



2021 Minerals Yearbook

MANGANESE [ADVANCE RELEASE]

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MANGANESE

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In 2021, U.S. manganese apparent consumption was estimated to be 717,000 metric tons (t) on a manganese-content basis, a 15% increase from consumption in 2020 (table 1). Exports of all types of manganese (gross weight) increased by 46% to 30,500 t compared with 20,900 t in 2020 (table 5). Total manganese imports (gross weight) increased by 33% to 1,190,000 t in 2021 compared with 895,000 t in 2020 (table 6).

In 2021, average U.S. spot-market prices for high- and medium-carbon ferromanganese increased by 77% and 81%, respectively, from those in 2020. The average U.S. spot-market price for silicomanganese increased by 76% from that in 2020. The average domestic spot-market price for manganese metal was more than double that in 2020 (table 1).

World production of manganese ore in 2021 on a gross-weight basis was essentially unchanged, and on a manganese-content basis increased by 4% compared with the revised amounts in 2020 (tables 1, 7). South Africa (33%), Gabon (17%), Australia (14%), and China (14%) were the leading producers of manganese ore on a gross-weight basis. Combined world production of ferromanganese and silicomanganese, excluding U.S. production, increased by 3% to 20.7 million metric tons (Mt) on a gross-weight basis compared with 20.0 Mt (revised) in 2020 (table 8). China was the leading producer of manganese ferroalloys, accounting for 60% of world production.

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 90% of the domestic manganese consumption (table 4). Among a variety of other uses, manganese was also a key component of certain widely used aluminum alloys and was used in oxide or sulfate forms in batteries.

Government Actions and Legislation

Stockpile.—The Annual Materials Plan (AMP) for fiscal year 2021 (October 1, 2020, through September 30, 2021) was issued on October 1, 2020, by the Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense. 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, 2020a, b).

At 2021 calendar yearend, the DLA Strategic Materials disposed of (sold) 18,100 t of high-carbon ferromanganese. The amount of metallurgical-grade manganese ore and high-carbon ferromanganese in the National Defense Stockpile at the calendar yearend was 291,000 t and 114,000 t, respectively (gross weight) (table 2).

Production

Ore and Concentrate.—The only mine production of manganese in the United States consisted of small amounts of manganese material (clays or schists) having a manganese content of less than 5%. This material was produced in South Carolina for use in coloring brick.

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 3.

Consumption

In 2021, U.S. manganese apparent consumption was estimated to be 717,000 t on a manganese-content basis (table 1). Reported domestic consumption of manganese ore was estimated to be 399,000 t (gross weight), and corresponding yearend stocks were estimated to be 220,000 t. Reported consumption (gross weight) of ferromanganese and silicomanganese each increased by 3% compared with that in 2020. Reported manganese metal consumption in 2021 was 19,000 t (table 4).

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 2021, six companies at seven locations were canvassed that processed ore, had processed ore in the past by such methods as grinding and roasting, or had used ore in the manufacture of dry cell batteries and manganese chemicals, ferroalloys, and metals. Four out of seven companies replied to the USGS “Manganese Ore and Products” survey, and all used manganese ore in their processes in 2021; the consumption data are 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 180 manganese 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 4 and include estimates to account for nonrespondents.

Globally, steel production accounted for more than 90% of manganese consumption, nonferrous alloys and batteries each accounted for about 2%, and multiple smaller applications accounted for the remaining consumption (Roskill Information Services Ltd., 2020).

Relatively small quantities of manganese were used for alloying with nonferrous metals, chiefly in the aluminum industry as manganese-aluminum briquets that typically contain between 75% and 85% manganese. Manganese plays an important alloying role in aluminum applications to increase corrosion resistance. The leading use of aluminum-manganese alloys was in the manufacture of beverage cans (Roskill Information Services Ltd., 2020). Other uses included but were not limited to aircraft components, automobiles, and building products.

Comparatively small amounts of manganese were used domestically in animal feed, glass and tile colorants, dry cell batteries, ferrites, fertilizers, manganese chemicals (including water treatment), and welding rods (Roskill Information Services Ltd., 2020). These were among the many nonmetallurgical applications of manganese.

Prices

Manganese Ore.—The only spot-market prices reported for manganese ore were for deliveries to China. In 2021, the average spot-market 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 \$5.27 per metric ton unit, a 15% increase from \$4.59 per metric ton unit in 2020 (CRU Group, 2022). [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 price per metric ton unit by the percentage manganese content of the ore; for example, multiplying by 46 when the manganese content is 46%.] The ore market consisted of several of submarkets because of differences in ore-quality requirements by end use—ferroalloys production, blast furnace ironmaking, and manufacture of manganese chemicals.

Manganese Ferroalloys and Metal.—Prices for manganese ferroalloys tended to vary in response to changes in demand by the steel and ferrous foundry industries, whereas prices for manganese metal predominantly followed changes in demand by the aluminum industry. Manganese ferroalloys prices were also 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 free market spot prices per unit of measurement, duty-paid in a U.S. warehouse. Annual average import prices were \$2,024.53 per gross ton for high-carbon ferromanganese, 164.66 cents per pound for medium-carbon ferromanganese, and 92.08 cents per pound for silicomanganese (table 1). These prices were 77%, 81%, and 76% more for high-carbon ferromanganese, medium-carbon ferromanganese, and silicomanganese, respectively, compared with those in 2020. The annual average North American transaction price for manganese metal as reported by CRU Group was 249.59 cents per pound, more than double that in 2020.

Foreign Trade

Excluding the negligible amount of mangiferous materials extracted in South Carolina to color bricks and in the absence of recycling specifically for manganese, U.S. net import reliance, as a percentage of apparent consumption, was 100% for manganese; this is the same as it had been for the previous 31 years. The ensuing comparisons of foreign trade data were made based on gross weight.

In 2021, U.S. exports (gross weight) of all manganese products increased by 46% to 30,500 t from 20,900 t in 2020. Exports of silicomanganese increased by 148% to 5,200 t, ferromanganese (all grades) increased by 92% to 9,010 t, manganese dioxide increased by 42% to 9,740 t, and manganese ore increased by 16% to 1,110 t. Exports of manganese metal, including waste and scrap, decreased by 13% to 5,460 t. Canada was the leading destination for most manganese product exports in 2021, accounting for 92% of ferromanganese exports, 91% of silicomanganese exports, and 65% of manganese dioxide exports. Manganese metal was exported predominantly to Malaysia (77%) and Canada (10%), and manganese ore exports went mainly to Canada (56%) and Mexico (25%) (table 5).

In 2021, U.S. imports (gross weight) of manganese products increased by 33% to 1,191,000 t from 895,000 t in 2020. Imports of manganese dioxide increased by 49% to 8,120 t, ferromanganese (all grades) increased by 47% to 329,000 t, unwrought manganese products increased by 47% to 41,800 t, manganese ore (all grades) increased by 35% to 497,000 t, silicomanganese increased by 17% to 313,000 t, and potassium permanganate increased by 13% to 825 t. Imports of wrought manganese products decreased by 47% to 465 t and imports of manganese waste and scrap decreased by 30% to 391 t (table 6).

World Industry Structure

World manganese ore production was 56.9 Mt (gross weight) and 20.1 Mt (manganese content) in 2021, essentially unchanged and 4% more, respectively, than the revised amounts in 2020. On a manganese-content basis, the leading producing countries of manganese ore were South Africa (36%), Gabon (22%), and Australia (16%), together accounting for 74% of world production. On a gross-weight basis, the leading producing countries were South Africa (33%), Gabon (17%), Australia (14%), and China (14%) (table 7).

Excluding the United States, total world manganese ferroalloy production was 20.7 Mt (gross weight) in 2021, 3% more than the revised amount in 2020. On a gross-weight basis, the leading producers of manganese ferroalloys were China (60%) and India (16%) (table 8).

The International Manganese Institute (IMnI) estimated that world apparent consumption of manganese ferroalloys (gross weight) increased by 3% to 22.7 Mt in 2021 compared with 22.0 Mt in 2020. Of the 22.7 Mt consumed in 2021, 17.3 Mt was silicomanganese, 4.1 Mt was high-carbon ferromanganese, and 1.3 Mt was refined (medium- and low-carbon) ferromanganese.

The IMnI's estimate for world manganese ferroalloys production in 2021 was 22.8 Mt, about the same as its estimate for ferroalloys apparent consumption (22.7 Mt). The IMnI estimated world manganese ore apparent consumption on a manganese-content basis in 2021 to be about 18.8 Mt, which was 9% more than the estimate of 17.2 Mt in 2020 (International Manganese Institute, 2022).

World Review

Australia.—Australia was the world's third-leading producer of manganese ore on a manganese-content basis and gross-weight basis. Ore production (manganese content) in Australia decreased slightly in 2021 from that in 2020 (table 7).

Element 25 Ltd. started production at its Butcherbird open pit manganese mining project in mid-2021, producing a total of 95,000 t of manganese concentrate in 2021 (Element 25 Ltd., 2021a, b, 2022). The Butcherbird manganese deposit had a measured, indicated, and inferred resource estimate of 263 Mt with a grade of 10% manganese and a reserve estimate of 50.55 Mt with a grade of 10.3% manganese (Element 25 Ltd., undated).

Groote Eylandt Mining Co. Operation (GEMCO), a joint venture between South32 Ltd. (60%) and Anglo American plc of the United Kingdom (40%), had been in operation since 1965. The operation, which had a remaining resource of 147 Mt with a grade of 43.7% manganese, produced 4% less manganese ore in 2021 compared with that in 2020 (South32 Ltd., 2021a, b, c, 2022, undated a; Northern Territory Government [Australia], undated).

OM Holdings Ltd. produced 850,000 t of manganese ore with an average grade of 28.42% manganese from its Bootu Creek Mine in the Northern Territory of Australia, 16% more than the 740,000 t (average grade 28.10% manganese) produced in 2020 (OM Holdings Ltd., 2021, p. 13; 2022, p. 19, 20).

China.—China led the world in ferromanganese and silicomanganese production, accounting for about 35% and 67% of global production, respectively, in 2021 (table 8). China's ferromanganese production was estimated to be 1.69 Mt, and silicomanganese production was 10.7 Mt, decreases of 3% and 6%, respectively, from those in 2020. In 2021, China exported 109,000 t of silicomanganese, more than four times the 26,200 t exported in 2020 (TEX Report, The, 2021, 2022). Owing to demand recovery and restocking following the global coronavirus disease 2019 (COVID-19) pandemic, China exported 406,000 t of manganese metal in 2021, an almost 15% increase from the 354,000 t exported in 2020 (Argus Media group—Argus Metals International, 2022).

In January, the National Manganese Flake Innovation Alliance, a group of 11 leading manganese metal flake producers in China, signed an agreement involving strategic cooperation of manganese research and development, raw material supply, marketing, financing, and other aspects of mutual aid (Asian Metal Ltd., 2021). These 11 companies accounted for about 80% of the manganese flake production capacity in China. Intermittent production suspensions initiated by the Innovation Alliance and electricity supply restrictions directed by the

Government of China contributed to manganese metal prices in China reaching a 14-year high (Argus Media group—Argus Metals International, 2021a, b, c).

Gabon.—Gabon was the world's second-leading producer of manganese ore on a manganese-content basis (table 7). Ore production (manganese-content) in Gabon increased by 22% in 2021 from that in 2020. Eramet Group (France), the leading producer of manganese ore in Gabon, accounted for about 73% of the country's total manganese ore production (gross weight) in 2021. From its Moanda Mine, Eramet produced 7.0 Mt of manganese ore in 2021, a 21% increase from that in 2020 (Eramet Group, 2022, p. 26).

South Africa.—South Africa was the world's leading producer of manganese ore on both a manganese-content and gross-weight basis. Ore production (manganese-content) in South Africa was estimated to have increased by 16% in 2021 from that in 2020 (table 7).

Manganese ore was produced from the Mamatwan and Wessels Mines, which were part of the Hotazel Manganese Mines consortium, of which South32 held a 44.4% interest and the remaining held by Anglo America and Broad-Based Black Economic Empowerment entities (South32 Ltd., undated b). In 2021, the mines produced about 21% more manganese ore than that in 2020 (South32 Ltd., 2021a, b, c, 2022).

Assmang Proprietary Ltd., a joint venture owned by African Rainbow Minerals Ltd. (50%) and Assore Ltd. (50%), was also a leading manganese ore producer, operating out of the Gloria and N'chwaning Mines with a combined capacity of 3.9 million metric tons per year (gross weight) (Roskill Information Services Ltd., 2020).

Outlook

Most consumption of manganese is by the steel industry. Global crude steel production in 2021 was 1.95 billion metric tons (Gt), compared with 1.88 Gt in 2020 (World Steel Association, 2022a, p. 9). The World Steel Association's short-range forecast for global steel consumption was 1.84 Gt for 2022 and 1.88 Gt for 2023 (World Steel Association, 2022b). Further details of the outlook for the steel industry are discussed in the "Outlook" section of the Iron and Steel chapter of the 2021 USGS Minerals Yearbook, volume I, Metals and Minerals.

Owing to a wide range of potential applications, in particular implantable medical devices, the global lithium manganese dioxide battery market is forecasted to increase by a compound annual growth rate of more than 7% from 2022 to 2028 (Business Wire, 2022).

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TABLE 1
SALIENT MANGANESE STATISTICS¹

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

	2017	2018	2019	2020	2021	
United States:						
Manganese ore (20% or more manganese):						
Production	--	--	--	--	--	
Exports	1	3	1	1	1	
Imports for consumption	297	440	434	367	497	
Consumption ^{e, 2}	378	369	442	378	399	
Stocks, December 31, consumers ^{e, 2}	148	191	175	143	220	
Ferromanganese:						
Production	W	W	W	W	W	
Exports	9	10	5	5	9	
Imports for consumption	331	427	332	223	329	
Consumption ^e	345	348	336	325	335	
Stocks, December 31, consumers and producers ^e	17	27	44	35	40	
Silicomanganese:						
Production	W	W	W	W	W	
Exports	8	4	2	2	5	
Imports for consumption	351	412	351	269	313	
Consumption ^e	141 ³	139 ³	143 ³	229	237	
Stocks, December 31, consumers and producers ^e	11	21	39	31	34	
Consumption, apparent, manganese content ^{e, 4}	715	796	748	621 ^r	717	
Price, average:						
Ferromanganese, high carbon ⁵	dollars per gross ton	1,488.74	1,471.36	1,311.14	1,145.92	2,024.53
Ferromanganese, medium carbon ⁵	cents per pound	110.46	113.31	109.70	90.93	164.66
Manganese metal ⁶	do.	112.17	137.27	115.72	99.49	249.59
Manganese ore ⁷	dollars per metric ton unit	5.97	7.16	5.63	4.59	5.27
Silicomanganese ⁵	cents per pound	65.59	64.96	62.36	52.40	92.08
World, production of manganese ore ⁸		59,100 ^r	57,000 ^r	60,900 ^r	56,300 ^r	56,900

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

¹Table includes data available through August 26, 2022. Data are rounded to no more than three significant digits, except prices.

²Exclusive of iron and steel plants.

³U.S. Geological Survey evaluation indicates that silicomanganese consumption was considerably understated.

⁴Based on estimates of average content for all significant components.

⁵S&P Global Platts Metals Week based on monthly averages.

⁶CRU Group North American transaction prices based on monthly averages.

⁷CRU Group, cost, insurance, and freight, China, 44% manganese metallurgical ore.

⁸May include estimated data.

TABLE 2
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE MANGANESE STATISTICS IN 2021^{1,2}

(Metric tons, gross weight)

Material	Inventory, yearend		Annual Materials Plan ³		Sales		Inventory changes ⁴	
	Fiscal year ³	Calendar year	Potential acquisitions	Potential disposals	Fiscal year ³	Calendar year	Fiscal year ³	Calendar year
Electrolytic metal	--	--	5,000	--	--	--	-432	-432
Metallurgical ore	291,000	291,000	--	292,000	--	--	-1,620	-1,620
High-carbon ferromanganese	119,000	114,000	--	45,400	33,600	18,100	-44,000	-20,700
Total	409,000	405,000	5,000	337,000	33,600	18,100	-46,100	-22,700

-- Zero.

¹Table includes data available through August 26, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes stockpile- and nonstockpile-grade materials.

³Twelve-month period ending September 30, 2021.

⁴From previous year.

Source: Defense Logistics Agency Strategic Materials.

TABLE 3
DOMESTIC PRODUCERS OF PRINCIPAL MANGANESE PRODUCTS IN 2021

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		Do.
Prince International Corp.	Baltimore, MD			X	Chemical.
Do.	New Johnsonville, TN			X	Electrolytic.

Do., do. Ditto.

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

TABLE 4
U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2021^{1,2}

(Metric tons, gross weight)

End use	Ferromanganese		Silicomanganese	Manganese metal
	High carbon	Medium and low carbon		
Steel:				
Carbon	(3)	(3)	189,000	(3)
High-strength, low-alloy	(3)	(3)	(3)	(3)
Stainless and heat-resisting	7,070	2,660	15,400	972
Full alloy	(3)	(3)	15,900	44
Unspecified ⁴	190,000	128,000	14,100	11,000
Total	197,000	131,000	234,000	12,000
Cast irons	6,310	(5)	139	(5)
Superalloys	(5)	(5)	--	79
Alloys (excluding alloy steels)	(5)	(5)	--	(5) ⁶
Miscellaneous and unspecified	386	537	2,750	6,850
Grand total	204,000	131,000	237,000	19,000
Total manganese content ⁷	163,000	110,000	156,000	19,000
Stocks, December 31, 2021, consumers and producers	11,000	28,700	34,300	1,210 ⁸

-- Zero.

¹Table includes data available through August 26, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes U.S. Geological Survey 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 5
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY¹

Country or locality	2020		2021	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Ore and concentrates, 20% or more manganese:²				
Belgium	325	\$507	20	\$57
Canada	298	292	624	427
Dominican Republic	--	--	29	21
India	40	34	97	91
Japan	40	71	--	--
Korea, Republic of	17	16	7	3
Mexico	73	58	279	137
Netherlands	64	241	14	53
Singapore	--	--	20	9
United Kingdom	40	25	25	15
Other [3 countries and (or) localities]	62 ^r	100 ^r	--	--
Total	957	1,340	1,110	813
Ferromanganese, all grades:²				
Argentina	--	--	218	427
Brazil	--	--	48	134
Canada	4,550 ^r	5,460	8,310	12,700
Chile	--	--	30	62
China	--	--	15	42
Jamaica	--	--	40	90
Mexico	2	4	295	622
Peru	--	--	38	115
Taiwan	--	--	4	10
Uruguay	--	--	5	9
Other [10 countries and (or) localities]	138 ^r	240 ^r	11	28
Total	4,690 ^r	5,710	9,010	14,300
Silicomanganese:				
Canada	2,020 ^r	2,470	4,750	7,840
Colombia	--	--	203	299
Honduras	--	--	2	5
Japan	--	--	(3)	4
Mexico	78	146	62	146
Peru	--	--	190	279
Turkey	1	3	--	--
Total	2,100 ^r	2,620	5,200	8,580
Metal, including waste and scrap:²				
Canada	51	205	536	2,000
Dominican Republic	14	17	48	130
Germany	76	127	82	413
Japan	113	312	103	372
Korea, Republic of	(3)	12	25	9
Malaysia	5,060	2,260	4,230	2,420
Mexico	9	228	59	416
Netherlands	--	--	165	1,030
Turkey	191	71	29	11
Vietnam	--	--	100	80
Other [19 countries and (or) localities]	763 ^r	1,930 ^r	88	1,600
Total	6,280	5,160	5,460	8,490
Manganese dioxide:²				
Brazil	66	256	91	351
Canada	4,410	3,500	6,300	4,650
El Salvador	117	145	271	325
Germany	58	214	112	122
Israel	234	286	690	869
Italy	516	1,250	516	1,350
Mexico	428	529	546	930
Poland	96	355	162	597

See footnotes at end of table.

TABLE 5—Continued
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY¹

Country or locality	2020		2021	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Manganese dioxide: ² —Continued				
Romania	--	--	95	136
United Kingdom	505	654	585	938
Other [20 countries and (or) localities]	433 ³	1,330 ³	367	1,250
Total	6,860	8,510	9,740	11,500

¹Revised. -- Zero.

¹Table includes data available through July 25, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Presentation of data is based on the 2021 annual quantities (gross weight) of the leading countries and (or) localities.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY OR LOCALITY¹

Country or locality	2020			2021		
	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, 20% or more manganese:						
All grades:						
Belgium	18	9	\$21	--	--	--
Brazil	553	273	328	193	97	\$135
China	--	--	--	18	17	4
France	17	8	21	1	1	2,020
Gabon	217,000	123,000	56,900	347,000	202,000	72,700
Mexico	70,500	30,000	14,100	56,000	21,300	9,670
Morocco	1,200	762	511	2,210	1,210	950
South Africa	77,900	31,500	12,300	91,700	36,600	14,300
Spain	20	9	7	--	--	--
Ukraine	31	15	2,510	--	--	--
Total	367,000	186,000	86,700	497,000	261,000	99,800
More than 20% but less than 47% manganese:						
Mexico	50,500	15,900	9,300	55,600	21,100	9,360
South Africa	76,700	30,900	11,800	84,900	33,300	12,300
Spain	20	9	7	--	--	--
Total	127,000	46,700	21,100	141,000	54,400	21,600
47% or more manganese:						
Belgium	18	9	21	--	--	--
Brazil	553	273	328	193	97	135
Canada	--	--	--	18	17	4
France	17	8	21	1	1	2,020
Gabon	217,000	123,000	56,900	347,000	202,000	72,700
Mexico	20,000	14,100	4,820	304	208	308
Morocco	1,200	762	511	2,210	1,210	950
South Africa	1,200	582	499	6,800	3,360	2,050
Ukraine	31	15	2,510	--	--	--
Total	240,000	139,000	65,600	356,000	207,000	78,200
Ferromanganese:						
All grades: ²						
Australia	41,200	31,500	37,300	56,100	42,800	88,000
France	748	571	857	6,460	4,870	10,300
India	2,590	1,970	2,450	52,300	39,500	63,600
Korea, Republic of	28,300	23,000	36,700	32,700	25,800	53,400
Malaysia	47,100	35,800	37,400	62,200	47,200	65,400
Mexico	1,540	1,180	2,360	2,660	2,050	4,610
Norway	33,700	27,300	46,300	45,100	36,700	96,600
Russia	26,100	19,800	22,700	15,500	10,900	23,100
South Africa	37,300	29,100	44,200	50,900	39,800	78,300
Switzerland	--	--	--	2,310	1,760	2,170
Other [9 countries and (or) localities]	4,700 ^r	3,510 ^r	5,130 ^r	2,910	2,250	4,510
Total	223,000	174,000	235,000	329,000	254,000	490,000
1% or less carbon: ²						
Canada	--	--	--	2	2	3
China	516	419	874	--	--	--
India	--	--	--	1	1	2
Japan	758	608	1,120	1,030	828	2,030
Korea, Republic of	5,010	4,610	9,000	--	--	--
Mexico	318	253	461	804	649	1,060
Norway	28,600	23,100	40,400	39,700	32,300	87,100
South Africa	2,250	1,940	3,340	574	511	927
Spain	--	--	--	1	1	2
Switzerland	--	--	--	1	1	2
Other [2 countries and (or) localities]	49	40	86	--	--	--
Total	37,500	31,000	55,300	42,100	34,300	91,100

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY OR LOCALITY¹

Country or locality	2020			2021		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ferromanganese:—Continued						
More than 1% but not more than 2% carbon:						
Australia	10,400	7,940	9,550	9,510	7,240	13,400
Brazil	540	430	497	--	--	--
China	--	--	--	20	16	51
India	301	241	419	756	575	752
Japan	298	240	362	96	77	149
Korea, Republic of	19,200	15,300	24,200	19,700	15,800	37,200
Mexico	1,220	931	1,900	1,820	1,380	3,510
Norway	4,700	3,800	5,590	4,900	4,000	9,070
South Africa	16,600	13,300	23,000	26,400	21,100	48,300
Total	53,200	42,200	65,500	63,300	50,200	113,000
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
Total	--	--	--	2,500	1,960	2,520
More than 4% carbon: ²						
Australia	30,800	23,500	27,700	46,500	35,600	74,600
France	748	571	857	6,460	4,870	10,300
India	2,290	1,730	2,030	50,100	37,700	61,400
Korea, Republic of	4,090	3,050	3,540	13,000	10,000	16,200
Malaysia	47,100	35,800	37,400	62,200	47,200	65,400
Norway	450	351	331	500	395	371
Russia	26,100	19,800	22,700	15,500	10,900	23,100
South Africa	18,500	13,900	17,900	22,900	17,400	28,000
Switzerland	--	--	--	2,310	1,760	2,170
Zambia	430	230	339	1,180	910	1,510
Other [5 countries and (or) localities]	2,120 ^r	1,550 ^r	1,850 ^r	600	436	798
Total	133,000	100,000	115,000	221,000	167,000	284,000
Silicomanganese: ²						
Australia	65,100	43,000	63,200	56,600	37,200	89,100
Brazil	1,150	749	978	913	603	983
Georgia	82,400	59,800	88,600	87,800	64,700	123,000
India	49	29	53	500	276	720
Malaysia	10,600	6,920	9,140	26,700	17,900	34,800
Mexico	15,300	10,100	14,000	14,600	9,470	19,000
Norway	17,200	8,840	20,300	28,400	17,600	49,100
Russia	11,300	2,660	10,700	15,400	2,730	31,800
South Africa	58,500	36,500	54,800	82,000	53,200	85,000
Spain	--	--	--	314	187	463
Other [6 countries and (or) localities]	7,240 ^r	5,470 ^r	6,280 ^r	31	20	39
Total	269,000	174,000	268,000	313,000	204,000	434,000
Metal:						
Unwrought: ^{2, 3}						
China	20,600	XX	32,000	31,000	XX	71,800
Gabon	--	XX	--	4	XX	10
Germany	767	XX	1,510	1,500	XX	3,970
Hong Kong	--	XX	--	11	XX	43
Japan	2	XX	2,150	11	XX	3,560
Mexico	86	XX	317	44	XX	211
Poland	(4)	XX	12	(4)	XX	8
South Africa	6,630	XX	13,100	9,210	XX	26,200
Spain	33	XX	55	7	XX	10

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY OR LOCALITY¹

Country or locality	2020			2021		
	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:—Continued						
Unwrought: ^{2, 3} —Continued						
United Kingdom	--	XX	--	25	XX	75
Other [3 countries and (or) localities]	410 ^r	XX	705 ^r	--	XX	--
Total	28,500	XX	49,800	41,800	XX	106,000
Other manganese, wrought:						
Canada	--	XX	--	(4)	XX	8
China	306	XX	532	13	XX	61
France	--	XX	--	(4)	XX	3
Germany	166	XX	2,260	155	XX	2,260
Italy	(4)	XX	2	--	XX	--
Japan	(4)	XX	25	(4)	XX	33
Luxembourg	44	XX	175	--	XX	--
Mexico	325	XX	816	246	XX	1,140
Sweden	45	XX	609	50	XX	814
United Kingdom	(4)	XX	5	(4)	XX	10
Total	887	XX	4,420	465	XX	4,320
Waste and scrap:						
Canada	555	XX	161	387	XX	159
Japan	(4)	XX	7	4	XX	27
Mexico	2	XX	5	--	XX	--
Total	557	XX	173	391	XX	187
Manganese dioxide: ²						
Belgium	48	XX	226	37	XX	144
Brazil	157	XX	198	188	XX	221
Canada	5	XX	21	26	XX	41
China	1	XX	6	118	XX	400
Greece	413	XX	955	4,090	XX	9,470
Japan	4,230	XX	9,440	2,980	XX	6,690
Mexico	63	XX	107	90	XX	152
Morocco	274	XX	465	51	XX	79
South Africa	--	XX	--	323	XX	748
Spain	202	XX	343	192	XX	396
Other [2 countries and (or) localities]	61 ^r	XX	161 ^r	28	XX	114
Total	5,450	XX	11,900	8,120	XX	18,500
Potassium permanganate:						
Australia	8	XX	27	--	XX	--
Canada	(4)	XX	18	(4)	XX	15
Germany	--	XX	--	(4)	XX	3
India	709	XX	1,680	750	XX	1,700
Japan	7	XX	24	74	XX	143
Spain	4	XX	36	--	XX	--
United Kingdom	(4)	XX	3	--	XX	--
Total	728	XX	1,790	825	XX	1,860

^rRevised. XX Not applicable. -- Zero.¹Table includes data available through July 25, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.²Presentation of data is based on the 2021 annual quantities (gross weight) of the leading countries and (or) localities.³Imports of unwrought metal include flake, powder, and other.⁴Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons)

Country or locality ³	2017	2018	2019	2020	2021
Australia: ^{4,5}					
Gross weight	6,473	8,193	7,545	7,976	7,911
Manganese (Mn) content, 37% to 53% Mn	2,821	3,475	3,177	3,331	3,255
Brazil:					
Gross weight	3,334	3,189	3,726	2,469 ^r	1,426
Mn content, 21% to 51% Mn	1,344	1,281	1,452	933 ^r	542
Bulgaria: ⁵					
Gross weight	33	45 ^r	--	--	24
Mn content, 25% to 35% Mn	9	13 ^r	--	--	7
Burkina Faso:					
Gross weight	9	9 ^e	9 ^e	30 ^e	--
Mn content, 36% to 51% Mn	4 ^e	4 ^e	4 ^e	13	--
Burma: ⁵					
Gross weight	346	518	1,100	630 ^r	515
Mn content, 39% to 40% Mn	138	207	430	250 ^r	206
China: ^{5,6}					
Gross weight	19,032 ^r	10,403 ^r	10,325 ^r	10,394 ^r	7,799
Mn content, 13% to 20% Mn	2,855 ^r	1,560 ^r	1,311 ^r	1,320 ^r	991
Congo (Kinshasa), gross weight	--	15	11	-- ^r	21
Côte d'Ivoire: ⁵					
Gross weight	470	864	1,175	1,280	905
Mn content, 41% to 45% Mn	212	354	482	525	362
Egypt: ⁵					
Gross weight	36	40	36	16	26
Mn content, 30% to 40% Mn	12	13	12	5	9
Gabon: ⁵					
Gross weight	4,717	5,071	6,169	7,916 ^r	9,643
Mn content, 45% to 53% Mn	2,193	2,336	2,759	3,562 ^r	4,343
Georgia, concentrate: ⁵					
Gross weight	463	569 ^r	461 ^r	547 ^r	589
Mn content, 37% to 40% Mn	186	216 ^r	175 ^r	208 ^r	224
Ghana:					
Gross weight	3,004	4,552	5,383	2,358	3,336
Mn content, 27% to 30% Mn	824 ^s	1,364 ^s	1,554 ^s	637 ^s	940 ^e
India: ⁵					
Gross weight	1,957 ^r	3,924 ^r	3,134 ^r	2,146 ^r	1,609
Mn content, 10% to 58% Mn	668 ^r	1,224 ^r	962 ^r	656 ^r	453
Indonesia: ⁵					
Gross weight	56	--	--	155 ^r	--
Mn content, 28% to 44% Mn	24	--	--	54 ^r	--
Iran: ^e					
Gross weight	101	129	131 ^r	10	1
Mn content, 30% to 43% Mn	41 ^r	52 ^r	53 ^r	4 ^r	1
Kazakhstan, concentrate:					
Gross weight	464	434	460	276 ^r	280 ^e
Mn content, 33% to 36% Mn ^e	167	143	152	91 ^r	90
Malaysia:					
Gross weight	1,226	1,263	1,131	870 ^r	913
Mn content, 32% to 45% Mn ^e	478	492	441	339 ^r	356
Mexico:					
Gross weight ^e	590	560	576 ^r	575 ^r	594
Mn content, 34% to 38% Mn ⁷	212	209	219 ^r	219 ^r	226
Morocco:					
Gross weight	99	80	71 ^r	80 ^e	40 ^e
Mn content, 47% to 53% Mn ^{e,8}	59	42	38 ^r	42	21

See footnotes at end of table.

TABLE 7—Continued
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons)

Country or locality ³	2017	2018	2019	2020	2021
Namibia:					
Gross weight ^e	80	66	92	106	88
Mn content, 35% Mn	28	23	32	37	31
Nigeria:					
Gross weight	37	59	1 ^r	1 ^{r, e}	1 ^e
Mn content, 25% to 37% Mn ^e	13	21	(9) ^r	(9) ^r	(9)
Oman:					
Gross weight	14	45	50 ^r	9 ^r	9 ^e
Mn content, 21% to 27% Mn ^e	3	11	13 ^r	2	2
Romania, ore:					
Gross weight	14	10	52	20 ^r	20
Mn content, ore, 11% to 24% Mn	3	1	9	4 ^r	3 ^e
Russia, concentrate, Mn content, 20% to 30% Mn	(9)	-- ^r	-- ^r	-- ^r	--
South Africa, metallurgical:					
Gross weight, all forms ¹⁰	14,653	14,920	17,000	16,021 ^r	18,880 ^e
Mn content, 30% to 48% Mn ^e	5,700	5,800	6,600	6,200 ^r	7,200
Sudan: ^e					
Gross weight	42	41	40	--	--
Mn content, 29% to 33% Mn	12	12	10	--	--
Thailand:					
Gross weight	8	4	5	1 ^r	1 ^e
Mn content, 44% to 50% Mn ^e	4	2	2	1 ^r	1
Turkey: ⁵					
Gross weight	40	41	45	40	41
Mn content, 30% to 40% Mn	14	14	16	14	14
Ukraine:					
Gross weight	1,425	1,521	1,687	1,888 ^r	1,760
Mn content, 30% to 35% Mn ^e	484	517	574	642 ^r	600
Uzbekistan, Mn content, 30% to 44% Mn	--	--	2	2	2 ^e
Vietnam: ⁵					
Gross weight	243 ^r	267 ^r	246 ^r	281	341
Mn content, 43% Mn	105 ^r	115 ^r	106 ^r	121	146
Zambia:					
Gross weight ¹¹	131	159	257	186	140
Mn content, 27% to 44% Mn ^e	58	70	113	82	62
Total:					
Gross weight	59,100 ^r	57,000 ^r	60,900 ^r	56,300 ^r	56,900
Mn content	18,700 ^r	19,600 ^r	20,700 ^r	19,300 ^r	20,100

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through August 10, 2022. 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 were for crude ore without manganese grade specified, 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% for manganese dioxide.

⁹Less than ½ unit.

¹⁰Calculated manganese content of metal includes allowance for assumed moisture content. Includes ore and sinter.

¹¹Imports received to all countries from Zambia. Source: UN Comtrade.

TABLE 8
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2017	2018	2019	2020	2021
Australia: ³					
Ferromanganese	125,100	148,300	114,000	83,000	90,000
Silicomanganese	120,200	112,900	95,000	101,000	99,000
Total	245,300	261,200	209,000	184,000	189,000
Brazil: ³					
Ferromanganese	123,470	136,000	120,000	85,000	80,000
Silicomanganese	202,520	228,690	216,000	206,000	203,000
Total	325,990	364,690	336,000	291,000	283,000
China:					
Ferromanganese: ^c					
Blast furnace	220,000	270,000	290,000	250,000	240,000
Electric furnace	1,560,000	1,660,000	1,770,000	1,500,000	1,450,000
Silicomanganese	6,610,000	9,450,000	12,600,000	11,380,000 ^r	10,650,000
Total	8,390,000	11,380,000	14,660,000	13,130,000 ^r	12,340,000
Egypt, ferromanganese ³	12,000	13,000	12,000	5,000	9,000
France: ³					
Ferromanganese	95,442	125,383	115,000	68,000	108,000
Silicomanganese	58,443	56,652	68,000	62,000	68,000
Total	153,885	182,035	183,000	130,000	176,000
Gabon, silicomanganese ³	21,300	42,900	43,000	37,000	44,000
Georgia, silicomanganese	289,800	335,000	291,600	217,500 ^r	322,800
India: ³					
Ferromanganese	514,000 ^r	537,000 ^r	542,000 ^r	566,000 ^r	952,000
Silicomanganese	2,038,000	2,133,000	1,889,000	1,770,000 ^r	2,276,000
Total	2,552,000 ^r	2,670,000 ^r	2,431,000 ^r	2,336,000 ^r	3,228,000
Indonesia, silicomanganese ³	40,000	9,000 ^r	22,000 ^r	61,000 ^r	21,000
Japan:					
Ferromanganese	456,460	456,518	462,740	400,331 ^r	440,173
Silicomanganese ³	24,500	21,100	31,000	15,000	14,000
Total	480,960	477,618	493,740	415,331 ^r	454,173
Kazakhstan, silicomanganese	123,977	137,710	123,464	122,743 ^r	132,119
Korea, Republic of:					
Ferromanganese	360,000 ³	374,000 ³	317,478	258,787	407,516
Silicomanganese	117,000 ³	164,000 ³	137,852 ^r	149,196 ^r	146,289
Total	477,000 ³	538,000 ³	455,330 ^r	407,983 ^r	553,805
Malaysia: ³					
Ferromanganese	264,555	315,000	266,000	215,000	173,000
Silicomanganese	230,535	283,414	312,000	301,000	335,000
Total	495,090	598,414	578,000	516,000	508,000
Mexico: ³					
Ferromanganese	90,013	95,468	73,000	57,000	72,000
Silicomanganese	148,130	152,000	154,000	148,000	171,000
Total	238,143	247,468	227,000	205,000	243,000
Norway: ³					
Ferromanganese	400,800	327,600	337,000	277,000	303,000
Silicomanganese	284,500	330,000	287,000	262,000	307,000
Total	685,300	657,600	624,000	539,000	610,000
Russia:					
Ferromanganese	253,000	281,000	273,000	238,000	240,000 ^c
Silicomanganese	44,917	43,334	51,774	--	-- ^c
Total	297,917	324,334	324,774	238,000	240,000 ^c
Saudi Arabia: ³					
Ferromanganese	10,000	15,000	12,000	10,000	15,000
Silicomanganese	65,000	70,000	63,000	35,000	65,000
Total	75,000	85,000	75,000	45,000	80,000

See footnotes at end of table.

TABLE 8—Continued
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2017	2018	2019	2020	2021
Slovakia:					
Ferromanganese	42,115	32,364	46,513	24,046 ^r	30,929
Silicomanganese	40,265	37,225	26,187	33,812 ^r	48,590
Total	82,380	69,589	72,700	57,858 ^r	79,519
South Africa:³					
Ferromanganese	257,100	235,600	232,000	122,000	102,000
Silicomanganese	160,400	164,200	172,000	108,000	151,000
Total	417,500	399,800	404,000	230,000	253,000
Spain:³					
Ferromanganese	132,100	86,200	55,500	28,000	48,000
Silicomanganese	138,700	156,100	98,400	83,000	77,000
Total	270,800	242,300	153,900	111,000	125,000
Ukraine:					
Ferromanganese	114,500	79,480	151,090	122,960 ^r	100,600
Silicomanganese	810,670	859,640	804,680	559,880 ^r	662,700
Total	925,170	939,120	955,770	682,840 ^r	763,300
United States, ferromanganese ⁴	W	W	W	W	W
Venezuela, silicomanganese ³	18,670	--	--	--	--
Grand total	16,600,000 ^r	20,000,000 ^r	22,700,000 ^r	20,000,000 ^r	20,700,000
Of which:					
Ferromanganese	5,030,000 ^r	5,190,000 ^r	5,190,000 ^r	4,310,000 ^r	4,860,000
Silicomanganese	11,600,000	14,800,000	17,500,000	15,700,000 ^r	15,800,000

^cEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data; not included in "Grand total." -- Zero.

¹Table includes data available through August 10, 2022. 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.