

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 2003 was about \$307 million. Ferrosilicon was produced by four companies in four plants, and silicon metal was produced by four companies in four plants. Two of the six companies in the industry produced both products. All 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:	1999	2000	2001	2002	2003^e
Production	423	367	282	261	250
Imports for consumption	286	361	231	285	300
Exports	61	41	23	22	23
Consumption, apparent	643	689	502	540	530
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	49.1	45.0	42.8	41.1	49
Ferrosilicon, 75% Si	40.2	35.4	31.9	32.8	45
Silicon metal	58.1	54.8	50.5	53.2	61
Stocks, producer, yearend	54	52	40	25	23
Net import reliance ² as a percentage of apparent consumption	34	47	44	52	54

Recycling: Insignificant.

Import Sources (1999-2002): Norway, 18%; South Africa, 16%; Russia, 10%; Canada, 10%; and other, 46%.

Tariff: Item	Number	Normal Trade Relations 12/31/03
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 2003 is projected to be slightly less than that of 2002. Of the 2003 total, the share accounted for by ferrosilicon is estimated to have decreased to 52% from 56% in 2002, while that for silicon metal increased to 48% from 44%. 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 9 months of 2003, however, domestic steel production was the same as that for the same period in 2002. Domestic shipments of silicon metal through the first 8 months in 2003 were about 19% higher than those of the same period in 2002. Demand for silicon metal comes primarily from the aluminum and chemical industries. In 2003, the demand growth rate in domestic specialty chemicals, which include silicones, was expected to be about that of total global chemical sector, 2%. While domestic primary production rose by about 2% through the first 9 months in 2003 compared year-on-year with 2002, production was projected to level off by yearend 2003. Global primary aluminum production in 2003 was 5% higher than that of 2002. Through the first 6 months in 2003, domestic secondary aluminum production was about 2% lower than that during the same period in 2002, while world secondary aluminum production rose slightly.

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Domestic production in 2003, expressed in terms of contained silicon, was projected to decline. For all silicon materials combined, the overall decline was 6% to the lowest level since 1982. Production was curtailed or stopped at some plants because of slackening demand.

Through the first 9 months of 2003, prices trended upward in the U.S. market for silicon materials, except for 50% ferrosilicon. Compared with those at the beginning of the year, weekly average prices as of the end of September were higher for 75% ferrosilicon (12%) and silicon metal (2%), and flat for 50% ferrosilicon. Year-average prices were projected to be higher for 50% ferrosilicon, 75% ferrosilicon, and silicon metal than those for 2002. At the end of September, the range in dealer import price, in cents per pound of contained silicon, was 46 to 48 for 50% ferrosilicon, 42.5 to 45 for 75% ferrosilicon, and 60 to 61 for silicon metal.

U.S. imports and exports of silicon materials in 2003, projected on the basis of data for the first 7 months of the year, were 7% more than those in 2002. The smallest overall percentage rise was for imports of silicon metal. Net import reliance rose in comparison with that for recent years owing to increases in silicon material imports.

World Production, Reserves, and Reserve Base:

	Production ^e		Reserves and reserve base ³
	2002	2003	
United States	261	250	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Brazil	217	230	
Canada	66	70	
China	1,270	1,600	
France	140	100	
Iceland	73	73	
India	34	34	
Kazakhstan	83	83	
Norway	390	350	
Poland	39	31	
Russia	490	480	
Slovakia	33	30	
South Africa	110	110	
Spain	55	60	
Ukraine	210	230	
Venezuela	38	58	
Other countries	214	210	
World total (rounded)	3,720	4,000	

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, Russia, Ukraine, and Brazil, and for silicon metal China, Brazil, France, the United States, and Norway. China was by far the largest producer of both ferrosilicon and silicon metal. An estimated 300,000 tons of silicon metal is included in China's total silicon production for 2003.

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.