilicon is estimated to have decreased to 53%, while that for silicon metal increased to 47%. The annual growth rate for ferrosilicon demand usually falls in the range of 1% to 2%, in line with long-term trends in steel production. Through the first one-half of 2001, however, domestic steel production was 13% less than for 2000. During recent years, the annual growth rate for overall silicon metal demand has been in the vicinity of 5%. This rate probably was not sustained, at least in part because of lagging global demand by the chemical industry, principally for silicones. Formerly, the growth rate in chemical demand has averaged about 8%.

Domestic production in 2001, expressed in terms of contained silicon, is projected to have declined significantly. For all silicon materials combined, the overall decline was nearly 20% to the lowest level since 1982. Production was curtailed or stopped at some plants because of high power costs and/or slackening demand.

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Through the first 9 months of 2001, price trends in the U.S. market for silicon materials were downward for ferrosilicon and slightly upward for silicon metal. Compared with those at the beginning of the year, prices as of the end of September were lower by 8% to 10% for ferrosilicon and higher by 1% for silicon metal. Year-average prices were projected to be lower than those for 2000 for all forms of silicon; the largest percentage decline was expected for 75% ferrosilicon. The price for silicon metal was projected to be the least since 1977. At the end of September, the range in dealer import price, in cents per pound of contained silicon, was 40 to 42.5 for 50% ferrosilicon, 30 to 31 for 75% ferrosilicon, and 49 to 52 for silicon metal.

U.S. imports and exports of silicon materials in 2001, projected on the basis of data for the first 6 months of the year, were significantly less than those in 2000. The smallest overall percentage decline was for imports of silicon metal. Net import reliance declined but was still high in comparison with that for most prior years.

World Production, Reserves, and Reserve Base:

	Production ^e		Reserves and reserve base ³
	2000	2001	
United States	367	301	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Brazil	292	235	
Canada	66	59	
China	910	975	
France	145	137	
Iceland	46	48	
India	39	36	
Kazakhstan	78	88	
Norway	397	379	
Poland	47	44	
Russia	463	468	
Slovakia	46	39	
South Africa	98	97	
Spain	55	52	
Ukraine	210	211	
Venezuela	39	37	
Other countries	211	206	
World total (rounded)	3,500	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 production were 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: Aluminum, silicon carbide, and silicomanganese can be substituted for ferrosilicon in some applications. Gallium arsenide and germanium 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 C for definitions.