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CHROMIUM [ADVANCE RELEASE]

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Chromium

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In 2023, there was no chromite ore produced in the United States. Recycling was the only domestic source of chromium. U.S. chromium apparent consumption (including recycling) was 430,000 metric tons (t) on a chromium content basis, a decrease of 30% from that in 2022 (table 1). Because stainless-steel mill products contributed a significant amount of chromium to the domestic economy, trade in these products and their contribution have been accounted for in chromium apparent consumption calculations. U.S. chromium apparent consumption in 2023 was 48% of the recorded high of 893,000 t in 1965.

Domestic reported consumption of chromium materials, excluding stainless steel, decreased by an estimated 10% (chromium content) in 2023 compared with that in 2022. Steelmaking was the leading end use for chromium materials and accounted for 93% of consumption in 2023. Superalloys and other end uses made up the remaining 7% (table 2).

Based on U.S. Census Bureau trade data, chromium exports increased by 12% to 147,000 t in 2023 compared with those in 2022, based on estimated chromium content of chromite ore, chromium chemicals, chromium ferroalloys, chromium metal, and stainless-steel mill products and scrap. Total chromium imports decreased by 26% on a chromium content basis to 451,000 t compared with imports in 2022 based on estimated chromium content of chromite ore, chromium chemicals, chromium ferroalloys, chromium metal, and stainless-steel mill products and scrap (table 1).

World production of chromite ore in 2023 increased slightly to 45.2 million metric tons (Mt) gross weight compared with 44.5 Mt (revised) in 2022 (table 7). South Africa was the leading producer of chromite ore, with an estimated 44% of global production. World production of ferrochromium decreased slightly to 15.7 Mt compared with 16.0 Mt (revised) in 2022. China was the leading producer of ferrochromium, with an estimated 49% of global production (table 8).

Government Actions and Legislation

Stockpile.—The Defense Logistics Agency, Strategic Materials, U.S. Department of Defense, disposed of chromium materials under its fiscal year 2023 (October 1, 2022, through September 30, 2023) Annual Materials Plan (AMP). Maximum disposal limits were based on the 2023 AMP for chromium materials, which were set at 21,800 t of chromium ferroalloys and 450 t of chromium metal (Defense Logistics Agency Strategic Materials, 2022).

Tariffs.—The International Trade Administration (ITA) issued a decision in December 2023 that antidumping duties on stainless-steel sheet and strip in coils imported from Japan, the Republic of Korea, and Taiwan would remain in place. Countervailing duties on imports of stainless-steel sheet and strip in coils from the Republic of Korea would also remain in place. The ITA reported in October that revoking the duties would likely lead to a continuation or recurrence of countervailing subsidies or dumping that would result in material injury to U.S. industry. The affected stainless steel, an alloy steel containing, by weight, 1.2% or less of carbon and 10.5% or more of chromium, included flat-rolled sheet and strip greater than 9.5 millimeters (mm) in width and less than 4.75 mm in thickness (U.S. Department of Commerce, International Trade Administration, 2023).

Consumption

Domestic data for chromium materials were developed by the U.S. Geological Survey by means of monthly "Chromite Ores and Chromium Products" and "Consolidated Consumers" consumer surveys. Based on the results of these surveys, stainless and heat-resisting steel producers were the leading chromium consumers, and high-carbon ferrochromium was the leading chromium-containing material consumed (table 2).

The major end uses of chromium-containing materials were chromite ore in foundry sand; chromium chemicals, ferroalloys, and metal; and stainless steel. In 2023, the United States produced chromium chemicals and stainless steel. There was no domestic production of chromite ore and foundry sand, ferrochromium, or chromium metal.

Chromium Chemicals.—Chemical grade chromite ore, which has a high chromium content with greater than 45% chromium oxide (Cr_2O_3), is typically processed via conversion to sodium dichromate. Sodium dichromate can then be used in other applications as oxidizing agents or in the production of dyes and inorganic chemicals, such as leather tanning liquors, metal plating and finishing solutions, drilling muds, and wood preservatives. In the United States, American Chrome & Chemicals, Inc., a subsidiary of Yildirim Group of Companies (Turkey), produced sodium dichromate from chromite ore at its production facilities in Castle Hayne, NC, and Corpus Christi, TX.

Stainless Steel.—Chromium is essential to stainless-steel production by virtue of its oxide-forming properties, and to some grades of alloy steel and nickel-, iron-, and cobalt-base superalloys because of its alloying properties. Chromium is also used to reduce stress corrosion susceptibility and improve toughness in aluminum-magnesium, aluminum-magnesium-silicon, and aluminum-magnesium-zinc alloys.

In 2023, the U.S. stainless-steel industry produced 1.82 Mt (2.01 million short tons) of stainless steel and imported and exported stainless-steel mill products and scrap, making it a leading consumer of chromium materials in the United States (American Iron and Steel Institute, 2024). North American Stainless Company (NAS), Cleveland-Cliffs Inc., and Outokumpu Oyj (Finland), listed in descending order of production, were the leading United States stainless-steel producers.

NAS was a subsidiary of Acerinox S.A., based in Spain, and produced stainless steel in its Ghent, KY, plant. Melt shop production decreased by 16% to 841,821 t in 2023 compared with 1,007,536 t in 2022, which made NAS the leading producer in the United States with 46% of domestic production (Acerinox S.A., 2023, p. 30; 2024, p. 139). NAS announced an expansion project at its Ghent plant. The expansion would cost $244 million and increase stainless-steel plant capacity by 200,000 metric tons per year (t/yr), 20% more than its current capacity. Upgrades to its annealing and pickling lines, a new temper mill, and expansion of its meltshop were listed among the planned improvements (North American Stainless Company, 2023).

Cleveland-Cliffs Inc. produced stainless steel at manufacturing plants in Butler, PA, Mansfield, OH, and Middletown, OH. Stainless- and electrical-steel shipments were 619,000 t (682,000 short tons) in 2023 compared with 692,000 t (763,000 short tons) in 2022, a decrease of 11%. Stainless and electrical steel account for 10% of Cleveland Cliffs' product mix by revenue, and were sold directly to the automotive, infrastructure, and manufacturing markets. No explanation was given for the decrease in stainless- and electrical-steel shipments (Cleveland-Cliffs Inc., 2024, p. 7, 30, 45).

Outokumpu Stainless USA, LLC, a subsidiary of Outokumpu Oyj, produced stainless steel at its Calvert, AL, and Richburg, SC, plants. Outokumpu reported that stainless-steel shipments in 2023 from plants in Mexico and the United States, combined, were 551,000 t, a 16% decrease from 654,000 t in 2022, and represented 27% of total company sales (Outokumpu Oyj, 2024a, p. 5; 2024b, p. 22).

Prices

Chromium materials were not openly traded. Purchase contracts were confidential between buyer and seller; however, trade journals reported composite prices based on interviews with buyers and sellers, and the U.S. Department of Commerce reported the declared value of U.S. imports and exports. Thus, industry publications and U.S. trade statistics were sources of chromium material prices and values, respectively (table 3).

In 2023, the annual average import unit value (gross weight) of chromite ore increased by 11% from that in 2022; the annual average import unit value of ferrochromium (gross weight) decreased by 17% from that in 2022; and the annual average import unit value of chromium metal decreased by 15% from that in 2022. Prices and unit values of specific grades of chromite ore, chromium metal, and ferrochromium are reported in tables 1 and (or) 3.

Chromite ore price increases for ore that originated in South Africa were attributed to increased demand in China, as China resumed ferrochromium output following a 3-year period of furnace consolidation and recovery from the global coronavirus disease 2019 (COVID-19) pandemic. Chromium metal and ferrochromium price decreases were attributed to higher interest rates, which resulted in decreased demand (Bedder, 2023; CRU Group, 2023b).

Foreign Trade

Chromium-containing material exports from and imports to the United States included chromite ore, chromium chemicals, ferroalloys, metal, pigments, and stainless steel (tables 1, 4, and 5). Based on foreign trade statistics reported by the U.S. Census Bureau for calendar year 2023, the value of foreign trade of these chromium materials, excluding stainless-steel mill products and scrap, was $27.4 million for exports (9% more than that in the previous year) and $873 million for imports (a 43% decrease from that in the previous year). A significant amount of chromium exited and entered the U.S. economy via stainless-steel mill products and scrap trade. The value of foreign trade of chromium materials, including stainless-steel mill products and scrap, was $3.0 billion for exports (6% more than that in the previous year) and $5.4 billion for imports (a 23% decrease from that in the previous year) (table 1).

World Review

European Union.—The European Commission launched an investigation in August into possible dumping of stainless-steel imports from Indonesia that were shipped via Taiwan, Turkey, and Vietnam to avoid antidumping duties. This investigation was prompted by a request from the European Steel Association in July following changes in the pattern of trade from Indonesia, Taiwan, Turkey, and Vietnam (European Commission, 2023).

Finland.—Outokumpu owned and operated the Kemi chromite mine, the only chromite mine in Finland. Chromite production decreased in 2023 by 5% to 1,906,409 t. Outokumpu also produced 390,000 t of ferrochromium at its Tornio ferrochromium production facility, a decrease of 9% compared with production in 2022, using chrome extracted from its Kemi chrome mine (tables 7, 8) (Outokumpu Oyj, 2024a, p. 50, 130).

In September 2022, Outokumpu temporarily shut down its third ferrochromium furnace in Tornio owing to the high price of electricity. The plant was expected to be offline until the end of the first quarter of 2023. However, Outokumpu restarted its third ferrochromium furnace in February 2023, a month earlier than planned. Even with the restart of the furnace, Outokumpu reported that it would optimize production based on the electricity market and that ferrochromium production capacity would be only 50% to 60% of normal capacity (Outokumpu Oyj, 2022, 2023b).

Germany.—In March, Outokumpu announced that it would begin construction of an atomization plant that would produce metal powder from stainless-steel scrap at its stainless-steel mill in Krefeld, Germany. The stainless-steel metal powders would be used for additive manufacturing in the production of new stainless steel, thereby strengthening the recycling economy. Initial production capacity would be 330 t/yr, with the ability to increase capacity depending on market demand. Construction of the plant would begin in April 2023; no date was given for completion (Outokumpu Oyj, 2023a).

Afarak Group SE (Finland) reported that it had resumed operations in November at its low-carbon ferrochromium smelter in Germany. The Elektrowerk Weisweiler smelter was idled in October owing to decreased demand (Afarak Group SE, 2023; CRU Group, 2023a).

India.—In April, Jindal Stainless Ltd. completed the expansion project at its Jajpur mill in Odisha. The project increased capacity at the mill from 1.1 million metric tons per year (Mt/yr) to 2.1 Mt/yr. In addition, with the merger of Jindal Stainless Ltd. and Jindal Stainless Hisar Ltd. in March 2023, Jindal Stainless Ltd.'s total stainless-steel production capacity increased to a total of 3 Mt/yr (FE Bureau, 2020; Livemint, 2023; SteelOrbis, 2023).

In May, Vedanta Resources Ltd. (United Kingdom) announced plans to more than triple its ferrochromium capacity in Odisha by 2025. Capacity would increase from 140,000 t/yr to 450,000 t/yr. The increase in capacity would be completed in two phases. During the first phase, Vedanta would build two new ferrochromium plants, one with a capacity of 60,000 t/yr and the other with a capacity of 150,000 t/yr. During the second phase, Vedanta would build an additional ferrochromium plant with a capacity of 150,000 t/yr capacity and increase chromite ore production at its Kalarangiatta Mine. In addition, Vedanta would increase its chromite ore capacity at its Ostapal Mine, ensuring the availability of raw material for its ferrochromium plants (Surendran, 2023).

Oman.—Although Oman Chromite Co. S.A.O.G. expected operations to begin in 2023 at a low-carbon ferrochromium plant in the Freezone of the Sohar Industrial Port, in which it had invested 20%, completion of the project was delayed until 2024. No reasons were provided for the delay (Oman Chromite Co. S.A.O.G., 2022; 2024, p. 9).

Saudi Arabia.—Immensa Additive Manufacturing Group opened a new additive manufacturing facility in Dammam, Saudi Arabia, that would produce spare parts from nonferrous metal powders using 3D printers from GE Additive (a subsidiary of General Electric Company). Immensa previously partnered with BEAMIT S.p.A. (Italy), a subsidiary of Sandvik Additive Manufacturing (Sweden), in 2021 to produce 3D nickel-chromium-base superalloys and titanium alloys from metal powders. The facility in Saudi Arabia would service regional markets in Bahrain, Kuwait, Qatar, and Saudi Arabia, for the electricity, oil and gas, and petrochemical sectors (BEAMIT S.p.A., 2021; Willing, 2023).

South Africa.—Transnet SOC Ltd., a rail, port, and pipeline company headquartered in South Africa, suspended its rail services on February 10, following heavy rains in Mpumalanga and Limpopo Provinces. Partial service was restored on the North East Corridor railway on February 13, after engineers deemed those sections of the railway safe for operations. Exports of chromite and ferrochromium, amongst others, to Congo (Kinshasa), Eswatini, Mozambique, Zambia, and Zimbabwe were affected by the suspended services (Backeberg, 2023b; CRU Group, 2023e).

In August, Jubilee Metals Group Plc (United Kingdom) commissioned the expansion of its chromite-processing plant located on the western limb of the Bushveld Complex. The upgraded plant increased its chromite-concentrate-processing capacity of 160,000 t/yr by an additional 200,000 t/yr, making full capacity at that facility 360,000 t/yr. Jubilee also announced that it was in discussions to add an additional 600,000 t/yr of processing capacity through an agreement with an unnamed partner (CRU Group, 2023d; Jubilee Metals Group Plc, 2023, undated).

Glencore plc (Switzerland) lowered its ferrochromium production guidance in South Africa for 2023 by approximately 110,000 t to 1.2 Mt because it took a smelter offline for 3 months in response to high electricity costs and market conditions. Annual chromite ore production, however, was not expected to decrease significantly (Glencore plc, 2023, p. 1–2).

Merafe Resources Ltd. (Merafe) reported that its ferrochromium production decreased by 22% to 300,000 t in 2023 compared with 384,000 t in 2022. Merafe reduced production in the winter months owing to higher electricity tariffs and weak market conditions. Out of 5 ferrochromium plants, only the Lion smelter was operating during the winter months. However, following the winter season, the Rustenburg smelter was kept on care-and-maintenance status because market conditions had not improved. The Lydenburg smelter and Waterval chromite mine were also kept on care-and-maintenance status for similar reasons (Merafe Resources Ltd., 2024, p. 10, 20–21).

Thailand.—Zhejiang Yongjin Metal Technology Co., Ltd. (Yongjin Metal) (China) invested in the construction of a stainless-steel plant in Thailand that would start production in the fourth quarter of 2023 (Backeberg, 2023a).

United Kingdom.—In September, Cogne Acciai Speciali S.p.A., a stainless-steel manufacturing company based in Italy, finalized the acquisition of Special Melted Products Ltd. from Mutares SE & Co. KGaA (Germany) following antitrust approval. The addition of Special Melted Products enabled Cogne Acciai Speciali to expand into the specialty steel and nickel-base superalloys market used in the aerospace, gas, nuclear, and oil industries (Cogne Acciai Speciali S.p.A., 2023; Olivieri, 2023).

Vietnam.—Yongjin Metal invested $125 million in a second stainless-steel plant in Vietnam. The plant would have the capacity to produce up to 260,000 t/yr of stainless steel (Backeberg, 2023a).

Zimbabwe.—Zimasco (Pvt) Ltd., majority owned by Sinosteel (China), restarted ferrochromium production in January at its Kwekwe smelter following a 2-month shutdown. The closure was the result of tariff disputes between Zimasco and its utility provider. During the shutdown, Zimasco completed critical maintenance work (CRU Group, 2023c).

Dinson Iron and Steel Company (Pvt) Ltd. (DISCO), a subsidiary of Tsingshan Holding Group (China), inaugurated its integrated steel plant in December. The steel plant consisted of a carbon and steel plant, an iron ore mine, and a ferrochrome plant. In addition, DISCO signed a memorandum of understanding with the Government of Zimbabwe to refurbish and construct a 1,000-kilometer railway line, which would enable local transportation and establish import-export routes through Mozambique (Project Blue, 2023, p. 8; Dinson Iron and Steel Company (Pvt) Ltd., undated).

Outlook

Domestic and global consumption of chromium is expected to follow closely the trend in stainless-steel production. U.S. stainless-steel production was reported by the American Iron and Steel Institute to be 1.82 Mt (gross quantity of stainless steel) in 2023, a decrease of 10% from that in 2022 (American Iron and Steel Institute, 2023, 2024). World stainless- and heat-resisting steel melt shop production (ingot or slab equivalent) was reported to be 58.4 Mt in 2023, an increase of 5% compared with that in 2022 (International Stainless Steel Forum, 2023, 2024).

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TABLE 1
SALIENT CHROMIUM STATISTICS[1]

		2019	2020	2021	2022	2023
Components of U.S. supply, chromium content:						
Secondary supply, recycled scrap[2]	metric tons	134,000 r	112,000 r	147,000 r	138,000 r	126,000
Imports:						
Chromite ore	do.	92,500	83,200	107,000	92,500	77,300
Chromium chemicals[3]	do.	4,070 r	4,950 r	5,500	6,430	4,820
Chromium ferroalloys	do.	254,000	202,000	243,000	263,000 r	166,000
Chromium metal	do.	14,400	11,600	12,100	14,900	12,400
Stainless-steel mill products and scrap[2]	do.	165,000	146,000	204,000	233,000	191,000
Stocks, January 1, industry[4]	do.	5,060	4,970	5,720	6,000	5,080
Total	do.	669,000 r	565,000 r	725,000 r	754,000 r	582,000
Distribution of U.S. supply, chromium content:						
Exports:						
Chromite ore[5]	do.	1,400	1,470	1,550	1,700	1,650
Chromium chemicals[3]	do.	226	121	101	191	129
Chromium ferroalloys and metal	do.	1,370	1,200	2,130	2,310 r	1,930
Stainless-steel mill products and scrap[2]	do.	146,000	135,000	110,000	128,000	143,000
Stocks, December 31, industry[4]	do.	4,970	5,720	6,000	5,080	4,740 e
Total	do.	154,000	144,000	120,000	137,000 r	152,000
Consumption:						
Apparent, chromium content[6]	do.	516,000 r	421,000 r	605,000 r	617,000 r	430,000
Reported:						
Chromite ore and concentrates, gross weight	do.	W	W	W	W	W
Chromium ferroalloys:[7]						
Gross weight	do.	465,000	345,000	327,000	230,000	207,000 e
Chromium content	do.	267,000	199,000	189,000	134,000	120,000 e
Chromium metal, gross weight	do.	4,860	4,580	4,550	4,450	4,000 e
Stocks, December 31, gross weight, industry, consumer:						
Chromium ferroalloys[8]	do.	4,600 r	4,450 r	4,810 r	4,900 r	4,430 e
Chromium metal	do.	282	273	279	273 r	250 e
Other[9]	do.	4,570 r	4,600 r	4,710 r	4,400 r	4,380 e
Price, average annual:						
Chromite ore, gross weight[10]	dollars per metric ton	167 r	158 r	199 r	277 r	321
Ferrochromium, chromium content[11]	dollars per pound	1.02 r	0.89 r	1.50 r	3.19 r	2.55
Aluminothermic chromium metal, gross weight[12]	do.	3.94 r	3.10 r	4.23 r	7.20 r	5.05
Value of trade:						
Imports	thousands	$779,000	$545,000	$898,000	$1,520,000	$873,000
Exports	do.	$25,200	$19,000	$24,100	$25,100 r	$27,400
Net imports[13]	do.	$753,000	$526,000	$874,000	$1,490,000	$846,000
Stainless steel:						
World production, chromium content[14]	metric tons	8,880,000	8,800,000	9,910,000	9,390,000	9,940,000
United States:						
Production:						
Gross weight[15]	do.	2,590,000	2,140,000	2,370,000	2,020,000 r	1,820,000
Chromium content[16]	do.	455,000	375,000	407,000	346,000 r	312,000
Average grade, dimensionless[17]		0.1755	0.1749	0.1719	0.1715	0.1710
Shipments, gross weight[12]	metric tons	2,280,000	1,990,000	2,250,000	1,990,000	1,660,000
Imports, gross weight	do.	767,000	642,000	930,000	1,130,000	914,000
Exports, gross weight	do.	436,000	321,000	355,000	349,000 r	335,000
Scrap, gross weight:						
Receipts	do.	791,000 r	659,000 r	867,000 r	814,000 r	742,000
Consumption	do.	1,220,000 r	936,000 r	1,160,000 r	1,120,000 r	1,030,000
Imports	do.	204,000	219,000	268,000	240,000	207,000
Exports	do.	422,000	474,000	293,000	403,000	509,000
Value of trade:						
Imports	thousands	$2,820,000	$2,240,000	$3,270,000	$5,200,000 r	$4,320,000
Scrap imports	do.	$183,000	$197,000	$368,000	$387,000	$240,000
Exports	do.	$1,990,000	$1,570,000	$1,910,000	$2,440,000 r	$2,550,000
Scrap exports	do.	$345,000	$273,000	$334,000	$383,000 r	$458,000
Net imports[13, 18]	do.	$675,000	$596,000	$1,390,000	$2,760,000 r	$1,560,000

See footnotes at end of table.

TABLE 1—Continued
SALIENT CHROMIUM STATISTICS[1]

[r]Revised. do. Ditto. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through August 22, 2024. Data are rounded to no more than three significant digits, except for average grade; may not add to totals shown.
[2]Calculated assuming chromium content of stainless steel and stainless-steel scrap to average 17% chromium.
[3]Excludes pigments and preparations.
[4]Includes consumer stocks of chromium ferroalloys and metal and other chromium-containing materials.
[5]Calculated based on the chromium content of imported chromite ore, typically between 46% and 63% chromium oxide (Cr_2O_3).
[6]Apparent consumption calculated as total U.S. supply minus total U.S. distribution.
[7]Chromium ferroalloys, chromite ore used in foundry sand, and other chromium-containing materials excluding chromium metal.
[8]Consumer stocks of high- and low-carbon ferrochromium.
[9]Includes chromium-aluminum alloy, ferrosilicon chromium, and other chromium materials.
[10]Time-weighted average price of South African chromite ore that contains 42% to 44% Cr_2O_3 free on board (f.o.b.) as reported by Argus Media, Argus Non-Ferrous Markets.
[11]Time-weighted average U.S. price of imported high-carbon chromium that contains 62% to 70% chromium as reported by Argus Media, Argus Non-Ferrous Markets.
[12]Time-weighted average U.S. price of imported aluminothermic chromium metal as reported by Argus Media, Argus Non-Ferrous Markets.
[13]Defined as imports minus exports.
[14]Production estimated from International Stainless Steel Forum. Chromium content estimated at 17%.
[15]Source: American Iron and Steel Institute annual report of stainless-steel and heat-resisting raw steel production.
[16]Estimated mass-weighted average of the mean chromium content of stainless-steel production by grade.
[17]Ratio of estimated mass-weighted average chromium content of stainless-steel production by grade to production. Uncertainty is approximately ±0.01, owing to the range of chromium chemical specification limits by stainless-steel grade.
[18]Includes stainless steel and stainless-steel scrap.

TABLE 2
U.S. REPORTED CONSUMPTION AND STOCKS OF CHROMIUM PRODUCTS[1]

(Metric tons)

	2022		2023[e]		Change[2]	
	Gross weight	Chromium content	Gross weight	Chromium content	Quantity	Percent
Consumption by end use:						
Steel:						
Carbon steel	3,580	2,270	3,280	1,960	-313	-14
High-strength low-alloy steel	1,110	711	1,010	650	-61	-9
Stainless and heat-resisting steel	195,000	112,000	175,000	101,000	-11,100	-10
Fully alloy steel	8,180	5,060	7,330	4,590	-466	-9
Unspecified steel[3]	14,000	7,950	12,500	7,450	-503	-6
Superalloys	6,220	5,060	5,570	4,460	-597	-12
Other alloys and uses[4]	6,360	4,130	5,930	3,680	-448	-11
Total	234,000	138,000	211,000	124,000	-13,500	-10
Consumption by material:						
Low-carbon ferrochromium	18,100	12,600	16,300	11,400	-1,210	-10
High-carbon ferrochromium	206,000	118,000	185,000	106,000	-12,000	-10
Ferrochromium silicon	(5)	(5)	(5)	(5)	(5)	(5)
Chromium metal	4,450	4,140	4,000	3,710	-430	-10
Chromium-aluminum alloy	415	300	375	231	-69	-23
Other chromium materials	5,670	3,000	5,380	2,840	-165	-6
Total	234,000	138,000	211,000	124,000	-13,900	-10
Consumer stocks:						
Low-carbon ferrochromium	1,030	715	930	640	-75	-10
High-carbon ferrochromium	3,860	2,210	3,500	2,000	-208	-9
Ferrochromium silicon	(5)	(5)	(5)	(5)	(5)	(5)
Chromium metal	273	254	250	230	-24	-9
Chromium-aluminum alloy	(5)	(5)	(5)	(5)	(5)	(5)
Other chromium materials	4,400	1,900	4,380	1,870	-30	-2
Total	9,570	5,080	9,060	4,740	-338	-7

[e]Estimated.
[1]Table includes data available through August 22, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Change based on chromium content of unrounded data of current year compared with that in the previous year.
[3]Includes electrical, tool, and unspecified steel end uses.
[4]Includes cast irons, welding and alloy hard-facing rods and materials, wear- and corrosion-resistant alloys, and aluminum, copper, magnetic, nickel, and other alloys.
[5]Withheld to avoid disclosing company proprietary data; included in “Other chromium materials.”

TABLE 3
VALUE OF IMPORTS AND U.S. PRICE QUOTATIONS FOR CHROMIUM MATERIALS[1]

(Dollars per metric ton unless otherwise specified)

Material	2022		2023	
	Gross weight	Chromium content	Gross weight	Chromium content
Value:[2]				
Chromite ore:				
Not more than 40% chromium oxide (Cr_2O_3)	274	900	233	928
More than 40% but less than 46% Cr_2O_3	215	496	221	508
46% or more Cr_2O_3	259	306	302	343
Average	254	332	281	374
Ferrochromium:				
Not more than 0.5% carbon	6,210 r	8,850 r	5,180	7,740
More than 0.5% but not more than 3% carbon	6,650	9,840	4,210	6,480
More than 3% but not more than 4% carbon	6,100	8,840	4,080	6,230
Average (not more than 4% carbon)	6,230 r	8,900 r	5,100	7,650
More than 4% carbon	2,190	3,900	1,730	3,120
Average (all grades)	2,600	4,510	2,160	3,800
Chromium metal[3]	14,400 r	XX	12,300	XX
Price:[4]				
Chromite ore, South Africa:				
40% to 42% chromium (Cr)	240	836 [5]	291	1,010 [5]
42% to 44% Cr	277	920 [6]	321	1,070 [6]
High-carbon ferrochromium,[7] 62% to 70% Cr	XX	3.19	XX	2.55
Low-carbon ferrochromium:[7]				
0.05% carbon	XX	5.89	XX	4.73
0.10% carbon	XX	4.86	XX	3.76
0.15% carbon	XX	4.62	XX	3.62
Chromium metal, imported, aluminothermic[7]	7.20	XX	5.05	XX

rRevised. XX Not applicable.
[1]Table includes data available through August 22, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Mass-weighted average based on customs value and quantity of imported material, as reported by the U.S. Census Bureau.
[3]Average for all grades.
[4]Source: Argus Media, Argus Non-Ferrous Markets.
[5]Calculated assuming average chromium content 41%.
[6]Calculated assuming average chromium content 43%.
[7]Reported by Argus Media, Argus Non-Ferrous Markets, in dollars per pound.

TABLE 4
U.S. EXPORTS OF CHROMIUM MATERIALS, BY TYPE[1]

Schedule B[2] number	Type	2022 Quantity (metric tons)	2022 Value (thousands)	2023 Quantity (metric tons)	2023 Value (thousands)	Principal destinations in 2023 (Quantity in metric tons, value in thousands)
2610.00.0000	Chromite ore and concentrates:					
	Gross weight	2,220	$1,640	2,200	$1,840	Mexico (906; $851), Canada (905; $706), Republic of Korea (162; $92), Thailand (66; $37), South Africa (48; $27).
	Cr_2O_3 content[3]	1,700	XX	1,650	XX	
	Chromium metal, gross weight:					
8112.21.0000	Unwrought chromium powders	465	9,110	321	7,250	Canada (113; $1,420), Netherlands (65; $2,400), United Kingdom (35; $508), Japan (30; $332), Germany (29; $586).
8112.22.0000	Chromium metal waste and scrap	27	466	7	134	United Kingdom (4; $82), China (1; $21), Poland (1; $13), Chile (1; $8).
8112.29.0000	Chromium metal other than unwrought powders and waste and scrap	75	3,210	120	6,170	Japan (53; $2,260), United Kingdom (18; $346), Canada (14; $350), Ireland (7; $217), Mexico (5; $439).
	Total chromium metal	567	12,800	449	13,600	
	Chromium ferroalloys:					
7202.41.0000	High-carbon ferrochromium:[4]					
	Gross weight	2,940 r	2,750 r	4,100	3,890	Canada (3,210; $3,050), Mexico (793; $748), Republic of Korea (70; $62), China (11; $10), Slovenia (10; $9).
	Chromium content	1,440 r	XX	1,290	XX	
7202.49.0000	Low-carbon ferrochromium:[5]					
	Gross weight	637	954	344	499	Canada (193; $294), Argentina (50; $67), India (48; $58), Pakistan (19; $20), Peru (17; $23).
	Chromium content	290	XX	163	XX	
7202.50.0000	Ferrochromium-silicon:					
	Gross weight	40	96	83	154	Canada (82; $147), Mexico (1; $7).
	Chromium content	14	XX	29	XX	
	Total chromium ferroalloys:					
	Gross weight	3,610 r	3,800 r	4,530	4,540	
	Chromium content	1,750 r	XX	1,480	XX	
	Chemicals:					
2833.29.4000	Chromium sulfates:					
	Gross weight	1	19	1	9	United Kingdom (1; $6).
	Chromium content[6]	(7)	XX	(7)	XX	

See footnotes at end of table.

TABLE 4—Continued
U.S. EXPORTS OF CHROMIUM MATERIALS, BY TYPE[1]

Schedule B[2] number	Type	2022 Quantity (metric tons)	2022 Value (thousands)	2023 Quantity (metric tons)	2023 Value (thousands)	Principal destinations in 2023 (Quantity in metric tons, value in thousands)
	Chemicals:—Continued					
	Salts of oxometallic or peroxometallic acids:					
2841.90.4500	Zinc and lead chromate:					
	Gross weight	4	344	13	668	Republic of Korea (9; $153), South Africa (4; $509).
	Chromium content[8]	1	XX	3	XX	
2841.50.1000	Potassium dichromate:					
	Gross weight	489	946	274	918	Mexico (136; $540), Netherlands (52; $48), India (35; $127), Taiwan (22; $70), Chile (13; $102).
	Chromium content[9]	139	XX	78	XX	
2841.50.9100	Other:					
	Gross weight	166	1,550	156	1,700	Canada (71; $190), Taiwan (21; $148), South Africa (15; $579), Mexico (11; $68), Jamaica (9; $69).
	Chromium content[9]	52	XX	48	XX	
	Total salts:					
	Gross weight	660	2,860	443	3,300	
	Chromium content	191	XX	129	XX	
3206.20.0000	Pigments and preparations:					
	Gross weight	1,220	4,040	396	4,170	Brazil (143; $887), Canada (103; $1,690), Mexico (90; $966), Guatemala (20; $139).
	Chromium content	NA	XX	NA	XX	

[r]Revised. XX Not applicable. NA Not available.
[1]Table includes data available through July 10, 2024. Data are rounded to no more than three significant digits; may not add to totals shown. In addition to the schedule B codes listed, the United States exports chromium oxides, but those data have been withheld by the U.S. Census Bureau to avoid disclosing proprietary data.
[2]Schedule B numbers based on the Harmonized System commodity classification system of the United States.
[3]Calculated based on the chromium content of imported chromite ore, typically between 46% and 76% chromium oxide (Cr_2O_3).
[4]More than 4% carbon.
[5]Not more than 4% carbon.
[6]Calculated assuming the average chromium content was about 17%.
[7]Less than ½ unit.
[8]Calculated assuming the average chromium content was about 20%.
[9]Calculated based on fraction of chromium in the chemical formula.

Source: U.S. Census Bureau.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF CHROMIUM MATERIALS, BY TYPE[1]

HTS[2] code	Type	2022 Quantity (metric tons)	2022 Value[3] (thousands)	2023 Quantity (metric tons)	2023 Value[3] (thousands)	Principal sources in 2023 (Quantity in metric tons, value in thousands)
	Chromite ore:					
2610.00.0020	Not more than 40% chromium oxide (Cr_2O_3):					
	Gross weight	5,750	$1,580	6,220	$1,450	South Africa (4,890; $960), Italy (615; $247), Brazil (561; $163), Germany (160; $80).
	Cr_2O_3 content	1,750	XX	1,560	XX	
2610.00.0040	More than 40%, but less than 46% Cr_2O_3:					
	Gross weight	17,100	3,670	20,900	4,610	South Africa (20,600; $4,480), Netherlands (128; $82), Germany (48; $22), Italy (44; $19).
	Cr_2O_3 content	7,400	XX	9,060	XX	
2610.00.0060	46% or more Cr_2O_3:					
	Gross weight	98,200	25,500	75,900	22,900	South Africa (75,700; $22,800), Belgium (192; $35), Italy (58; $33), China (10; $14).
	Cr_2O_3 content	83,300	XX	66,700	XX	
	Total chromite ore:					
	Gross weight	121,000	30,700	103,000	29,000	
	Cr_2O_3 content	92,500	XX	77,300	XX	
	Chromium ferroalloys:					
	Ferrochromium:					
7202.49.5090	Not more than 0.5% carbon:					
	Gross weight	42,300 r	263,000 r	34,400	178,000	Kazakhstan (10,700; $60,700), Germany (10,000; $54,700), India (8,400; $32,800) Turkey (1,860; $9,770), Japan (1,810; $15,400).
	Chromium content	29,700 r	XX	23,000	XX	
7202.49.5010	More than 0.5%, but less than 3% carbon:					
	Gross weight	2,250	15,000	2,850	12,000	Brazil (1,760; $5,090), Kazakhstan (936; $6,310), India (127; $495), China (25; $105).
	Chromium content	1,520	XX	1,850	XX	
7202.49.1000	More than 3%, but less than 4% carbon:					
	Gross weight	36	219	98	400	India (70; $386), Kazakhstan (28; $14).
	Chromium content	25	XX	64	XX	
7202.41.0000	More than 4% carbon:					
	Gross weight	399,000	875,000	252,000	436,000	South Africa (127,000; $144,000), Kazakhstan (37,700; $138,000), Zimbabwe (34,400; $43,400), Finland (15,800; $23,800), Turkey (15,500; $40,600).
	Chromium content	224,000	XX	140,000	XX	
7202.50.0000	Ferrosilicon-chromium:					
	Gross weight	17,100	41,400	1,680	4,280	Kazakhstan (all).
	Chromium content	6,840	XX	704	XX	
	Total chromium ferroalloys:					
	Gross weight	461,000	1,190,000	292,000	631,000	
	Chromium content	263,000 r	XX	166,000	XX	

See footnotes at end of table.

TABLE 5—Continued
U.S. IMPORTS FOR CONSUMPTION OF CHROMIUM MATERIALS, BY TYPE[1]

HTS[2] code	Type	2022 Quantity (metric tons)	2022 Value[3] (thousands)	2023 Quantity (metric tons)	2023 Value[3] (thousands)	Principal sources in 2023 (Quantity in metric tons, value in thousands)
	Chromium metal, gross weight:					
8112.21.0000	Unwrought chromium powders	13,500	197,000	10,400	125,000	China (5,410; $51,900), United Kingdom (3,870; $60,100), Russia (489; $4,510), France (312; $5,050), India (156; $1,750).
8112.22.0000	Waste and scrap	519	4,890	451	3,740	United Kingdom (237; $1,990), Canada (136; $965), China (38; $466), Japan (26; $238), Taiwan (12; $47).
8112.29.0000	Other than waste and scrap	912 r	13,100 r	1,500	24,000	France (1,230; $16,800), Russia (110; $1,080), Brazil (41; $809), United Kingdom (35; $670), Germany (33; $2,600).
	Total chromium metal	14,900	215,000 r	12,400	153,000	
	Chemicals:					
	Chromium oxides and hydroxides:					
2819.10.0000	Chromium trioxides:					
	Gross weight	5,080	18,500	4,230	14,300	Kazakhstan (2,700; $8,350), India (1,080; $3,890), South Africa (330; $1,310), France (53; $270), China (34; $195).
	Chromium content[4]	2,640	XX	2,200	XX	
2819.90.0000	Other:					
	Gross weight	3,800	19,100 r	2,600	14,300	China (1,090; $5,640), Germany (818; $6,990), Canada (417; $463), India (156; $814), France (43; $198).
	Chromium content[4]	2,600	XX	1,780	XX	
	Total oxides:					
	Gross weight	8,870	37,600 r	6,830	28,600	
	Chromium content[4]	5,240	XX	3,980	XX	
2833.29.4000	Sulfates of chromium:					
	Gross weight	900	797	212	252	Turkey (126; $178), India (61; $48), Canada (20; $14).
	Chromium content[4]	151	XX	35	XX	
	Salts of oxometallic or peroxometallic acids:					
2841.90.4500	Chromates of lead and zinc:					
	Gross weight	83	1,630	--	--	XX.
	Chromium content[5]	16	XX	--	XX	
2841.30.0000	Sodium dichromate:					
	Gross weight	1,060	2,440	779	1,310	South Africa (651; $1,090), India (128; $222).
	Chromium content[4]	371	XX	272	XX	
	Other chromates and dichromates; peroxochromates:					
2841.50.1000	Potassium dichromate:					
	Gross weight	3	38	5	57	India (3; $25), Colombia (2; $14).
	Chromium content[4]	1	XX	1	XX	
2841.50.9100	Other:					
	Gross weight	1,430	6,210	1,350	6,160	Austria (1,190; $5,280), China (75; $192), France (55; $432), India (17; $213), Colombia (8; $43).
	Chromium content[4]	444	XX	419	XX	
	Total salts:					
	Gross weight	2,570	10,300	2,130	7,530	
	Chromium content	832	XX	692	XX	

See footnotes at end of table.

TABLE 5—Continued
U.S. IMPORTS FOR CONSUMPTION OF CHROMIUM MATERIALS, BY TYPE[1]

HTS[2] code	Type	2022 Quantity (metric tons)	2022 Value[3] (thousands)	2023 Quantity (metric tons)	2023 Value[3] (thousands)	Principal sources in 2023 (Quantity in metric tons, value in thousands)
	Chemicals:—Continued					
2849.90.2000	Chromium carbide:					
	Gross weight	244	8,730	134	5,360	Israel (66; $3,610), China (45; $757), Canada (15; $557), Germany (3; $143), United Kingdom (3; $187).
	Chromium content[4]	212	XX	116	XX	
	Total chromium chemicals:					
	Gross weight	12,600	57,500	9,310	41,700	
	Chromium content	6,430	XX	4,820	XX	
	Pigments and preparations based on chromium, gross weight:					
3206.20.0010	Chrome yellow:					
	Gross weight	351	1,680	254	1,850	Colombia (115; $690), Canada (73; $679), Germany (32; $231), Taiwan (22; $161), India (12; $87).
	Chromium content[4]	56	XX	41	XX	
3206.20.0020	Molybdenum orange	174	1,260	244	1,470	Canada (223; $1,400), India (21; $62).
3206.20.0030	Zinc yellow	96	318	62	185	China (47; $144), Austria (14; $38).
3206.20.0050	Other	1,760	18,100	1,460	14,400	Mexico (1,137; $12,000), China (112; $874), Netherlands (103; $503), Germany (33; $562), Colombia (29; $177).
	Total pigments	2,380	21,300	2,020	17,900	

[r]Revised. XX Not applicable. -- Zero.
[1]Table includes data available through July 10, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Harmonized Tariff Schedule of the United States.
[3]Customs import value generally represents a value in the foreign country, and therefore, excludes U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise into the United States.
[4]Calculated based on fraction of chromium in the chemical formula.
[5]Calculated assuming the average chromium content was about 20%.

Source: U.S. Census Bureau.

TABLE 6
ESTIMATED WORLD PRODUCTION CAPACITY (CHROMITE ORE, FERROCHROMIUM, CHROMIUM METAL, CHROMIUM CHEMICALS, AND STAINLESS STEEL) AND CONSUMPTION FOR SELECTED COUNTRIES[1]

(Thousand metric tons, chromium content, unless otherwise specified)

	Production capacity in 2023					Chromium consumption[2]		
Country or locality	Ore[3]	Ferro-chromium[3]	Metal	Chemicals[4]	Stainless steel[5]	2021	2022	2023
Afghanistan	57	--	--	--	--	4	16 r	12
Albania	1,700	150	--	--	--	54	110 r	170
Austria	--	--	--	--	20	24	23	22
Belgium	--	--	--	--	260	200	160	130
Brazil	1,700	300	--	--	80	420	420 r	410
Canada	--	--	--	--	--	24	21	16
China	200	12,000	61	350	8,300	6,100	5,900	7,500
Finland	2,800	530	--	--	280	540	480	470
France	--	--	12	--	70	36	18	22
Germany	--	36	4	4	100	130	120	98
Greece	40	--	--	--	--	1	1	1
India	6,000	2,000	--	56	940	970 r	730 r	840
Indonesia	--	600	--	--	970	1,000	1,100	760
Iran	200	200	--	2	--	11 r	31 r	29
Italy	--	--	--	8	300	--	4	--
Japan	--	25	3	11	590	400	370 r	330
Kazakhstan	8,500	2,400	--	60	--	1,100	1,000 r	1,200
Korea, Republic of	--	--	--	--	500	320	250	260
Kosovo	70	--	--	--	--	5	1 r	--
Madagascar	320	--	--	--	--	--	6 r	--
Oman	1,800	125	--	--	--	49 r	100 r	120
Pakistan	580	--	--	1	--	--	--	--
Papua New Guinea	150	--	--	--	--	30	31	31
Philippines	57	--	--	--	--	--	15 r	--
Poland	--	--	--	8	--	10	13	12
Russia	1,200	500	27	50	20	160	81 r	120
Slovenia	--	--	--	--	30	18	11	9
South Africa	29,000	5,500	--	50	100	--	--	--
Spain	--	--	--	6	200	110	88	69
Sudan	120	--	--	--	--	2	1	1
Sweden	--	250	--	--	130	--	8 r	7
Taiwan	--	--	--	--	200	110	90	52
Turkey	14,000	190	--	70	--	1,700	2,100 r	2,000
Ukraine	--	--	--	--	15	12	3	3
United Arab Emirates	240	58	--	--	--	9	11 r	19
United Kingdom	--	--	10	4	70	21	45	22
United States	--	--	--	48	500	340	290	220
Zimbabwe	2,400	576	--	--	--	46 r	140 r	--
Total	71,100	25,400	117	728	14,000	XX	XX	XX

rRevised. XX Not applicable. -- Zero.

[1]Table includes data available through August 22, 2024. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported in chromium content. Apparent consumption was estimated based on chromite ore production reported by the U.S. Geological Survey and trade statistics for chromite ore, chromium metal, and ferrochromium as reported by Global Trade Tracker in July 2024 assuming that the average grade of chromite ore is 45% chromium oxide (Cr_2O_3); ferrochromium, 57% chromium; and chromium metal, 100% chromium.

[3]Reported in gross weight.

[4]Chromium content was calculated assuming chemicals were in the form of anhydrous sodium dichromate.

[5]Chromium content of stainless steel was calculated assuming an average grade of 17% chromium.

TABLE 7
CHROMITE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1, 2]

(Metric tons, gross weight)

Country or locality	2019	2020	2021	2022	2023
Afghanistan[e]	6,000 [r]	6,000 [r]	12,000	52,000 [r]	38,000
Albania	1,288,315	626,627	650,200	932,686	920,770
Brazil, ore and concentrates	1,237,549	1,328,501 [r]	1,431,207	1,424,312 [r]	1,423,740
China	84,400	128,000	130,000 [e]	136,000 [r]	130,000 [e]
Finland, ore	2,415,287	2,293,330	2,273,857	1,997,701	1,906,409
Greece, crude ore	25,171	1,651	1,800 [e]	-- [r]	--
India	4,138,817	2,401,508	4,248,973	3,470,110 [r]	4,100,000 [e]
Iran, ore	230,000	215,000	230,000 [e]	290,000 [e]	330,000 [e]
Kazakhstan, ore[3]	7,018,900	6,326,400	6,192,000	5,716,900 [r]	6,000,000 [e]
Kosovo	66,000 [e]	24,427	16,656	1,000 [r, e]	1,400 [e]
Madagascar	76,126	12,400	13,500	18,300 [r]	18,000 [e]
Oman	732,600	456,800	488,900 [r]	412,000 [r]	400,000 [e]
Pakistan	120,698	164,027 [r]	173,837 [r]	178,433 [r]	170,000 [e]
Papua New Guinea	115,573	119,773	98,705	100,000 [e]	100,000 [e]
Philippines	36,423	35,112	30,721	87,182 [r]	101,960
Russia	594,000	608,000	600,000 [e]	600,000 [e]	600,000 [e]
South Africa:					
44% to 48% Cr_2O_3	1,428,471	1,155,904	1,792,254	2,316,105	2,304,537
Less than 44% Cr_2O_3	16,227,031	12,040,976	16,588,719	16,788,530	17,378,814
Total	17,655,502	13,196,880	18,380,973	19,104,635	19,683,351
Sudan	12,728	9,000	5,600	2,800 [e]	4,400 [e]
Turkey, 34% to 43% Cr_2O_3	8,666,114	6,164,598	6,960,683	8,278,124 [r]	8,159,767
United Arab Emirates	136,100	62,413	21,800	26,000 [r, e]	63,000 [e]
Zimbabwe	1,550,064	1,196,837	1,325,126	1,623,159	1,074,450
Grand total	46,200,000 [r]	35,400,000 [r]	43,300,000 [r]	44,500,000 [r]	45,200,000

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through October 7, 2024. All data are reported unless otherwise noted; totals may include estimates. Grand totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Values for all countries or localities represent marketable output.

[3]Reported in gross weight by the Statistical Committee of the Ministry of National Economy of the Republic of Kazakhstan.

TABLE 8
FERROCHROMIUM: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Metric tons, gross weight)

Country or locality	2019	2020	2021	2022	2023
Albania	66,402	53,543	103,700	80,194	75,000 [e]
Brazil[2]	136,780	254,346	213,756	205,371	202,481
China	6,030,000	6,230,000 [r]	6,410,000 [r]	7,340,000 [r, e]	7,750,000 [e]
Finland	505,000	498,000	515,000	430,000	390,000
Germany	25,515	16,409	23,252	26,624	21,179
India	930,000	826,000	1,090,000	1,073,000 [r]	1,400,000 [e]
Indonesia	190,000	230,000	252,000	275,000 [r]	300,000
Iran	12,000	10,000 [e]	17,000 [e]	15,000 [e]	10,000 [e]
Japan[e]	13,000	9,900	11,000	12,000	12,000
Kazakhstan	1,858,130	1,841,309	1,704,561	1,658,378	1,400,000 [e]
Oman	84,938	23,500	82,250	84,250	50,000 [e]
Russia	384,089	342,622	289,000 [r]	307,219 [r]	300,000 [e]
South Africa	3,247,609	2,404,088	3,109,979 [r]	3,900,000 [e]	3,200,000 [e]
Sweden	114,200 [r]	87,000	114,600	114,600	108,000 [e]
Turkey	71,300 [r]	94,200	100,750	98,813	84,000 [e]
Zimbabwe	311,500	134,000	306,847	395,097	400,000 [e]
Total	14,000,000	13,100,000 [r]	14,300,000 [r]	16,000,000 [r]	15,700,000

[e]Estimated. [r]Revised.

[1]Table includes data available through October 7, 2024. 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.

[2]Includes ferrosilicon-chromium.