

# Mineral Industry Surveys

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## SILICON IN DECEMBER 2022

Domestic production of silicon materials was 19,900 metric tons (t) in December 2022, 12% less than November 2022 production and 34% less than December 2021 production (table 1). Net shipments in December 2022 were withheld to avoid disclosing proprietary information. Total net shipments during 2022 were 249,000 t, 7% less than those during in 2021. Ending stocks in December were 21,600 t, 5% less than those in November 2022 and 59% more than those in December 2021.

On a contained weight basis, total ferrosilicon imports were 21,300 t in December 2022, more than double those in November 2022 and December 2021, respectively (fig. 1, table 4). Total silicon metal imports, on a contained weight basis were 6,890 t in December 2022, 27% less than those in November 2022 and 37% less than those in December 2021.

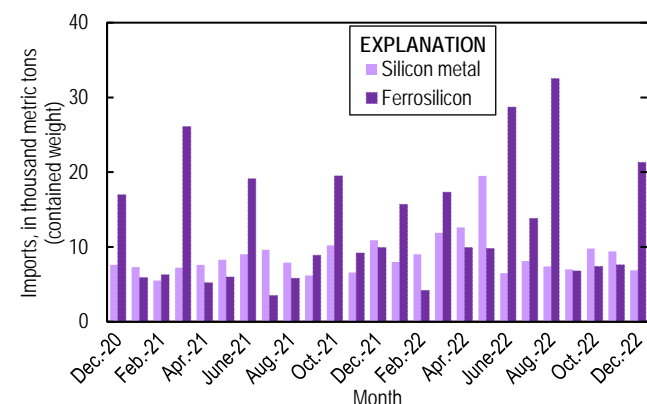


Figure 1. Ferrosilicon and silicon metal imports (excluding solar and semiconductor grades) from December 2020 through December 2022. Source: U.S. Census Bureau.

In December 2022, on a contained-weight basis in descending order of quantity, the leading destinations for silicon metal, more than 99.99% silicon trade category, were Vietnam, Japan, and Taiwan (table 3). In December 2022, on a contained-weight basis in descending order of quantity, leading import sources for ferrosilicon, 55%–80% grade, were Russia, Iceland, and Brazil and the leading import sources for silicon metal, 99.00%–

99.99% silicon trade category, were Brazil, Norway, and Canada and the (table 4).

## Prices

The average U.S. spot price for silicon metal was 256.25 cents per pound in December 2022, 4% less than the average price in November 2022 and 46% less than the average price in December 2021. The average U.S. spot price for ferrosilicon, 75% grade, was 206.25 cents per pound, 10% less than the average price in November 2022 and 38% less than the average price in December 2021 (fig. 2). The average spot prices for ferrosilicon, 50% grade, were discontinued by CRU Group in April 2022 and no other published sources were available.

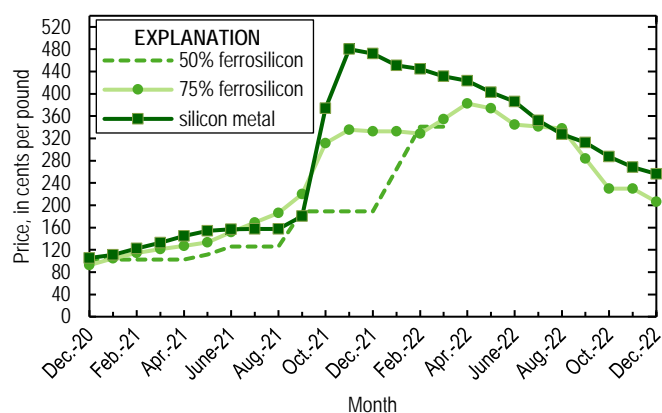


Figure 2. Average monthly spot prices for silicon metal and ferrosilicon 50% and 75% grades, contained silicon, from December 2020 through December 2022. The average spot prices for ferrosilicon, 50% grade, were discontinued by CRU Group in April 2022. Source: CRU Group and S&P Global Platts Metals Week.

## Industry News

According to the China Nonferrous Metals Industry Association, China produced 811,000 t of polysilicon in 2022, a 66% increase compared with 2021 production (Argus Media group—Argus Metals International, 2023).

The China Securities Regulatory Commission approved the Guangzhou Futures Exchange (GFEX) to launch silicon futures

contracts on December 22, 2022, and options contracts on December 23, 2022 for silicon metal grade 5-5-3, which is used as feedstock in metallurgical and polysilicon manufacturing, and silicon metal grade 4-2-1, which is used by the chemicals sector (Argus Media group—Argus Metals International, 2022). The GFEX was started in 2021 with a focus on products associated with green and sustainable development (China Daily, 2022). Believed to be the world's first industrial silicon futures contracts, the goal is to reduce price volatility of silicon metal which is used in the manufacture of semiconductor chips and solar panels (Jingjing, 2022).

### References Cited

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TABLE 1  
PRODUCTION, SHIPMENTS, AND STOCKS OF SILICON ALLOYS  
AND METAL IN THE UNITED STATES<sup>1, 2, 3</sup>

(Metric tons, gross weight)

	Gross production <sup>4</sup>	Net shipments	Producers' stocks, end of period
2021:			
January–December	W	269,000 <sup>r</sup>	13,600 <sup>r</sup>
December	30,300 <sup>r</sup>	24,200 <sup>r</sup>	13,600 <sup>r</sup>
2022:			
January	W	24,000 <sup>r</sup>	16,100 <sup>r</sup>
February	W	23,000 <sup>r</sup>	17,700 <sup>r</sup>
March	W	W	21,200 <sup>r</sup>
April	W	23,500 <sup>r</sup>	19,300 <sup>r</sup>
May	32,600 <sup>r</sup>	22,400 <sup>r</sup>	W
June	W	22,400 <sup>r</sup>	W
July	W	W	W
August	W	22,500 <sup>r</sup>	W
September	W	15,700 <sup>r</sup>	W
October	25,500	17,100 <sup>r</sup>	24,700 <sup>r</sup>
November	22,600 <sup>r</sup>	20,600 <sup>r</sup>	22,800 <sup>r</sup>
December	19,900	W	21,600
January–December	348,000	249,000	21,600

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes ferrosilicon, miscellaneous silicon alloys, and silicon metal, excluding semiconductor and solar grades, except where noted.

<sup>3</sup>Includes USGS estimates.

<sup>4</sup>Ferrosilicon production includes material consumed in the production of miscellaneous silicon alloys.

TABLE 2  
PRICES FOR FERROSILICON AND SILICON METAL IN DECEMBER 2022

		Low	Average	High	Average low, mid, and high
Ferrosilicon:					
50% ferrosilicon <sup>1</sup>	cents per pound of contained silicon	NA	XX	NA	NA
75% ferrosilicon <sup>2</sup>	do.	180.00	206.25	255.00	XX
Silicon metal, 553 grade <sup>3</sup>	cents per pound	250.00	256.25	265.00	XX

do. Ditto. NA Not available. XX Not applicable.

<sup>1</sup>CRU Group transaction price, duty paid, f.o.b. Pittsburgh, producing plant or Chicago/Pittsburgh warehouse. Average price reported for price range.

<sup>2</sup>S&P Global Platts Metals Week, in U.S. warehouse, U.S. origin and imported material. Average price reported for all transactions during the month.

<sup>3</sup>S&P Global Platts Metals, duty paid, delivered Midwest, U.S. spot and imported 553 grade silicon metal (minimum 98.50% silicon). Average price reported for all transactions during the month.

TABLE 3  
U.S. EXPORTS OF FERROSILICON AND SILICON METAL IN DECEMBER 2022<sup>1, 2</sup>

(Metric tons, unless otherwise specified)

Country or locality	Gross weight	Contained weight	Value	January–December <sup>3</sup>		
				Gross weight	Contained weight	Value
Ferrosilicon:						
More than 55% silicon:						
Brazil	--	--	--	40	24	\$62,400
Canada	989	593	\$1,570,000	8,750	5,250	15,200,000
Czechia	--	--	--	4	2	5,990
France	--	--	--	17	10	27,000
Germany	531	407	1,140,000	763	560	1,550,000
India	--	--	--	40	28	67,200
Israel	3	2	5,000	3	2	5,000
Mexico	142	85	221,000	1,920	1,150	3,100,000
Singapore	--	--	--	22	13	34,400
Thailand	5	3	7,500	14	8	21,800
United Arab Emirates	--	--	--	2	1	3,250
Total	1,670	1,090	2,940,000	11,600	7,050	20,100,000
Other ferrosilicon:						
Belgium	36	16	56,500	396	176	403,000
Brazil	--	--	--	300	150	831,000
Canada	21	11	54,300	1,430	280	1,900,000
China	--	--	--	20	10	50,600
Dominican Republic	--	--	--	63	9	78,800
France	--	--	--	74	32	91,500
Malaysia	--	--	--	15	7	10,000
Mexico	27	14	72,200	1,820	654	4,460,000
Turkey	40	18	64,000	120	54	251,000
United Kingdom	--	--	--	97	48	406,000
Other [3 countries and (or) localities]	--	--	--	28	10	101,000
Total	125	58	247,000	4,360	1,430	8,590,000
Total ferrosilicon	1,790	1,150	3,190,000	15,900	8,480	28,600,000
Metal:						
More than 99.99% silicon:						
China	291	291	11,100,000	3,250	3,250	112,000,000
Germany	201	201	7,590,000	5,030	5,030	161,000,000
Japan	961	961	38,700,000	11,200	11,200	492,000,000
Korea, Republic of	104	104	3,150,000	832	832	33,300,000
Malaysia	93	93	3,190,000	2,550	2,550	108,000,000
Singapore	101	101	2,920,000	2,020	2,020	55,300,000
Taiwan	304	304	9,660,000	4,680	4,680	104,000,000
Thailand	(4)	(4)	12,100	234	234	9,460,000
Turkey	16	16	576,000	948	948	32,800,000
Vietnam	1,690	1,690	67,500,000	13,000	13,000	476,000,000
Other [37 countries and (or) localities]	101	101	5,350,000	776	776	33,400,000
Total	3,870	3,870	150,000,000	44,600	44,600	1,620,000,000
99.00%–99.99% silicon:						
Australia	337	337	991,000	337	337	991,000
Belgium	--	--	--	124	121	344,000
Czechia	--	--	--	114	113	280,000
France	--	--	--	50	50	70,800
Germany	--	--	--	258	253	310,000
Korea, Republic of	2	2	2,730	15	15	21,300
Mexico	--	--	--	1	1	9,630
Singapore	--	--	--	2	2	3,320
Saint Maarten	2	2	2,580	2	2	2,580
Taiwan	--	--	--	5	5	6,410
United Kingdom	--	--	--	75	75	165,000
Total	341	341	997,000	984	974	2,200,000
Other silicon:						
Belgium	--	--	--	192	186	355,000
Canada	9	9	28,600	187	182	597,000
China	30	30	40,200	146	142	193,000
Germany	--	--	--	136	132	287,000
Japan	--	--	--	5	5	7,590
Korea, Republic of	3	3	3,510	13	12	16,600
Mexico	14	14	64,400	467	453	2,170,000
Netherlands	--	--	--	309	300	371,000
South Africa	35	34	46,300	131	128	186,000
Trinidad and Tobago	(4)	(4)	3,400	30	29	60,100
Other [9 countries and (or) localities]	(4)	(4)	4,560	14	13	78,000
Total	92	89	191,000	1,630	1,580	4,320,000
Total silicon metal	4,300	4,300	151,000,000	47,200	47,100	1,620,000,000

-- Zero.

<sup>1</sup>Presentation of monthly data is based on the quantities (gross weight) of the leading countries and (or) localities.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>May include revisions to previously published data.

<sup>4</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 4  
U.S. IMPORTS OF FERROSILICON AND SILICON METAL IN DECEMBER 2022<sup>1,2</sup>

(Metric tons, unless otherwise specified)

Country or locality	Gross weight	Contained weight	Value	January–December <sup>3</sup>		
				Gross weight	Contained weight	Value
Ferrosilicon:						
55%–80% silicon, more than 3% Ca:						
China	--	--	--	1,790	1,040	\$2,920,000
France	36	29	\$166,000	502	305	1,930,000
India	--	--	--	21	19	57,800
Mexico	--	--	--	2	2	6,660
Norway	--	--	--	276	210	1,350,000
South Africa	27	27	71,100	293	224	1,030,000
Total	63	56	237,000	2,890	1,800	7,290,000
55%–80% silicon, other:						
Brazil	1,230	930	2,170,000	26,900	20,200	63,800,000
Canada	767	550	3,110,000	12,200	8,730	47,400,000
China	579	440	1,030,000	26,100	19,700	58,000,000
France	23	17	113,000	1,520	1,090	5,940,000
Germany	187	138	959,000	1,320	975	4,450,000
Iceland	1,250	953	3,460,000	8,730	6,690	35,700,000
Kazakhstan	--	--	--	6,070	4,550	30,600,000
Malaysia	199	149	589,000	20,600	15,000	73,600,000
Norway	695	527	3,520,000	5,400	4,060	23,100,000
Paraguay	250	183	745,000	1,480	1,070	4,090,000
Russia	20,800	15,800	45,900,000	88,600	67,400	359,000,000
Singapore	200	149	817,000	200	149	817,000
Other [9 countries and (or) localities]	114	84	453,000	5,100	3,670	14,800,000
Total	26,200	19,900	62,800,000	204,000	153,000	721,000,000
80%–90% ferrosilicon, China	--	--	--	3	3	3,570
More than 90% ferrosilicon						
China	--	--	--	174	160	420,000
France	1	1	3,180	1	1	3,180
India	--	--	--	2	2	4,530
Total	1	1	3,180	177	163	427,000
Magnesium ferrosilicon:						
Brazil	460	210	1,260,000	4,920	2,270	11,400,000
Canada	1,360	595	3,960,000	19,700	9,010	61,800,000
China	--	--	--	2,650	1,220	6,370,000
Germany	--	--	--	308	139	499,000
India	213	96	541,000	4,780	2,180	13,000,000
Norway	24	12	90,300	1,430	658	5,250,000
Russia	--	--	--	93	44	225,000
Slovakia	--	--	--	87	39	113,000
Thailand	220	98	492,000	1,450	658	3,590,000
Zambia	--	--	--	365	164	319,000
Other [1 country or locality]	--	--	--	53	24	89,000
Total	2,280	1,010	6,350,000	35,900	16,400	103,000,000
Other ferrosilicon:						
Brazil	--	--	--	208	91	318,000
Canada	686	207	1,340,000	8,080	2,600	15,000,000
China	--	--	--	164	52	301,000
France	47	21	83,300	47	21	83,300
Germany	14	6	46,500	32	14	108,000
India	--	--	--	67	30	165,000
Norway	--	--	--	85	43	210,000
Paraguay	3	2	11,400	199	99	587,000
Slovakia	79	35	158,000	710	313	1,320,000
Spain	--	--	--	51	22	98,500
United Kingdom	--	--	--	6	3	13,600
Other [1 country or locality]	--	--	--	2	1	6,850
Total	830	271	1,640,000	9,650	3,280	18,200,000
Total ferrosilicon	29,400	21,300	71,000,000	253,000	175,000	850,000,000
Metal:						
More than 99.99% silicon:						
Brazil	112	112	401,000	1,780	1,780	5,670,000
Canada	--	--	--	5	5	15,000
China	3	3	1,620,000	372	372	15,800,000
Germany	80	80	4,550,000	751	751	55,500,000
Israel	--	--	--	20	20	70,900
Japan	1	1	337,000	64	64	8,840,000
Norway	--	--	--	69	69	508,000
Taiwan	45	45	6,070,000	647	647	84,200,000
Thailand	--	--	--	72	72	466,000
Turkey	--	--	--	19	19	93,400
Other [14 countries and (or) localities]	--	--	--	8	8	1,410,000
Total	243	243	13,000,000	3,810	3,810	173,000,000
99.00%–99.99% silicon:						
Australia	--	--	--	806	800	4,690,000

See footnotes at end of table.

TABLE 4—Continued  
U.S. IMPORTS OF FERROSILICON AND SILICON METAL IN DECEMBER 2022<sup>1,2</sup>

(Metric tons, unless otherwise specified)

Country or locality	Gross weight	Contained weight	Value	January–December <sup>3</sup>		
				Gross weight	Contained weight	Value
Metal—Continued:						
99.00%–99.99% silicon:						
Brazil	1,340	1,330	\$5,350,000	14,100	13,900	\$55,900,000
Canada	386	383	2,490,000	7,320	7,280	26,400,000
Germany	--	--	--	780	776	1,990,000
Korea, Republic of	--	--	--	1,010	1,010	2,180,000
Malaysia	--	--	--	363	361	1,150,000
Norway	960	954	8,040,000	6,750	6,710	46,600,000
Slovakia	--	--	--	405	402	1,940,000
Thailand	--	--	--	2,510	2,490	13,400,000
Turkey	--	--	--	250	249	1,230,000
Other [10 countries and (or) localities]	142	141	519,000	425	423	1,340,000
Total	2,830	2,810	16,400,000	34,700	34,400	157,000,000
Other silicon:						
Australia	240	237	1,600,000	3,280	3,180	12,300,000
Belgium	--	--	--	299	279	567,000
Brazil	1,930	1,880	10,600,000	37,900	36,200	174,000,000
Canada	1,080	874	5,740,000	25,700	23,400	154,000,000
Laos	--	--	--	500	490	1,510,000
Malaysia	--	--	--	290	285	231,000
Netherlands	(4)	(4)	6,400	832	743	1,420,000
Norway	507	497	3,480,000	6,800	6,560	37,500,000
Slovakia	--	--	--	1,650	1,610	4,120,000
Thailand	360	355	1,070,000	4,620	4,390	15,100,000
Other [12 countries and (or) localities]	2	2	17,400	632	610	1,560,000
Total	4,120	3,840	22,600,000	82,500	77,800	402,000,000
Total silicon metal	7,190	6,890	52,000,000	121,000	116,000	732,000,000

-- Zero.

<sup>1</sup>Presentation of monthly data is based on the quantities (gross weight) of the leading countries and (or) localities.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>May include revisions to previously published data.

<sup>4</sup>Less than ½ unit.

Source: U.S. Census Bureau.