

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 2005 was about \$412 million. Five companies produced silicon materials in six plants. Of those companies, four produced ferrosilicon in four plants. Silicon metal was produced by three companies in four plants. Two of the five companies in the industry produced both products at two plants. 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.

<u>Salient Statistics—United States:</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005^e</u>
Production	282	261	253	275	276
Imports for consumption	231	285	315	338	330
Exports	23	22	26	24	23
Consumption, apparent	502	540	544	595	577
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	42.8	41.1	47.7	58.2	56
Ferrosilicon, 75% Si	31.9	32.8	45.3	55.4	48
Silicon metal	50.5	53.2	61.3	81.9	77
Stocks, producer, yearend	40	25	22	16	22
Net import reliance ² as a percentage of apparent consumption	44	52	54	54	52

Recycling: Insignificant.

Import Sources (2001-04): Brazil, 16%; South Africa, 14%; Canada, 11%; Venezuela, 10%; and other, 49%.

<u>Tariff: Item</u>	<u>Number</u>	<u>Normal Trade Relations 12-31-05</u>
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 materials in 2005 was projected to be slightly less than that of 2004. Ferrosilicon accounted for 52% of the apparent consumption, up from 51% in 2004. 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 2005, domestic steel production was 6% lower than that for the same period in 2004. Domestic shipments of silicon metal through the first 8 months in 2005 were about 1% higher than those of the same period in 2004. Demand for silicon metal comes primarily from the aluminum and chemical industries. In the first 9 months of 2005, the consumption increase in domestic specialty chemicals, which include silicones, was about 5.3% compared with that during the same period in 2004. Domestic primary aluminum production was projected to remain flat in 2005, as was secondary aluminum production. Global primary aluminum production in 2005 was projected to be 5% higher than that of 2004.

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Domestic production in 2005, expressed in terms of contained silicon, was expected to increase slightly. Production in 2004 and 2005 was about 11% greater than that in 2003. Companies adjusted their product mix at some plants to meet changes in demand.

Through the first 9 months of 2005, prices trended downward 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 lower for 50% ferrosilicon (9%), 75% ferrosilicon (10%), and silicon metal (4%). Year-average prices were projected to be lower for 50% ferrosilicon, 75% ferrosilicon, and silicon metal than those for 2004. At the end of September, the range in dealer import price, in cents per pound of contained silicon, was 47 to 49 for 50% ferrosilicon, 42 to 44 for 75% ferrosilicon, and 70 to 72 for silicon metal.

U.S. imports and exports of silicon materials in 2005, projected on the basis of data for the first 7 months of the year, were 3% and 4% less, respectively, than those in 2004. These trends were attributable primarily to decreases in silicon metal imports and exports. Decreases in silicon metal imports also led to a reduction in net import reliance as a percentage of apparent consumption compared with that of 2004.

World Production, Reserves, and Reserve Base:

	Production ^{e, 3}		Reserves and reserve base ⁴
	2004	2005	
United States	275	276	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Brazil	225	230	
Canada	66	66	
China	2,490	2,700	
France	139	140	
Iceland	78	78	
India	36	36	
Kazakhstan	67	68	
Norway	298	280	
Russia	513	520	
South Africa	149	140	
Spain	55	55	
Ukraine	161	160	
Venezuela	60	62	
Other countries	255	270	
World total (rounded)	4,900	5,100	

Poland (ferrosilicon and silicon metal) and Slovakia (ferrosilicon) production is now included in "other countries." Ferrosilicon accounts for about four-fifths of world production (gross-weight basis). The leading countries for ferrosilicon production, in descending order of production, were China, Russia, Norway, Ukraine, and the United States, and for silicon metal, China, the United States, Brazil, and Norway. China was by far the leading producer of both ferrosilicon and silicon metal. An estimated 550,000 tons of silicon metal is included in China's production of silicon materials for 2005.

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.

³Production quantities are combined totals of estimated silicon content for ferrosilicon and silicon metal, as applicable.

⁴[See Appendix C for definitions.](#)