

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 2004 was about \$440 million. Ferrosilicon was produced by four companies in five plants, and silicon metal was produced by three companies in five plants. Two of the five 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 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:	2000	2001	2002	2003	2004^e
Production	367	282	261	248	240
Imports for consumption	361	231	285	315	330
Exports	41	23	22	26	23
Consumption, apparent	689	502	540	543	560
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	45.0	42.8	41.1	47.7	59
Ferrosilicon, 75% Si	35.4	31.9	32.8	45.3	57
Silicon metal	54.8	50.5	53.2	61.3	81
Stocks, producer, yearend	52	40	25	28	21
Net import reliance ² as a percentage of apparent consumption	47	44	52	54	56

Recycling: Insignificant.

Import Sources (2000-03): South Africa, 15%; Norway, 12%, Brazil, 12%; Russia, 10%; and other, 51%.

Tariff: Item	Number	Normal Trade Relations 12-31-04
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, 15% (Domestic and foreign); gravel, 5% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic apparent consumption of silicon for 2004 is projected to be slightly more than that of 2003. Of the 2004 total, the share accounted for by ferrosilicon is estimated to have decreased to 50% from 52% in 2003, while that for silicon metal increased to 50% from 48%. 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, but through the first 9 months of 2004, domestic steel production was 8% higher than that for the same period in 2003. Domestic shipments of silicon metal through the first 8 months in 2004 were about 4% higher than those of the same period in 2003. Demand for silicon metal comes primarily from the aluminum and chemical industries. In 2004, the demand increase in domestic specialty chemicals, which include silicones, was expected to be about 7% compared with that of 2003. Domestic primary aluminum production was projected to decrease in 2004 by about 8% from that of 2003. Global primary aluminum production in 2004 was 4% higher than that of 2003. Through the first 9 months in 2004, domestic secondary aluminum production was about 3% higher than that during the same period in 2003. World secondary aluminum production decreased by 3% through the first 6 months in 2004 compared with that during the same period in 2003.

SILICON

Domestic production in 2004, expressed in terms of contained silicon, was projected to decline slightly. For all silicon materials combined, the overall decline was 3% to the lowest level since 1961. As in 2003, production continued to be curtailed or stopped at some plants.

Through the first 9 months of 2004, prices trended upward in the U.S. market for silicon materials. Compared with those at the beginning of the year, weekly average prices as of the end of September were higher for 50% ferrosilicon (9%), 75% ferrosilicon (13%), and silicon metal (30%). Year-average prices were projected to be higher for 50% ferrosilicon, 75% ferrosilicon, and silicon metal than those for 2003. At the end of September, the range in dealer import price, in cents per pound of contained silicon, was 50 to 54 for 50% ferrosilicon, 50 to 52 for 75% ferrosilicon, and 85 to 87 for silicon metal.

U.S. imports and exports of silicon materials in 2004, projected on the basis of data for the first 7 months of the year, were 5% more and 12% less, respectively, than those in 2003. The smallest overall percentage rise was for imports of silicon metal. Net import reliance as a percentage of apparent consumption 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
	2003	2004	
United States	248	240	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Brazil	214	230	
Canada	66	66	
China	1,970	2,200	
France	139	150	
Iceland	75	79	
India	35	35	
Kazakhstan	83	88	
Norway	326	330	
Poland	35	37	
Russia	538	530	
Slovakia	33	34	
South Africa	138	140	
Spain	55	59	
Ukraine	163	180	
Venezuela	59	62	
Other countries	210	210	
World total (rounded)	4,390	4,700	

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, in descending order of production, were China, Russia, Norway, Ukraine, and Brazil, and for silicon metal China, the United States, Brazil, Norway, and France. China was by far the leading producer of both ferrosilicon and silicon metal. An estimated 700,000 tons of silicon metal is included in China's total silicon production for 2004.

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.