



2022 Minerals Yearbook

MANGANESE [ADVANCE RELEASE]

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MANGANESE

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In 2022, U.S. manganese apparent consumption was estimated to be 804,000 metric tons (t) on a manganese content basis, an increase from consumption in 2021 (table 1). Exports of all types of manganese (gross weight) decreased by 38% to 18,900 t from 30,500 t in 2021 (table 4). Total manganese imports (gross weight) increased by 14% to 1,360,000 t in 2022 from 1,190,000 t in 2021 (table 5).

In 2022, average U.S. spot market prices for high- and medium-carbon ferromanganese increased by 17% and 46%, respectively, from those in 2021. The average U.S. spot-market price for silicomanganese increased by 31% from that in 2021. The average domestic spot-market price for manganese metal increased by 28% from that in 2021 (table 1).

World production of manganese ore in 2022 decreased slightly, on a gross-weight basis, from the revised amount in 2021 (tables 1, 6). South Africa (34%), Gabon (18%), Australia (13%), and China (12%) were the leading producers of manganese ore on a gross-weight basis. Combined world production of ferromanganese and silicomanganese, excluding U.S. production, decreased by 3% to 20.8 million metric tons (Mt) on a gross-weight basis from 21.5 Mt (revised) in 2021. China was the leading producer of manganese ferroalloys, accounting for 58% of world production (table 7).

Manganese is essential to iron and steel production because of its sulfur-fixing, deoxidizing, and alloying properties. Steelmaking, including its ironmaking component, accounted for greater than 95% of the domestic manganese consumption (table 3). Among a variety of other uses, manganese is also a key component of certain widely used aluminum alloys and is used in oxide or sulfate forms in batteries.

Government Actions and Legislation

In October, the U.S. Department of Defense, Defense Logistics Agency Strategic Materials announced the fiscal year 2022 (October 4, 2021, through September 30, 2022) Annual Materials Plan (AMP) for the National Defense Stockpile (NDS). Under this AMP, the maximum acquisition authority for manganese materials was 5,000 t of electrolytic manganese metal, and the maximum disposal authority for manganese materials was 292,000 t of manganese ore and 45,000 t of high-carbon ferromanganese (Defense Logistics Agency Strategic Materials, 2021a, b).

Production

Ore and Concentrates.—Manganese ore containing 20% or more manganese has not been produced domestically since 1970. Possible future mine production in Arizona was planned by South32 Ltd. after being permitted through the Fixing America's Surface Transportation Act (FAST-41) (South32 Ltd., 2023).

Chemicals and Ferroalloys.—Production statistics for these materials were withheld to avoid disclosing company proprietary data. Domestic producers of manganese ferroalloys and synthetic dioxide are listed in table 2. In April, Prince International Corp. completed its acquisition of Ferro Corp. and combined with Chromaflo Technologies Corp. to form a new company, Vibrantz Technologies Inc. (Chromaflo Technologies Corp., 2022).

Consumption

In 2022, reported domestic consumption of manganese ore was 357,000 t (gross weight), and corresponding yearend stocks were estimated to be 312,000 t (table 1). Reported consumption (gross weight) of ferromanganese and silicomanganese were essentially unchanged compared with consumption in 2021. Reported manganese metal consumption in 2022 was 20,200 t (table 3).

Reported consumption statistics were derived from U.S. Geological Survey (USGS) voluntary surveys of U.S. operations. Data on domestic consumption of manganese ore, excluding that consumed by the steel industry, are collected by means of the "Manganese Ore and Products" survey. In 2022, six companies were canvassed that processed ore or had processed ore in the past by such methods as grinding and roasting or used it in the manufacture of dry cell batteries and manganese chemicals, ferroalloys, and metals. Of those six companies, four responded with consumption data and two were estimated based on previous responses. All six companies used manganese ore in their processes in 2022 with the consumption reported in table 1. The collective consumption of these firms was considered to constitute all the manganese ore consumption in the United States, excluding that consumed directly by the steel industry.

A second survey covered a broad range of metal-consuming companies, such as aluminum, nonferrous-alloy, and steel producers. More than 150 consumers were canvassed on an annual basis in this survey. Reported consumption and stocks data for ferromanganese, silicomanganese, and manganese metal are reported in tables 1 and 3 and include estimates to account for nonrespondents.

Globally, steel production accounted for more than 90% of manganese consumption, batteries accounted for about 2.5%, and nonferrous alloys accounted for 2% (Project Blue, 2023, p. 17, 18). Relatively small quantities of manganese were used for alloying with nonferrous metals, such as aluminum and copper. Further nonmetallurgical applications included batteries, electrolytic manganese metal, electrolytic manganese dioxide, and manganese sulfate. Other uses included animal feed, fertilizers, and manganese chemicals.

Prices

Manganese Ore.—The only spot prices reported for manganese ore were for deliveries to China. In 2022, the average spot price for metallurgical-grade ore containing 44% manganese, based on weekly averages of China's cost, insurance, and freight (c.i.f.) transaction prices as reported by CRU Group, was \$5.97 per metric ton unit, a 13% increase from \$5.27 per metric ton unit in 2021. [A metric ton unit is 1 t of ore containing 1% or 10 kilograms of manganese. The price of 1 t of ore (gross weight) is obtained by multiplying the metric-ton-unit price by the percentage manganese content of the ore; for example, multiplying by 46 when the manganese content is 46%.] The ore market consisted of a number of submarkets because of differences in ore-quality requirements by end use—ferroalloy production, blast furnace ironmaking, and manufacture of manganese chemicals.

Manganese Ferroalloys and Metal.—Prices for manganese ferroalloys tend to vary in response to changes in demand by the steel and ferrous foundry industries, whereas prices for manganese metal predominantly follow changes in demand by the aluminum industry. Manganese ferroalloy prices also are influenced by changes in the product mix of the world's suppliers because various manganese ferroalloys are largely interchangeable with each other.

Annual average import prices for manganese ferroalloys are reported by S&P Global Platts Metals Week. These prices are based on spot prices per unit of measurement, duty-paid in a U.S. warehouse. Annual average import prices were \$2,369.74 per gross ton for high-carbon ferromanganese, 239.96 cents per pound for medium-carbon ferromanganese, and 121.21 cents per pound for silicomanganese. These prices were 17%, 46%, and 32% more for high-carbon ferromanganese, medium-carbon ferromanganese, and silicomanganese, respectively, compared with those in 2021. The annual average North American transaction price for manganese metal as reported by CRU Group was 318.47 cents per pound, which increased by 28% from that in 2021 (table 1).

Foreign Trade

The U.S. net import reliance as a percentage of apparent consumption was 100% for manganese ore containing greater than 20% manganese, the same it has been since 1970. The ensuing comparisons of foreign trade data were made based on gross weight.

In 2022, U.S. exports (gross weight) of all manganese products decreased by 38% to 18,900 t from 30,500 t in 2021 (table 4). Exports of ferromanganese (all grades) decreased by 68% to 2,860 t; silicomanganese exports decreased by 41% to 3,050 t; exports of manganese metal (including waste and scrap) decreased by 26% to 4,020 t; manganese ore exports decreased by 20% to 895 t; manganese dioxide exports decreased by 17% to 8,100 t. Canada was the leading destination for most manganese product exports in 2022, accounting for 92% of ferromanganese, 99% of silicomanganese, and 60% of manganese dioxide. Manganese ore exports went to Canada (42%), the Republic of Korea (25%), and Mexico (21%), and manganese metal exports went to Malaysia (64%), Canada (10%), and India (8%).

In 2022, U.S. imports (gross weight) of manganese products increased by 14% to 1,360,000 t in 2022 from 1,190,000 t in 2021 (table 5). Imports of potassium permanganate increased by 42% to 1,170 t; silicomanganese increased by 34% to 420,000 t; manganese ore (all grades) increased by 14% to 566,000 t; manganese waste and scrap increased by 3% to 403 t; wrought manganese metal products increased slightly to 474 t. Imports of manganese dioxide decreased by 52% to 3,920 t. Imports of unwrought manganese metal were essentially unchanged, and imports of ferromanganese (all grades) were unchanged from those in 2021.

World Industry Structure

World manganese ore production was 56.4 Mt (gross weight) and 20.1 Mt (manganese content) in 2022, a slight decrease and unchanged, respectively, compared with the revised amounts in 2021. On a gross-weight basis, the leading producer countries were South Africa (34%), Gabon (18%), and Australia (13%). On a manganese-content basis, the leading producer countries of manganese ore were South Africa (36%), Gabon (23%), and Australia (15%), together accounting for 75% of world production (table 6).

Excluding the United States, total world manganese ferroalloy production was 20.8 Mt (gross weight) in 2022, 3% less than the revised amount in 2021 (table 7). On a gross-weight basis, the leading producers of manganese ferroalloys were China (58%) and India (17%).

The International Manganese Institute (IMnI) estimated that world apparent consumption of manganese ferroalloys (gross weight) decreased by 5% to 21.5 Mt in 2022 from 22.7 Mt in 2021 (International Manganese Institute, 2023). Of the 21.5 Mt consumed in 2022, 16.3 Mt was silicomanganese, 4.0 Mt was high-carbon ferromanganese, and 1.2 Mt was refined (medium- and low-carbon) ferromanganese. The IMnI's estimate for world manganese ferroalloys production in 2022 was 21.8 Mt, slightly more than its estimate for ferroalloys apparent consumption (21.5 Mt). The IMnI estimated world manganese ore apparent consumption in 2022 to be about 49.7 Mt (gross weight), which was slightly more than the estimate of 48.5 Mt in 2021.

World Review

Brazil.—Brazil was the leading producer of manganese ore in the Western Hemisphere in 2022. Brazilian mining company Vale S.A. sold its iron and manganese ore and logistics assets in the Midwestern System in Mato Grosso do Sul State in central Brazil to J&F Mineracao Ltda. Midwestern System was valued at \$1.2 billion, generated \$110 million of adjusted earnings in 2021 and produced 200,000 t of manganese ore in 2021 (Vale S.A., 2022).

China.—China was the world's leading producer of ferromanganese and silicomanganese in 2022. China's ferromanganese production was estimated to be 2.1 Mt, and its silicomanganese production was 10.0 Mt, unchanged and a 6% decrease, respectively, from production in 2021 (table 7).

Since 2021, dozens of Chinese manganese processors joined the Manganese Innovation Alliance to discuss supply of key products, prices, stockpiles, and network for financial assistance

(Yap, 2021). China produced more than 90% of the high-purity manganese used globally in car batteries. Subsequent to the creation the union of Chinese manganese companies, prices for exported manganese increased (Global Newswire, 2022).

Lockdowns owing to the coronavirus disease 2019 (COVID-19) pandemic continued to affect the market and slowed the supply of raw material to steelmakers. Production cuts owing to the record-breaking high temperature and low rainfall in southern China resulted in high demand for electricity for air conditioning and affected electricity production from hydroelectric facilities (CRU Group, 2022a, b).

Guyana.—Production of manganese ore restarted in Guyana after nearly 54 years. Guyana Manganese Inc.’s (GMI) (China) first shipment of 33,000 t of manganese ore was exported in May 2022 (Stabroek News, 2022). GMI expected a target output of 600,000 metric tons per year (t/yr) of manganese concentrate, with an average manganese oxide content of 38%, from the Matthews Ridge Mine in northwestern Guyana (Bosai Minerals Group Co., Ltd., undated).

India.—India was the world’s second-ranked producer of both ferromanganese and silicomanganese in 2022 (table 7). Tata Steel Ltd. announced acquisition of Stork Ferro and Mineral Industries Pvt. Ltd.’s Balasore ferroalloy plant. The Balasore plant had a production capacity of 53,000 t/yr for silicomanganese and high-carbon ferromanganese (Tata Steel Ltd., 2022).

South Africa.—South Africa was the world’s leading producer of manganese ore on both a manganese-content and gross-weight basis. Ore production (contained weight) in South Africa was unchanged in 2022 from that in 2021 (table 6).

In October, major port and rail freight lines operator Transnet faced a strike by rail and freight workers (Banya, 2022). Rail operations transported 75% of South Africa’s manganese ore to ports and were immediately affected by the strike (CRU Group, 2022c).

Ukraine.—Ukraine’s ferromanganese and silicomanganese production decreased by 78% and 30%, respectively, in 2022 compared with production in 2021 (table 7). The energy supply shortage in Ukraine and decreased ferroalloy demand forced several producers, such as PJSC Pokrovsky Mining and Processing Plant, to shut down in late 2022 (GMK Center, 2023).

Outlook

Consumption of manganese closely follows trends in the commercial and residential construction and remodeling industries. Domestic new residential construction declined sharply between March 2022 and January 2023 and is still below the number of construction units from that in 2021 (U.S. Census Bureau, 2023) but commercial construction was showing a robust recovery (World Steel Association, 2023). The future consumption of manganese will likely keep following the construction industry forecast. The steel industry may be considered an indicator of the construction industry, and further details of the outlook for the steel industry are discussed in the “Outlook” section of the Iron and Steel chapter of the 2022 USGS Minerals Yearbook, volume I, Metals and Minerals.

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TABLE 1
SALIENT MANGANESE STATISTICS¹

(Thousand metric tons, gross weight, unless otherwise specified)

	2018	2019	2020	2021	2022	
United States:						
Manganese ore (20% or more Mn):						
Production	--	--	--	--	--	
Exports	3	1	1	1	1	
Imports for consumption	440	434	367	497	566	
Consumption ^{c, 2, 3}	369	442	378	399	357	
Stocks, December 31, consumers ^{c, 2, 3}	191	175	143	220	312	
Ferromanganese:						
Production	W	W	W	W	W	
Exports	10	5	5	9	3	
Imports for consumption	427	332	223	329	330	
Consumption ^{c, 3}	348	336	325	335	339	
Stocks, December 31, consumers and producers ^{c, 3}	27	44	35	40	50	
Silicomanganese:						
Production	W	W	W	W	W	
Exports	4	2	2	5	3	
Imports for consumption	412	351	269	313	420	
Consumption ^{c, 3}	139 ⁴	143 ⁴	229	237	234	
Stocks, December 31, consumers and producers ^{c, 3}	21	39	31	34	26	
Consumption, apparent, manganese content ^{c, 3, 5}	796	748	621	717	804 ⁶	
Price, average:						
Ferromanganese, high-carbon ⁷	dollars per gross ton	1,471.36	1,311.14	1,145.92	2,024.53	2,369.74
Ferromanganese, medium-carbon ⁷	cents per pound	113.31	109.70	90.93	164.66	239.96
Manganese metal ⁸	do.	137.27	115.72	99.49	249.59	318.47
Manganese ore ⁹	dollars per metric ton unit	7.16	5.63	4.59	5.27	5.97
Silicomanganese ⁷	cents per pound	64.96	62.36	52.40	92.08	121.04
World, production of manganese ore ¹⁰		57,000	60,900	58,600 ^r	57,800 ^r	56,400

^eEstimated. ^rRevised. do. Ditto. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through August 7, 2023. Data are rounded to no more than three significant digits, except prices.

²Exclusive of iron and steel plants.

³Includes U.S. Geological Survey estimates.

⁴Internal evaluation indicates that silicomanganese consumption is considerably understated.

⁵Based on estimates of average content for all significant components.

⁶U.S. Government National Defense Stockpile inventory statistics are no longer available and are not included in the calculation of apparent consumption.

⁷S&P Global Platts Metals Week based on monthly averages.

⁸CRU Group North American transaction prices based on monthly averages.

⁹CRU Group, cost, insurance, and freight, China, 44% manganese metallurgical ore.

¹⁰May include estimated data.

TABLE 2
DOMESTIC PRODUCERS OF PRINCIPAL MANGANESE PRODUCTS IN 2022

Company	Plant location	Products ¹			Type of process
		FeMn	SiMn	MnO ₂	
Borman Specialty Materials	Henderson, NV			X	Electrolytic.
Energizer Holdings, Inc., Energizer Battery Inc.	Marietta, OH			X	Do.
Eramet Marietta, Inc.	do.	X	X		Electric furnace.
Felman Production, LLC	Letart, WV	X	X		Do.
Vibrantz Technologies Inc. ²	Baltimore, MD			X	Chemical.
Do.	New Johnsonville, TN			X	Electrolytic.

Do., do. Ditto.

¹FeMn, ferromanganese; SiMn, silicomanganese; MnO₂, synthetic manganese dioxide.

²Previously Prince International Corp.

TABLE 3
U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2022^{1,2}

(Metric tons, gross weight)

End use	Ferromanganese		Silicomanganese	Manganese metal
	High carbon	Medium and low carbon		
Steel:				
Carbon	131,000	107,000	181,000	(3)
High strength, low alloy	(3)	4,660	(3)	(3)
Stainless and heat resisting	6,640	2,070	15,100	961
Full alloy	(3)	(3)	16,000	(3)
Unspecified ⁴	62,400	18,400	19,100	12,300
Total	200,000	132,000	231,000	13,200
Cast irons	6,200	(5)	(5)	(5)
Superalloys	(5)	(5)	--	100
Alloys (excluding alloy steels)	(5)	(5)	--	(5) ⁶
Miscellaneous and unspecified	385	498	3,000	6,900
Grand total	206,000	133,000	234,000	20,200
Total manganese content ⁷	165,000	112,000	155,000	20,200
Stocks, December 31, 2022, consumers and producers	26,100	24,100	25,900	W ⁸

W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through August 1, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes USGS estimates.

³Included with "Steel: Unspecified," to avoid disclosing company proprietary data.

⁴Includes electrical and tool steel.

⁵Included with "Miscellaneous and unspecified," to avoid disclosing company proprietary data.

⁶Primarily aluminum alloys.

⁷Estimated based on the following typical percentages of manganese content: high-carbon ferromanganese (80%); Medium- and low-carbon ferromanganese (84%); silicomanganese (66%); and manganese metal (100%).

⁸Consumer stocks only.

TABLE 4
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2021		2022	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Ore and concentrates with 20% or more manganese:				
Belgium	20	\$57	--	--
Canada	624	427	377	\$280
Dominican Republic	29	21	--	--
Guyana	--	--	56	139
India	97	91	--	--
Korea, Republic of	7	3	220	189
Mexico	279	137	185	70
Netherlands	14	53	51	241
Singapore	20	9	--	--
United Kingdom	25	15	6	3
Total	1,110	813	895	921
Ferromanganese, all grades:				
Canada	8,310	12,700	2,640	6,370
China	15	42	11	29
Dominican Republic	--	--	13	24
Ecuador	--	--	9	10
France	--	--	10	20
Guyana	--	--	12	34
Mexico	295	622	112	363
Saudi Arabia	--	--	21	41
United Kingdom	--	--	12	22
Venezuela	--	--	6	12
Other [16 countries and (or) localities]	393 ^r	874 ^r	10	44
Total	9,010	14,300	2,860	6,970
Silicomanganese:				
Canada	4,750	7,840	3,020	5,250
Colombia	203	299	--	--
Honduras	2	5	--	--
Japan	(3)	4	--	--
Mexico	62	146	29	60
Peru	190	279	--	--
Total	5,200	8,580	3,050	5,310
Metal, including alloys and waste and scrap:				
Canada	536	2,000	405	2,180
China	9	199	204	5,480
France	--	--	16	87
Germany	82	413	75	55
India	20	12	328	378
Japan	103	372	172	1,030
Korea, Republic of	25	9	45	68
Malaysia	4,230	2,420	2,580	1,870
Mexico	61 ^r	424 ^r	158	549
Singapore	--	--	13	23
Other [24 countries and (or) localities]	401 ^r	2,650 ^r	26	951
Total	5,460	8,490	4,020	12,700

See footnotes at end of table.

TABLE 4—Continued

U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2021		2022	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Manganese dioxide:				
Brazil	91	\$351	84	\$335
Canada	6,300	4,650	4,890	4,260
El Salvador	271	325	267	333
Germany	112	122	291	758
Israel	690	869	553	744
Italy	516	1,350	379	741
Korea, Republic of	65	296	64	417
Mexico	546	930	648	805
Poland	162	597	100	374
United Kingdom	585	938	575	842
Other [24 countries and (or) localities]	397 ^r	1,090 ^r	251	802
Total	9,740	11,500	8,100	10,400

^rRevised. -- Zero.¹Table includes data available through July 24, 2023. Data are rounded to no more than three significant digits.²Presentation of data is based on the 2022 annual quantities (gross weight) of the leading countries and (or) localities.³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS,
BY COUNTRY OR LOCALITY^{1, 2}

Country or locality	2021			2022		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ore and concentrates with 20% or more manganese:						
All grades:						
Brazil	193	97	\$135	214	106	\$137
Canada	18	17	4	--	--	--
France	1	1	2,020	16	9	25
Gabon	347,000	202,000	72,700	269,000	173,000	74,600
Mexico	56,000	21,300	9,670	77,600	29,400	15,100
Morocco	2,210	1,210	950	16	9	30
Netherlands	--	--	--	277	79	115
Slovakia	--	--	--	53	16	19
South Africa	91,700	36,600	14,300	219,000	85,000	36,300
Total	497,000	261,000	99,800	566,000	287,000	126,000
More than 20% but less than 47% manganese:						
Mexico	55,600	21,100	9,360	77,000	28,900	14,500
Netherlands	--	--	--	244	61	71
Slovakia	--	--	--	53	16	19
South Africa	84,900	33,300	12,300	215,000	83,500	35,200
Total	141,000	54,400	21,600	293,000	112,000	49,700
47% or more manganese:						
Brazil	193	97	135	214	106	137
Canada	18	17	4	--	--	--
France	1	1	2,020	16	9	25
Gabon	347,000	202,000	72,700	269,000	173,000	74,600
Mexico	304	208	308	679	467	624
Morocco	2,210	1,210	950	16	9	30
Netherlands	--	--	--	33	18	44
South Africa	6,800	3,360	2,050	3,100	1,520	1,140
Total	356,000	207,000	78,200	273,000	175,000	76,600
Ferromanganese:						
All grades:						
Australia	56,100	42,800	88,000	53,100	40,600	119,000
India	52,300	39,500	63,600	43,700	32,800	66,700
Japan	1,120	905	2,180	1,370	1,110	3,890
Korea, Republic of	32,700	25,800	53,400	47,000	37,500	117,000
Malaysia	62,200	47,200	65,400	70,200	53,200	139,000
Mexico	2,810 ^r	2,160 ^r	4,930 ^r	8,050	6,390	23,700
Norway	45,100	36,700	96,600	40,500	32,800	101,000
Russia	15,500	10,900	23,100	16,900	12,900	33,600
South Africa	50,900	39,800	78,300	43,800	34,300	119,000
United Kingdom	--	--	--	3,130	2,370	6,110
Other [11 countries and (or) localities]	10,600 ^r	7,980 ^r	14,800 ^r	2,270	1,760	5,190
Total	329,000	254,000	490,000	330,000	256,000	734,000
1% or less carbon:						
Canada	2	2	3	15	12	39
China	--	--	--	322	261	956
Japan	1,030	828	2,030	1,370	1,110	3,890
Kazakhstan	--	--	--	12	10	20
Korea, Republic of	--	--	--	5,250	4,580	19,100
Mexico	804	649	1,060	3,900	3,150	12,800
Norway	39,700	32,300	87,100	32,800	26,600	84,900
South Africa	574	511	927	3,220	2,630	5,190
Spain	1	1	2	370	299	1,160
Switzerland	1	1	2	--	--	--
Other [1 country and (or) locality]	1 ^r	1 ^r	2 ^r	--	--	--
Total	42,100	34,300	91,100	47,300	38,700	128,000

See footnotes at end of table.

TABLE 5—Continued
U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS,
BY COUNTRY OR LOCALITY^{1, 2}

Country or locality	2021			2022		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
More than 1% but not more than 2% carbon:						
Australia	9,510	7,240	\$13,400	--	--	--
Canada	--	--	--	20	16	\$188
China	20	16	51	--	--	--
India	756	575	752	19	15	33
Italy	--	--	--	8	6	12
Japan	96	77	149	--	--	--
Korea, Republic of	19,700	15,800	37,200	30,600	24,500	77,900
Mexico	1,970 ^r	1,490 ^r	3,830 ^r	4,030	3,150	10,700
Norway	4,900	4,000	9,070	5,200	4,240	12,400
South Africa	26,400	21,100	48,300	19,000	15,000	59,700
Total	63,400 ^r	50,300 ^r	113,000	58,800	47,000	161,000
More than 2% but not more than 4% carbon:						
India	1,440	1,130	1,410	--	--	--
Mexico	4	3	4	--	--	--
Norway	56	44	53	--	--	--
South Africa	999	778	1,060	199	156	186
Total	2,500	1,960	2,520	199	156	186
More than 4% carbon:						
Australia	46,500	35,600	74,600	53,100	40,600	119,000
Brazil	496	364	630	262	192	558
India	50,100	37,700	61,400	43,700	32,800	66,700
Korea, Republic of	13,000	10,000	16,200	11,100	8,440	20,500
Malaysia	62,200	47,200	65,400	70,200	53,200	139,000
Norway	500	395	371	2,500	1,970	3,390
Russia	15,500	10,900	23,100	16,900	12,900	33,600
South Africa	22,900	17,400	28,000	21,400	16,500	54,000
United Kingdom	--	--	--	3,130	2,370	6,110
Zambia	1,180	910	1,510	899	691	1,320
Other [7 countries and (or) localities]	8,880 ^r	6,700 ^r	12,700 ^r	483	355	1,170
Total	221,000	167,000	284,000	224,000	170,000	445,000
Silicomanganese:						
Australia	56,600	37,200	89,100	62,900	41,500	161,000
Brazil	913	603	983	3,410	2,220	4,160
Georgia	87,800	64,700	123,000	114,000	82,300	246,000
India	500	276	720	33,700	21,800	48,700
Malaysia	26,700	17,900	34,800	46,200	30,300	94,900
Mexico	14,400 ^r	9,360 ^r	18,700 ^r	32,300	20,800	45,300
Norway	28,400	17,600	49,100	24,600	15,800	53,100
Russia	15,400	2,730	31,800	8,250	1,510	18,800
South Africa	82,000	53,200	85,000	89,800	58,300	98,900
Spain	314	187	463	3,340	2,170	6,500
Other [7 countries and (or) localities]	31	20	39	1,630	1,060	3,130
Total	313,000	204,000	434,000	420,000	278,000	780,000

See footnotes at end of table.

TABLE 5—Continued
U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS,
BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2021			2022		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Metal:						
Unwrought: ³						
China	31,000	XX	\$71,800	33,400	XX	\$131,000
Gabon	4	XX	10	--	XX	--
Germany	1,500	XX	3,970	777	XX	4,020
India	--	XX	--	25	XX	148
Indonesia	--	XX	--	260	XX	1,130
Japan	19 ^r	XX	3,560	62	XX	6,820
Mexico	44	XX	211	102	XX	938
South Africa	9,190 ^r	XX	26,100 ^r	6,590	XX	38,200
Spain	7	XX	10	153	XX	342
United Kingdom	25	XX	75	--	XX	--
Other [1 country and (or) locality]	(4) ^r	XX	8 ^r	--	XX	--
Total	41,800	XX	106,000	41,400	XX	183,000
Other manganese, wrought:						
Canada	(4)	XX	8	--	XX	--
China	13	XX	61	44	XX	185
France	(4)	XX	3	--	XX	--
Germany	155	XX	2,260	157	XX	2,230
India	--	XX	--	(4)	XX	9
Japan	(4)	XX	33	(4)	XX	61
Mexico	246	XX	1,140	152	XX	1,170
Sweden	50	XX	814	121	XX	2,110
United Kingdom	(4)	XX	10	(4)	XX	6
Total	465	XX	4,320	474	XX	5,770
Waste and scrap:						
Canada	387	XX	159	397	XX	206
China	--	XX	--	(4)	XX	4
India	--	XX	--	(4)	XX	3
Japan	4	XX	27	6	XX	35
Total	391	XX	187	403	XX	247
Manganese dioxide:						
Belgium	37	XX	144	65	XX	284
Brazil	188	XX	221	135	XX	178
China	118	XX	400	155	XX	294
Colombia	--	XX	--	17	XX	44
Greece	4,090	XX	9,470	990	XX	3,110
India	10	XX	26	19	XX	32
Japan	2,980	XX	6,690	2,340	XX	5,950
Mexico	90	XX	152	21	XX	35
South Africa	323	XX	748	34	XX	57
Spain	192	XX	396	130	XX	221
Other [3 countries and (or) localities]	95 ^r	XX	208 ^r	13	XX	71
Total	8,120	XX	18,500	3,920	XX	10,300
Potassium permanganate:						
Canada	(4)	XX	15	(4)	XX	2
Germany	(4)	XX	3	--	XX	--
India	750	XX	1,700	1,100	XX	3,220
Japan	74	XX	143	78	XX	150
Total	825	XX	1,860	1,170	XX	3,370

¹Revised. XX Not applicable. -- Zero.

²Table includes data available through July 24, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

³Presentation of data is based on the 2022 annual quantities (gross weight) of the leading countries and (or) localities.

⁴Imports of unwrought metal include flake, powder, and other.

⁵Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, manganese content)

Country or locality ³	2018	2019	2020	2021	2022
Australia: ^{4,5}					
Gross weight	8,193	7,545	7,976	7,900 ^r	7,169
Mn content, 37% to 53% Mn	3,475	3,177	3,331	3,252 ^r	3,044
Brazil:					
Gross weight	3,189	3,726	2,469	1,426	1,691 ⁵
Mn content, 21% to 51% Mn	1,281	1,452	933	542	624 ⁵
Bulgaria: ⁵					
Gross weight	45	--	--	24	--
Mn content, 25% to 35% Mn	13	--	--	7	--
Burkina Faso:					
Gross weight	9 ^e	9 ^e	30 ^e	--	--
Mn content, 36% to 51% Mn	4 ^e	4 ^e	13	--	--
Burma: ⁵					
Gross weight	518	1,100	630	515	518
Mn content, 39% to 40% Mn	207	430	250	206	207
China: ^{5,6}					
Gross weight	10,403	10,325	12,856 ^r	8,000 ^r	6,500
Mn content, 13% to 20% Mn	1,560	1,311	1,670 ^r	880 ^r	743
Congo (Kinshasa), gross weight	15	11	--	21	15
Côte d'Ivoire: ⁵					
Gross weight	864	1,175	1,280	905	986
Mn content, 41% to 45% Mn	354	482	525	362	394
Egypt: ⁵					
Gross weight	40	36	15 ^r	25 ^r	16
Mn content, 30% to 40% Mn	13	12	5	8 ^r	5
Gabon: ⁵					
Gross weight	5,071	6,169	7,916	9,643	10,375
Mn content, 45% to 53% Mn	2,336	2,759	3,572 ^r	4,354 ^r	4,671
Georgia, concentrate: ⁵					
Gross weight	569	461	549 ^r	596 ^r	437
Mn content, 37% to 40% Mn	216	175	209 ^r	227 ^r	166
Ghana:					
Gross weight	4,552	5,383	2,358	3,336	3,103 ⁵
Mn content, 27% to 30% Mn ⁵	1,364	1,554	637	911 ^r	844
India: ⁵					
Gross weight	3,924	3,134	1,809 ^r	1,759 ^r	2,543
Mn content, 10% to 58% Mn	1,224	962	548 ^r	495 ^r	721
Indonesia: ⁵					
Gross weight	--	--	158 ^r	19 ^r	138
Mn content, 28% to 44% Mn	--	--	55 ^r	6 ^r	48
Iran:					
Gross weight	129 ^e	131 ^e	25 ^{r,5}	106 ^{r,5}	77 ⁵
Mn content, 30% to 43% Mn	52 ^e	53 ^e	7 ^{r,5}	29 ^{r,5}	21 ⁵
Kazakhstan, concentrate:					
Gross weight	434	460	276	371 ^r	390
Mn content, 33% to 36% Mn	143 ^e	152 ^e	91 ^e	122 ^r	129 ^e
Malaysia:					
Gross weight	1,263	1,131	870	913	916 ⁵
Mn content, 32% to 45% Mn	492 ^e	441 ^e	339 ^e	356 ^e	247 ⁵
Mexico:					
Gross weight	560 ^e	576 ^e	575 ^e	580 ^r	582
Mn content, 34% to 38% Mn ⁷	209	219	219	221 ^r	221
Morocco:					
Gross weight	80	71	50 ^{r,5}	19 ^{r,5}	49 ⁵
Mn content, 47% to 53% Mn ⁸	42 ^e	38 ^e	24 ^{r,5}	9 ^{r,5}	24 ⁵

See footnotes at end of table.

TABLE 6—Continued
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, manganese content)

Country or locality ³	2018	2019	2020	2021	2022
Namibia:					
Gross weight ^c	66	92	106	88	66
Mn content, 35% Mn	23	32	37	31	23
Nigeria:					
Gross weight	59	1	20 ^r	57 ^r	60 ^c
Mn content, 25% to 37% Mn ^c	21	(9)	7 ^r	21 ^r	22
Oman:					
Gross weight	45	50	15 ^r	15 ^r	15 ^c
Mn content, 21% to 27% Mn ^c	11	13	4 ^r	4 ^r	4
Romania, ore:					
Gross weight	10	52	20	20	30
Mn content, 11% to 24% Mn	1	9	4	4 ^r	5 ^c
South Africa, metallurgical:					
Gross weight, all forms	14,920	17,002 ^r	16,199 ^r	19,156 ^r	18,967
Mn content, 30% to 48% Mn ^c	5,800	6,600	6,200	7,300 ^r	7,300
Sudan: ^c					
Gross weight	41	40	--	--	--
Mn content, 29% to 33% Mn	12	10	--	--	--
Thailand:					
Gross weight	4	5	1	-- ^r	1 ^c
Mn content, 44% to 50% Mn	2 ^c	2 ^c	1 ^c	-- ^r	1 ^c
Turkey: ⁵					
Gross weight	41	45	40	41	45
Mn content, 30% to 40% Mn	14	16	14	14	16
Ukraine:					
Gross weight	1,521	1,687	1,888	1,760	950 ^c
Mn content, 30% to 35% Mn ^c	517	574	642	600	323
Uzbekistan, Mn content, 30% to 44% Mn	--	2	2	(9) ^r	4 ⁵
Vietnam: ⁵					
Gross weight	267	246	279 ^r	339 ^r	362
Mn content, 43% Mn	115	106	120 ^r	146	155
Zambia:					
Gross weight	159 ¹⁰	257 ¹⁰	186 ¹⁰	140 ¹⁰	374 ⁵
Mn content, 27% to 44% Mn ^c	70	113	82	62	152 ⁵
Total:					
Gross weight	57,000	60,900	58,600 ^r	57,800 ^r	56,400
Mn content	19,600	20,700	19,500 ^r	20,200 ^r	20,100

^cEstimated. ^rRevised. -- Zero.

¹Table includes data available through August 7, 2023. All data are reported unless otherwise noted; totals may include estimated data. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Data pertain to concentrates or comparable shipping product, except that in a few instances the best data available appear to be for crude ore, possibly after some upgrading.

³In addition to the countries and (or) localities listed, Cuba, Greece, Pakistan, Panama, and Peru may have produced manganese ore and (or) manganiferous ore, but available information was inadequate to make reliable estimates of output.

⁴Metallurgical ore.

⁵Reported by the International Manganese Institute.

⁶Includes manganiferous ore.

⁷Mostly oxide nodules; may include smaller quantities of direct-shipping carbonate and oxide ores for metallurgical and battery operations, and sinter.

⁸Mn content estimated at 84% of manganese dioxide (MnO₂).

⁹Less than ½ unit.

¹⁰Imports received by all countries from Zambia. Source: UN Comtrade.

TABLE 7
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2018	2019	2020	2021	2022
Australia: ³					
Ferromanganese	148,300	114,000	84,000 ^r	91,000 ^r	124,000
Silicomanganese	112,900	95,000	102,000 ^r	100,000 ^r	95,000
Total	261,200	209,000	186,000 ^r	191,000 ^r	219,000
Brazil: ³					
Ferromanganese	136,000	120,000	85,000	80,000	73,000
Silicomanganese	228,690	216,000	206,000	203,000	205,000
Total	364,690	336,000	291,000	283,000	278,000
China:					
Ferromanganese: ^c					
Blast furnace	270,000	290,000	281,000 ^r	294,000 ^r	295,000
Electric furnace	1,660,000	1,770,000	1,730,000 ^r	1,810,000 ^r	1,810,000
Silicomanganese	9,450,000	12,600,000	11,380,000	10,650,000	10,010,000
Total	11,380,000	14,660,000	13,391,000 ^r	12,754,000 ^r	12,114,000
Egypt, ferromanganese ³	13,000	12,000	6,000 ^r	9,000	6,000
France: ³					
Ferromanganese	125,383	115,000	69,000 ^r	108,000	120,000
Silicomanganese	56,652	68,000	63,000 ^r	69,000 ^r	46,000
Total	182,035	183,000	132,000 ^r	177,000 ^r	166,000
Gabon, silicomanganese ³	42,900	43,000	38,000 ^r	44,000	43,000
Georgia, silicomanganese	335,000	291,600	217,500	356,300 ^r	397,700
India: ³					
Ferromanganese	537,000	542,000	567,000 ^r	943,000 ^r	965,000
Silicomanganese	2,133,000	1,889,000	1,770,000	2,276,000	2,568,000
Total	2,670,000	2,431,000	2,337,000 ^r	3,219,000 ^r	3,533,000
Indonesia, silicomanganese ³	9,000	22,000	61,000	33,000 ^r	24,000
Japan:					
Ferromanganese	456,518	462,740	400,331	440,173	405,899
Silicomanganese ³	21,100	31,000	16,000 ^r	14,000	17,000
Total	477,618	493,740	416,331 ^r	454,173	422,899
Kazakhstan, silicomanganese	137,710	123,464	122,743	132,119	196,000 ^c
Korea, Republic of:					
Ferromanganese	374,000 ³	317,478	258,787	407,516	328,000 ³
Silicomanganese	164,000 ³	137,852	149,196	146,289	126,000 ³
Total	538,000 ³	455,330	407,983	553,805	454,000 ³
Malaysia: ³					
Ferromanganese	315,000	266,000	215,000	174,000 ^r	250,000
Silicomanganese	283,414	312,000	302,000 ^r	336,000 ^r	328,000
Total	598,414	578,000	517,000 ^r	510,000 ^r	578,000
Mexico: ³					
Ferromanganese	95,468	73,000	58,000 ^r	72,000	73,000
Silicomanganese	152,000	154,000	148,000	171,000	176,000
Total	247,468	227,000	206,000 ^r	243,000	249,000
Norway: ³					
Ferromanganese	327,600	337,000	278,000 ^r	303,000	278,000
Silicomanganese	330,000	287,000	262,000	307,000	343,000
Total	657,600	624,000	540,000 ^r	610,000	621,000
Russia:					
Ferromanganese	281,000	273,000	238,000	209,000 ^{r, 3}	203,000 ³
Silicomanganese	43,334	51,774	--	406,000 ^{r, 3}	455,000 ³
Total	324,334	324,774	238,000	615,000 ^{r, 3}	658,000 ³
Saudi Arabia: ³					
Ferromanganese	15,000	12,000	9,000 ^r	9,000 ^r	9,000
Silicomanganese	70,000	63,000	35,000	48,000 ^r	40,000
Total	85,000	75,000	44,000 ^r	57,000 ^r	49,000

See footnotes at end of table.

TABLE 7—Continued
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2018	2019	2020	2021	2022
Slovakia:					
Ferromanganese	32,364	46,513	24,046	30,929	13,000 ³
Silicomanganese	37,225	26,187	33,812	48,590	4,000 ³
Total	69,589	72,700	57,858	79,519	17,000 ³
South Africa:³					
Ferromanganese	235,600	232,000	122,000	103,000 ^r	89,000
Silicomanganese	164,200	172,000	109,000 ^r	151,000	134,000
Total	399,800	404,000	231,000 ^r	254,000 ^r	223,000
Spain:³					
Ferromanganese	86,200	55,500	28,000	48,000	22,000
Silicomanganese	156,100	98,400	84,000 ^r	78,000 ^r	53,000
Total	242,300	153,900	112,000 ^r	126,000 ^r	75,000
Ukraine:					
Ferromanganese	79,480	151,090	122,960	100,600	22,000 ³
Silicomanganese	859,640	804,680	559,880	662,700	466,000 ³
Total	939,120	955,770	682,840	763,300	488,000 ³
United States, ferromanganese⁴	W	W	W	W	W
Grand total	20,000,000	22,700,000	20,200,000 ^r	21,500,000 ^r	20,800,000
Of which:					
Ferromanganese	5,190,000	5,190,000	4,580,000 ^r	5,230,000 ^r	5,080,000
Silicomanganese	14,800,000	17,500,000	15,700,000	16,200,000 ^r	15,700,000

^rEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data: not included in “Grand total.” -- Zero.

¹Table includes data available through September 25, 2023. All data are reported unless otherwise noted; totals may include estimated data. Grand totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Iran may have produced ferromanganese, but available information was inadequate to make reliable estimates of output.

³Reported by the International Manganese Institute.

⁴U.S. output of ferromanganese includes silicomanganese.