

CHROMIUM

By John F. Papp

Domestic survey data and tables were prepared by Joseph M. Krisanda, statistical assistant, and the world production tables were prepared by Ronald L. Hatch and Glenn J. Wallace, international data coordinators.

In 2000, the U.S. chromium supply (measured in contained chromium) was 139,000 metric tons (t) from recycled stainless steel scrap; 453,000 t from imports; and 924,000 t from Government and industry stocks. Supply distribution was 86,300 t to exports; 840,000 t to Government and industry stocks; and 589,000 t to apparent consumption. Chromium apparent consumption increased by 5.63% compared with that of 1999.

Legislation and Government Programs

The Department of Health and Human Services (HHS) updated the toxicological profile for chromium. HHS revises and republishes toxicological profiles as necessary, but no less than once every 3 years. The profiles are prepared for health professionals and report toxicologic and health effect information (Syracuse Research Corp., 2000).

The Defense Logistics Agency (DLA) disposed of chromium materials under its fiscal year (FY) 2000 (October 1, 1999, through September 30, 2000) Annual Materials Plan (AMP). DLA's FY 2000 AMP (as revised in April) set maximum disposal goals for chromium materials at 90,700 t of chemical grade chromite ore, 227,000 t of metallurgical grade chromite ore, 90,700 t of refractory grade chromite ore, 136,000 t of chromium ferroalloys, and 454 t of chromium metal. DLA also developed its FY 2001 AMP, which set maximum disposal goals of 90,700 t of chemical grade chromite ore; 227,000 t of metallurgical grade chromite ore; 90,700 t of refractory grade

chromite ore; 136,000 t of chromium ferroalloys; and 454 t of chromium metal (U.S. Department of Defense, 2001, p. 8, 11).

World Review

Albania.—The Government of Albania (GOA) studied the possibility of privatizing chromite ore mines and ferrochromium smelters (Ryan's Notes, 2000j). GOA contracted Darfo S.p.A. (Italy) to operate the Elbasan ferrochromium smelter. There are two 9 megavoltampere furnaces at the smelter, of which one is producing at the rate of 800 tons per month (t/mo) and the other is closed. Darfo planned to install a 13 megavoltampere and a 25 megavoltampere furnace at a cost of about \$15 million, raising the plant's annual production capacity to 40,000 t (Ryan's Notes, 2000a).

Australia.—Danelagh Resources Pty. Ltd. produced chromite at Coobina Chromite Deposit 57 kilometers (km) east-southeast of Newman, Western Australia. The Coobina Range consists of a central core of serpentinite. An associated gabbro was formed by the serpentinization of layered peridotite, which contains minor amounts of chlorite, talc, carbonate, chromite, and magnetite. As of December 1997, resources were: measured, 39,000 t graded at 38.5% chromic oxide; indicated, 86,200 t graded at 39.7% chromic oxide; and inferred, 400,000 t of similar grade. Mining process is open cut, and run-of-mine ore is crushed and screened. Danelagh exercised its option to take ownership of the mine leaving Consolidated Minerals

Chromium in the 20th Century

In 1900, "chromic iron ore" was used to describe what we now call chromite ore. Chromium was used as an alloying element, in chemical compounds, and in refractory materials. It played an important role in metallurgy as an alloying element. Chromium and tungsten were being alloyed with iron to make tool steels that permitted large increases in industrial productivity. Chromium was also used to make armor plating hard. These, along with the use of chromite ore as a refractory in steel-producing furnaces, made chromium a critical and strategic material during World War I. In 1900, the United States had resumed production of chromite ore and chromium after a hiatus from 1897 to 1899. Prior to that, the United States had produced 3,767 metric tons of chromite ore in 1890. Production picked up during World War I and again during World War II. In 1900, U.S. chromite ore production was 142 metric tons, which represented 0.27% of world production.

Chromium has played an important role in metallurgy as an alloying element. It was not until 1910 to 1920 that the

alloying role of chromium with iron to make stainless steel was developed in France, Germany, the United Kingdom, and the United States. Once this was understood, however, stainless steel became an integral part of the steel industry, accounting for more than 2% of steel production in 2000. Stainless steel manufacture, while small compared with steel production of all grades, nonetheless accounts for about 60% of chromium consumption. Stainless steel, which didn't even exist in 1900, accounted for most of the chromium consumed in 2000, and its share of steel production was growing. Chromium chemical use has grown since 1900; chromite refractory use, however, has been reduced because of technological developments. Superalloys, which are engineering alloys of chromium and nickel used in aggressive environments and were also nonexistent in 1900, were an important strategic use of chromium in 2000, because they were used to make the internal workings of jet engines.

Ltd.'s interest to a royalty. Chromite ore production was 6,000 t in 1996; 31,000 t in 1997; 130,000 t in 1998; and 85,000 t in 1999 (Resource Information Unit, 2000, p. 294-295). Danelagh planned to construct a beneficiation plant that would permit it to increase its recoverable resources and to produce more product grades. Danelagh reported proven reserves of 2.2 million tons (Mt) and probable reserves of 10 Mt. The mine produced chromite ore graded at 37% Cr₂O₃ and from 6 millimeters (mm) to 150 mm in size (Ryan's Notes, 2001c).

Tata Iron and Steel Co. Ltd. (India) studied the possibility of constructing a ferrochromium smelter in Gladstone, Queensland. Tata produced chromite ore and ferrochromium in India; however, its ferrochromium production was limited by the availability and cost of electrical power in India. Electrical power was available at a lower cost in Australia than it was in India. A 120,000-ton-per-year (t/yr) capacity ferrochromium smelter with the potential to double that capacity would cost about \$50 million (Metal Bulletin, 2000o, 2001; Ryan's Notes, 2001b).

Dragon Mining NL studied the Range Well deposit 67 km northwest of Cue, Western Australia. Chromium occurs predominantly in the iron oxide minerals hematite and goethite. The Range Well laterite resource lies directly over part of a 5.5 km thick funnel-shaped layered ultramafic complex. As of June 1998, inferred resource was estimated at 36 Mt graded at 3.60% chromium (2% cutoff grade) (Resource Information Unit, 2000, p. 295).

Brazil.—Brazil reported production for use in the metallurgical and refractory industries. Brazil produced high- and low-carbon ferrochromium. Brazil reported 1999 chromite ore production of 420,000 t (45.2% Cr₂O₃), exported 194,000 t of chromite ore (53.1% Cr₂O₃), and imported 8,482 t (48.0% Cr₂O₃). In 1999, Brazil produced 91,000 t of chromium ferroalloys of which 71,000 t was high-carbon ferrochromium, 8,200 t was low-carbon ferrochromium, and the remainder was ferrochromium-silicon. Brazil imported 5,000 t of chromium ferroalloys and metal and exported 59 t of ferrochromium (Cesar, 2000).

Associação Brasileira dos Produtores de Ferroligas e de Silício Metálico reported ferrochromium production in 1999 to have been 71,291 t of high-carbon and 7,583 t of low-carbon ferrochromium. Brazil exported 59 t of high-carbon ferrochromium and 168 t of low-carbon ferrochromium. Brazil imported 2,144 t of high-carbon ferrochromium and 2,827 t of low-carbon ferrochromium (TEX Report, 2000r, s, t).

Villa Nova Mine, Amapa State, operated with an annual production capacity of 200,000 t of chromite concentrate from 400,000 t of run-of-mine chromite ore. Villa Nova operated a four-stage beneficiation process that it is replacing with a three-stage spiral separator process having a through-put of 100 metric tons per hour. The new process was expected to achieve a recovery rate of about 96% (Mining Weekly, 2000).

Canada.—Allican Resources planned to build a low-carbon ferrochromium smelter at Thetford Mines, Quebec. The project was estimated to cost about \$44.6 million for a 19,000-metric-ton-year smelter. Chromite ore would be supplied initially from imports followed by development of chromite ore deposits in the Thetford area. At this capacity, the plant could supply about one-half of North American low-carbon ferrochromium demand

(Ryan's Notes, 2000c).

China.—China reported its national chromium-material trade statistics for 1999. Chromite ore imports were 711,493 t in 1998; 816,229 t in 1999; and 1,112,838 t in 2000. High-carbon ferrochromium exports were 74,849 t in 1997; 65,576 t in 1998; 49,652 t in 1999; and 130,446 t in 2000. Low-carbon ferrochromium exports were 27,220 t in 1997; 36,508 t in 1998; 24,161 t in 1999; and 24,161 t in 2000 (TEX Report, 2000b, c, 2001a, b). Based on this reported trade, apparent consumption of chromium in China was 420,000 t.

The State Economic and Trade Commission of China embarked on a modernization program for the ferroalloys industry. Goals of the plan are to scrap old ferroalloy plants, prohibit construction of new plants, prevent environmental pollution, and promote technology. China operated about 1,600 ferroalloy furnaces of which about 1,000 had electrical power capacity under 3,000 kilovolt-amperes. Electrical furnaces rated under 1,800 kilovolt-amperes were to have been scrapped by the end of 2000; furnaces under 3,200 kilovolt-amperes by the end of 2001. New furnace construction was suspended until 2005 as were expansions. The modernization plan was expected to reduce high-carbon ferrochromium production in China; however, more low-carbon ferrochromium could be produced (TEX Report, 2000d).

European Union.—The European Union (EU) permits duty-free importation of ferrochromium from non-EU countries on a specified amount of material from all non-EU sources. Import duties are applied to imported materials in excess of the specified amount of material. The EU set the duty-free ferrochromium import quota at 1.035 Mt in January 2000 (Metal Bulletin, 2000a). The EU lifted antidumping duties imposed on Kazakhstani and Russian low-carbon ferrochromium producers in 1993 (Metal Bulletin, 2000b). Since the EU made a special trade deal with South Africa, it revised its 2000 duty-free import quota at 515,000 t for South Africa; 520,000 t for all other countries combined. EU left its 2001 duty-free quota for South Africa unchanged while reducing that for all other countries to 400,000 t (Ryan's Notes, 2001c).

Finland.—Outokumpu Polarit Oy planned to merge with Avesta Sheffield (Sweden, United Kingdom). See Sweden section. Outokumpu reported on its ferroalloys production process using preheated charge. Sintered pellets and other charge components are heated before being charged into the smelting furnace (called preheated) on a moving steel belt over which hot gasses from the closed smelting furnace are passed. The system was developed to process chromite ore from Kemi Mine. The process was developed to consume little electrical energy for smelting, have high on-line availability, good working conditions, and adequate environmental aspects (Nurmialo, 2000). Outokumpu planned the addition of a new melt shop and hot- and cold-rolling facilities that were expected to double output at Tornio works to 800,000 t in 2002.

France.—Delachaux Metals Division produced chromium metal by aluminothermic reduction. Delachaux reported that world demand for chromium metal in 2000 increased to 21,000 t from 20,000 t in 1999. The major end uses for chromium metal were the production of superalloys for use in gas turbine engines or petrochemical production. Delachaux estimated its

production in 2000 to be 5,500 t (Metal Bulletin Books, 1995, p. 42; TEX Report, 2000g).

Germany.—ThyssenKrupp Group made a purchase guarantee with SA Chrome and Alloys (South Africa), a startup ferrochromium producer. ThyssenKrupp committed to purchase 230,000 t/yr of high-carbon ferrochromium from SA Chrome and Alloys for 5 years.

India.—The Ministry of Commerce conducted a review of the antidumping duty imposed in January 1997 that found no evidence of injury to domestic industry by the import of low-carbon ferrochromium from Kazakhstan or Russia. Ferro Alloys Corp. Ltd., the only domestic low-carbon ferrochromium producer, has not produced the material for the past 2 years (Metal Bulletin, 2000h; Platt's Metals Week, 2000b).

Ferro Alloys Corp. Ltd. resumed production at Garividi and at Shreeram Nagar. The Garividi plant was closed for financial reasons. The Shreeram Nagar plant was closed over a labor dispute. Ferro Alloys Corp. Ltd. exported chromite ore for the first time. Ferro Alloys Corp. Ltd. reported annual ferrochromium production of 87,000 t in 1998 and 51,000 t in 1999. (Metal Bulletin, 2000d, n; TEX Report, 2000f).

Indian Metals and Ferroalloys Ltd. started opencast mining in the Sukinda Valley. Indian Metals and Ferroalloys received 190 hectares (ha) containing 21 Mt of chromite ore reserves when the Government redistributed Sukinda Valley resources in 1999. Chromite ore production reached 31,000 t/mo in May, enough to supply its ferroalloy plants. Indian Metals and Ferroalloys used that chromite ore to feed its ferrochromium smelters at Therubali and Choudwar. At Therubali, Indian Metals and Ferroalloys operated three furnaces electrically rated at 48 megavolt-amperes, 24 megavolt-amperes, and 10 megavolt-amperes. The plant's annual ferrochromium production capacity was 110,000 t; however, Indian Metals and Ferroalloys was producing ferrochromium at the rate of 30,000 t/yr from the 24 megavolt-ampere furnace. Indian Charge Chrome Ltd. was producing ferrochromium at the annual rate of 60,000 t from a 48 megavolt-ampere furnace at Choudwar. Indian Metals and Ferroalloys reported annual production of 56,000 t in 1998 and 67,000 t in 1999 (TEX Report, 2000h).

Jindal Strips Ltd., Ferro Alloys Division planned to exploit chromite ore resources allocated to it when the Government redistributed Sukinda Valley resources in 1999. Jindal planned to produce ferrochromium at the annual rate to 60,000 t at its plant in Andhra Pradesh State (TEX Report, 2000k).

Tata Iron and Steel Co. Ltd. reported 1999 ferrochromium production of 100,000 t and planned to increase that in 2000. Tata produced ferrochromium at its Bamnival plant in India and under agreements with five other domestic companies operating nine furnaces and five Chinese plants operating seven furnaces. Tata reported 1999 chromite ore production of 772,000 t with plans to increase that to 1,000,000 t by exploiting resources assigned to it when the Government redistributed Sukinda Valley resources in 1999; Tata also reported chromite ore concentrate production of 200,000 t with plans to increase that to 300,000 t. To meet ferrochromium expansion goals, Tata bid to buy Industrial Development Corp.'s ferroalloy plant. To reduce electrical energy cost and assure supply, Tata requested permission to build a powerplant in Orissa. Another plan by Tata to increase ferrochromium production while avoiding the

high cost of electrical energy was to build a ferrochromium plant in Australia that would use chromite ore mined by Tata in India (see Australia section) (Lobo, 2000; Metal Bulletin, 2000m, n, p; TEX Report, 2000x).

Iran.—Abdan Ferroalloy Refinery produced ferrochromium with an annual capacity of 15,000 t from a 12.5-megavolt-ampere furnace. The company also operated the Ne'Mat chromite ore mine. The mine's annual production capacity was 400,000 t, some of which was processed in its 120,000-t/yr concentrator.

Iran produced chromite ore in excess of its domestic needs. To increase value added exports, the Government planned to increase domestic annual ferrochromium production to 200,000 t by 2005. New production facilities were planned for the provinces Kerman and Fars. Baft Ferrochrome Industrial Company and Nahid Ehyan Sepahan contracted with ABB Engineering Company (Sweden, Switzerland) to build two plants, each with an annual ferrochromium production capacity of 25,000 t, for \$74 million. Construction was expected to take 2 years (Iran Daily, 2000; Ryan's Notes, 2000l).

Japan.—Japan imported 501,727 t of chromite ore; 714,531 t of high-carbon, and 61,796 t of low-carbon ferrochromium; and 3,202 t of chromium metal. Japan produced 131,759 t of high- and low-carbon ferrochromium. Stainless steel production was 3.447 Mt. Ferrochromium imports represented 85% of market share. Japan exported 2,541 t of ferrochromium and 1.162 Mt of stainless steel. Japan had stainless steel scrap imports of 211,581 t and exports to 70,676 t (TEX Report, 2001c, f, g, h, i, j, k).

Based on chromite ore, ferrochromium, chromium metal, and stainless steel scrap trade, chromium apparent consumption in Japan was 586,000 t contained chromium. Japan had a duty-free quota for the importation of ferrochromium amounting to 28,100 t in FY 2000. There was a preferential duty of 3.18% and a temporary duty of 5.3% imposed effective April 1, 2001 (April 1, 2000, through March 31, 2001) (TEX Report, 2001m).

The Ministry of International Trade and Industry reported its intent to review the goals of the rare metals stockpile, which included chromium metal, taking into account current political conditions, budget constraints, and rare metal demand. The rare metals stockpiling program has been active since 1984, at which time chromium was identified as one of the rare metals that would be stocked in the amount necessary to meet 60 days of demand (TEX Report, 2000o). A stockpile equivalent to 78.2% of the goal for chromium had been reached. The review found that the amount of chromium held in the stockpile could be reduced. J S Processing Co. Ltd. is a new business setup in Osaka to supply blended scrap to Nippon Steel Corp. The company is a joint venture among ELG Haniel Metals Corp. (40%), Mitsui and Co. Ltd. (19%), Mitsubishi Corp. (19%), Nippon Steel Trading Co. Ltd. (12%), Fujimoto Kinzoku (5%), and Sangyo Shinko (5%). The company anticipated handling 3,000 t/mo of scrap, of which 1,000 t would be blended (TEX Report, 2000i, j).

High-carbon ferrochromium producers and production in Japan in 2000 were: Nippon Denko Co. Ltd., 7,113 t; NKK Materials Co. Ltd., a subsidiary of NKK Corp., 31,948 t; and Shunan Denko K.K., a subsidiary of Showa Denko K.K.,

83,909 t (TEX Report, 2001c).

NKK Materials Co. Ltd. reported the development of a new product, 99.5% pure chromium metal. NKK Materials implemented its two-step electric furnace refining process followed by vacuum degasification at its Toyama plant. NKK expected the chromium metal to be used by master alloy producers for the aircraft industry, a market sector that NKK currently supplies with low-carbon ferrochromium. NKK planned to produce about 1,000 t/yr, developing its chromium metal production capacity to 3,000 t/yr (Metal Bulletin, 2000i; TEX Report, 2000n).

Japan houses about one-fifth of the world's stainless steel industry with a production capacity well in excess of its domestic demand. That industry has participated in the trend to make strategic alliances between ferrochromium consumers, that is themselves, and ferrochromium producers in South Africa. As no new alliances have originated over the past 2 years, that trend appears to have played out. The stainless steel industry itself is now undergoing changes in Japan. From 1961 through 2000, stainless steel production (excluding heat resisting grades) in Japan has grown from 199,462 t to 3,021,080 t, a compounded growth rate of 7.22%. The major stainless steel-producing companies that also operate blast furnaces, their stainless steel production locations, and production in 2000 were Kawasaki Steel Corp., Chiba, 683,858 t; Nippon Metal Industry, Kinuura, 318,888 t; Nippon Steel, Hikari and Yawata, 1,105,318 t; Nippon Yakin Kogyo Co. Ltd., Kawasaki, 337,840 t; Nisshin Steel Co., Shunan, 629,072 t; and Sumitomo Metal Mining Co. Ltd., Wakayama and Naoetsu, 551,672 t. Nippon Steel and Sumitomo agreed to specialize. Nippon Steel was to specialize in producing stainless steel coils; Sumitomo in pipes and shaped steels. Nippon Steel also reached an agreement with Nisshin Steel wherein Nippon Steel would specialize in austenitic (that is, chromium-nickel-containing) grades and Nisshin would specialize in ferritic (that is, chromium-containing) grades. By these agreements, each company expected to benefit economically by producing larger volumes of fewer products and permitting the elimination of excess production capacity (TEX Report, 2000e, 2001d, e). Japan has exported a substantial fraction of its stainless steel production. In recent years, stainless steel production capacity has been developed in Asia, namely in the Republic of Korea and Taiwan. Since new capacity has come into production faster than demand expansion, adjustments are necessary. Capacity reduction takes place where production is least efficient; that is, in older facilities. The older facilities in Asia are in Japan.

Kazakhstan.—Kazchrome was co-owned by Trans World (Alloys) Inc. and the Government of Kazakhstan. A dispute arose in 1997 between Trans World and local company officials over who would control and manage the mine and ferrochromium smelters. The dispute was settled in 2000 when the Chodiev Group (also known as Kazakhstan Mineral Resource Corp.) bought Trans World's interest in the Kazchrome. Kazchrome owns the Donskoy Ore Dressing Complex and the Aksusky Ferroalloy Plant (Aksu) and Aktyubinsk Ferroalloy Plant. Kazchrome was owned by Kazakhstan Mineral Resource Corp. (28.75%), the Kazakhstani Government (31.3%), and holds its own stock (28.75%).

Kazakhstan's chromium industry includes Donskoy Ore

Dressing Complex, Aksu, and Aktyubinsk Ferroalloy Plant. Donskoy extracted chromite ore from the Poiskovy open pit and the Molodyonzhnaya underground mines (TEX Report, 2000m). Donskoy completed construction of equipment that will produce briquettes from chromite ore fines, with an annual capacity of 500,000 t (TEX Report, 2001l). Aksu installed a new 64-megavolt-ampere furnace manufactured by Mannesmann-Demag (Germany) that has a high-carbon ferrochromium production capacity of 102,000 t/yr. Aksu planned to add about 160,000 t of high-carbon ferrochromium production capacity in the form of two 50-megavolt-ampere or three 30-megavolt-ampere furnaces in 2002 (Ryan's Notes, 2000e; TEX Report, 2000l).

Norway.—Elkem ASA produced high-carbon ferrochromium containing 60% to 65% chromium from two closed furnaces at its ferrochromium plant in Rana. Annual production capacity was 160,000 t (Ryan's Notes, 2000h).

Philippines.—The four ferrochromium producers in the Philippines were reported to have ceased production several years ago (Bennet, Barrand, and Clarkson, 2000). Benguet Corporation mined foundry and refractory grades of chromite ore at Masinloc Chromite Operation in Zambales Province. Having developed a stockpile equivalent to 15 to 18 months of consumption, Benguet temporarily suspended production in 1999 to reduce stocks (Industrial Minerals, 1999). Having depleted its stockpile, Benguet started underground chromite ore mine production (Platt's Metals Week, 2000a).

Russia.—Serov Ferroalloy Plant reported production of 129,500 t of ferrochromium in 1999: 90,000 t of high-carbon ferrochromium; 18,500 t of medium-carbon ferrochromium; and 21,000 t of low-carbon ferrochromium. The plant is 359 km from Sverdlovsk. It uses locally mined and imported chromite ore. Serov was developing a new mine at Salechard, which it expected to yield chromite ore of higher grade than that currently available from local sources. Serov imported ore from Kazakhstan and Turkey (Metal Bulletin, 2000k).

Severonickel Combine, a subsidiary of RAO Norilsk Nickel, continued development of the Sopchezero chromite deposits. Norilsk sought a partner to develop the chromite ore mine and a ferrochromium smelter (Ryan's Notes, 2000b).

Chelyabinsk Electrometallurgical Integrated Plant produced low-carbon ferrochromium with an annual production capacity of 144,000 t. Chelyabinsk imported its chromite ore from Kazakhstan (Ryan's Notes, 2001a). Chelyabinsk planned to install a scrap recycling circuit (Ryan's Notes, 2000g).

South Africa.—The Minerals Bureau reported that, from a reserve base of 3,100 Mt of chromite ore, in 1999 South Africa produced 6,817,000 t of chromite ore from which it produced 2,155,000 t of ferrochromium and other products. South Africa exported 841,000 t of chromite ore and 1,897,100 t of ferrochromium in 1999 (Armitage, 2000). Based on chromite ore production and chromite ore and ferrochromium trade, 1999 South African chromium apparent consumption was 755,658 t, contained chromium. The Minerals Bureau reported chromite ore production in 2000 of 6,620,754 t and sales of 6,744,278 t. Eighty-five percent of sales was sold locally; the remaining 15% was exported (South African Minerals Bureau, 2001).

South Africa considered changing its mining law. Currently,

companies own mineral property rights. Draft legislation would change to government ownership of minerals and government licensing of mining for a specified period of time (Ryan's Notes, 2000h, k). Eskom, the South African power company, planned to change its billing structure for the ferrochromium industry, as their current 7-year contract with that industry comes to a close. The current contract adjusts the price of electrical energy between minimum and maximum rates based on the price of ferrochromium. The proposed system would be a fixed tariff rate of 12.2 cents per kilowatthour. Eskom was the fifth largest electrical power producer worldwide and planned to be privatized (Metal Bulletin, 2000l; Ryan's Notes, 2000f, 2001d). South African environmentalists made their desire for stricter pollution-control standards known at public hearings held to discuss the environmental impact of new plants or new furnaces (Ryan's Notes, 2000m).

ASA Metals (Pty.) Ltd. planned another furnace and an agglomeration facility for its ferrochromium plant near Burgersfort, Northern Province. ASA completed construction and started production at its ferrochromium plant last year. ASA had an annual ferrochromium production capacity of 60,000 t from a 33 megavolt-ampere furnace. ASA is a joint venture between Northern Province Development Corporation (40%) and East Asian Metals Investment Co. Ltd. (60%) (Lourens, 2000).

South Africa Chrome and Alloys Ltd. (SACChrome), formerly Southern Witwatersrand Exploration Co., studied the feasibility of constructing a ferrochromium plant. The plant was to use chromite ore from its Horizon and Chromeden mines. SACChrome planned to build a pelletizing and sintering plant with an annual capacity of 520,000 t and a ferrochromium plant with annual production capacity of 230,000 t. They planned two closed furnaces with electrical capacity of 54 megavolt-amperes each. The plant was to be located near Boshhoek at a rail siding about 40 km from the mine and about 650 km from Richards Bay. Plant cost was estimated at about \$100 million. SACChrome planned to use chromite ore from the UG-2 and LG-6 seams to produce ferrochromium containing 51% chromium. Thyssen Krupp Metallurgie contracted to take up to 250,000 t/yr of ferrochromium for 5 years from SACChrome (Graulich, 2000; Ryan's Notes, 2000d, m, 2001b).

Associated Manganese Mines of South Africa Ltd. (Assmang) started production at the Dwarsrivier chromite ore mine in Mpumalanga Province about 30 km from Steelpoort (Mining Journal, 2000b). The opencast mine and beneficiation plant located at the mine site had an annual production capacity of about 350,000 t/yr. Assmang planned to start underground mining in 2001, thereby bringing production capacity up to about 1 million tons per year. The LG-6 seam, which dips at 8 degrees to 14 degrees and has a thickness of about 180 centimeters, was being mined. Within the mine, ore was transported by conveyor belt from the pit to the beneficiation plant. From the plant, ore was trucked to the Steelpoort rail terminal from which it was carried by train the remaining 60 to 65 km to Feralloys, Assmang's ferrochromium plant at Machadodorp (<http://www.avmin.co.za/mediashop/pressreleas.asp?story=5>, downloaded April 13, 2000) (TEX Report, 2000a). Feralloys operated three furnaces and a metal-from-slag recovery process. The furnaces accounted for an

annual ferrochromium production capacity of about 125,000 t; the metal-from-slag recovery was 25,000 t. Two of their three furnaces had electrical capacity of 24 megavolt-amperes; the third furnace, 30 megavolt-amperes. The two 24-megavolt-ampere furnaces were upgraded to 30 megavolt-amperes, bringing Feralloys' ferrochromium production capacity up to 175,000 t/yr (Metal Bulletin, 2000g). A fourth furnace and pelletizing plant of Outokumpu technology was planned. The fourth furnace was planned to have an electrical capacity of 54 megavolt-amperes and ferrochromium production capacity of 130,000 t/yr. The pelletizing plant was planned to produce 350,000 t/yr of pellets (Metal Bulletin, 2000f).

Columbus Stainless Steel estimated its production of stainless steel flat products to have been 440,000 t in 2000, of which 105,000 t was sold domestically (Metal Bulletin, 2000c).

Hernic (Pty.) Ltd. brought its third furnace into production. The third furnace is supported by pelletizing and preheating operations manufactured by Outokumpu Oy (Finland). The system was installed at a cost of about 200 million Rand and increased Hernic's annual ferrochromium production capacity to 260,000 t (Venter, 2000b).

Samancor Ltd. planned a greenfield ferrochromium plant in the western belt of the Bushveld Complex near its Mooinooi Mine. Samancor planned to construct two closed furnaces to be fed by one pelletizing and sintering plant on a 50-ha site at a cost of 500 million Rand. Production technology is from Outokumpu Technology (Finland) that Samancor is using at its Ferrometals plant. This will be Samancor's first ferrochromium plant in the western belt of the Bushveld complex. The mine was expected to produce about 760,000 t/yr of chromite ore. The smelter was expected to produce 520,000 t/yr of preheated pellets, from which about 300,000 t/yr of ferrochromium would be produced. The plans were reported to have included the use of UG-2 chromite byproduct from platinum mining and iron and steel scrap (Venter, 2000a). Samancor anticipated proceeding with plant construction when market conditions indicated the need for this new plant (Gonsalves, 2000).

Xstrata S.A. (Pty.) Ltd. was developing the Townlans Mine in the Rustenburg area, western belt of Bushveld Complex. The mine was expected to start production in 2001 and have a production capacity of 480,000 t/yr. The new mine complements Xstrata's existing mines in the western belt: Waterval, 273,000 t/yr production capacity and Kroondal Mine, 663,000 t/yr; and the Thorncliffe Mine, 1,056,000 t/yr in the eastern belt (TEX Report, 2000y).

Samancor and Xstrata formed an equally owned joint venture to develop chromite ore mining and ferrochromium production in the Rustenburg area of the western belt of the Bushveld Complex. The joint venture will develop chromite ore reserves owned by Samancor that are accessible via Xstrata's Kroondal Mine and will expand Xstrata's Wonderkop smelter. The Wonderkop smelter near Rustenburg had an annual ferrochromium production capacity of about 300,000 t from four, 39 megavolt-ampere furnaces, two pelletizing lines, and a recovery plant. Wonderkop obtained its chromite ore supply primarily from the Kroondal Mine. Samancor and Xstrata planned to add two 45 megavolt-ampere furnaces, pelletizing and prereduction, and metal-from-slag recovery at a cost of

about \$40 million. The new production equipment will add 180,000 t/yr of ferrochromium to the plant's annual production capacity. Additional chromite ore supplies will come through development of the Kroondal Mine to exploit reserves owned by Samancor. Production was expected to start in 2001 (Metal Bulletin, 2000j; Mining Journal, 2000a; Platt's Metals Week, 2000c; Robinson, 2000b; Ryan's Notes, 2000i; TEX Report, 2000p).

Sweden.—Vargön Alloys AB planned to purchase a recovery plant that would recover ferrochromium from slag. The plant was planned to process slag at the rate of 100 metric tons per hour. The equipment supplier was Apic Toll Treatment, a joint venture between Mintek and Bateman Titaco Company (Robinson, 2000a).

The European stainless steel producers Avesta Sheffield Ltd. (Sweden, United Kingdom) and Outokumpu Polarit Oy (Finland) merged to form AvestaPolarit Abp. Avesta Sheffield is the result of the merger of Avesta (Sweden) and British Stainless Steel (UK) in 1992. The merger was to be effected in 2001. The new company would have a stainless steel production capacity of 1.7 Mt. Other stainless steel producers in Europe include Acciai Speciali Terni SpA (Italy), Acerinox SA (Spain), ALZ NV (Belgium), Ugine SA (France), and Krupp-Thyssen Nirosta GmbH (Germany). Raw materials supply appears to favor Outokumpu Polarit's plant at Tornio because it is near to chromium and nickel supply (Metal Bulletin Books, 1995, p. 4, 18, 30, 48, 79, 96; Avesta Sheffield, 2000; TEX Report, 2000q).

Taiwan.—Taiwan reported production of ferrochromium to have been 296,297 t high carbon in 1998; 387,995 t high carbon in 1999; and 380,996 t high carbon, and 14,175 t low carbon in 2000 (TEX Report, 2001n, o). Taiwan reported stainless steel scrap imports of 20,789 t in 2000 (TEX Report, 2000v). Taiwan reported stainless steel scrap exports of 45,095 t in 1998 and 49,055 t in 1999 (TEX Report, 2000u).

Tang Eng Iron Works, Yieh United Steel, Walsin Carteck, and China Steel Corp. produced about 1.2 Mt of stainless steel in 2000 (TEX Report, 2000w).

Turkey.—Eskikaya and Aydiner (Eskikaya and Aydiner, 2000) reported that Turk Maadin A.S. operated the Dagardi, Kavak, Koycegiz, and Tavas chromite ore mines. The Kavak Mine had 2 Mt of reserves, and annual production was about 100,000 t. Eskikaya reported that mine performance was improved when they introduced new mining techniques and equipment. In particular, the improvements reduced accidents, manpower required, and timber consumption. These savings could extend the reserves and mine life by making low-grade ore production economical.

Zimbabwe.—Zimbabwe Alloys Ltd. reported production of 33,425 t of low-carbon ferrochromium in 1999. Zimbabwe Alloys renovated its Gweru plant. It converted one 28-megavolt-ampere furnace from the production of ferrochromium-silicon to the production of high-carbon ferrochromium. The conversion cost about \$3 million. The new furnace had a high-carbon ferrochromium production capacity of 35,000 t/yr. Zimbabwe Alloys will continue to produce low-carbon ferrochromium under a joint-venture agreement with Japan Metals and Chemicals Co. (Japan) (Ryan's Notes, 2000n).

Current Research and Technology

Mintek found that dry milling of ferrochromium slag or chromite ore produces a buildup of chromium in the +6 valence state. Chromium in chromite ore is in the +3 valence state. Mintek found that longer duration milling resulted in higher concentration of chromium in the +6 valence state (Mintek Bulletin, 2000).

Outlook

The outlook for chromium consumption in the United States and the rest of the world is about the same as that for stainless steel, which is the major end use for chromium worldwide. Thus, stainless steel industry performance largely determines chromium industry demand worldwide. (See the following section on stainless steel.)

Several trends are occurring simultaneously in the chromium industry. Chromite ore production is moving from independent producers to vertically integrated producers. In other words, chromite ore mines tend to be owned and operated by ferrochromium or chromium chemical producers. This trend is associated with the migration of ferrochromium production capacity from stainless steel-producing countries to chromite ore-producing countries. As ferrochromium-production capacity is rationalized in historically producing countries, which are usually stainless steel producing countries, new furnaces or plants are constructed in chromite ore producing areas. The electrical power capacity and production capacity of submerged-arc electric furnaces used to produce ferrochromium has been increasing. Production process improvements such as agglomeration of chromite ore, preheating and prereluction of furnace feed, and closed furnace technology have been retrofitted at major producer plants and are being incorporated into newly constructed plants. When ferrochromium plants started to be built, furnaces rated in the low kilovoltampere range were common. Furnaces built recently tend to approach the mid megavolt-ampere range. The introduction of post melting refining processes in the steel industry after 1960 started a shift in consumption from low-carbon ferrochromium to high-carbon ferrochromium causing a decline in low-carbon ferrochromium production that continues today. After years of ferrochromium production, slag stockpiles have built up. Recently developed processes efficiently recover ferrochromium from that slag. Equipment to use these processes was being installed at plant sites. In South Africa, the major chromite ore- and ferrochromium-producing country, two trends are emerging; ferrochromium plants are being developed in the western belt of the Bushveld Complex, and chromite ore byproduct from platinum operations are being accommodated by new production processes. After many years of stainless steel production, stainless steel scrap resources have accumulated. Stainless steel producers have been improving their production processes by reducing scrap generated during the production process and by increasing the amount of scrap used as feed material. As a result, the fraction of stainless steel scrap use as feed material has been increasing, especially from post consumer sources.

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TABLE 1
SALIENT CHROMIUM STATISTICS 1/

(Metric tons, contained chromium, unless otherwise specified)

	1996	1997	1998	1999	2000	
World production:						
Chromite ore (mine) 2/	3,480,000	4,130,000 r/	4,040,000 r/	4,250,000 r/	4,320,000 e/	
Ferrochromium (smelter) 3/	2,250,000	2,760,000	2,710,000 r/	2,810,000 r/	2,930,000 e/	
Stainless steel 4/	2,750,000	2,960,000	2,920,000	2,940,000	3,110,000 e/	
U.S. supply:						
Components of U.S. supply:						
Domestic mines	--	--	--	--	--	
Secondary	98,400	120,000	104,000	118,000	139,000	
Imports:						
Chromite ore	79,200	96,600	117,000	85,000	86,200	
Chromium chemicals	7,060	6,430	9,070	10,400	12,500	
Chromium ferroalloys	267,000	237,000	249,000	371,000	344,000	
Chromium metal	8,730	9,800	9,520	9,030	9,940	
Stocks, January 1:						
Government	1,120,000	1,070,000	1,020,000	928,000	909,000	
Industry 5/	80,200 r/	73,800 r/	63,600 r/	59,300 r/	14,000	
Total	1,660,000	1,610,000	1,570,000 r/	1,580,000	1,520,000	
Distribution of U.S. supply:						
Exports:						
Chromite ore	21,900	5,890	39,900	37,200	44,600	
Chromium chemicals	18,200	16,700	17,500	17,300	16,400	
Chromium ferroalloys and metal	10,800	7,710	5,000	5,790	25,400	
Stocks, December 31:						
Government	1,070,000	1,020,000	928,000	909,000	825,000	
Industry 5/	73,800 r/	70,900 r/	59,300 r/	54,000 r/	15,200	
Total	1,190,000	1,120,000	1,050,000	1,020,000	926,000	
Apparent consumption	468,000 r/	489,000 r/	524,000 r/	558,000	589,000	
Reported production: 6/						
Chromium ferroalloy and metal net production:						
Gross weight	36,800	60,700	W	W	W	
Chromium content	26,400	40,900	W	W	W	
Net shipments	38,800	56,300	W	W	W	
Reported consumption:						
Chromite ore and concentrates (gross weight)	282,000	350,000	269,000	W	W	
Chromite ore average Cr ₂ O ₃ (percentage)	45	45	45	45	45	
Chromium ferroalloys (gross weight)	329,000	385,000	332,000	385,000 r/	354,000	
Chromium ferroalloys (contained chromium)	186,000	220,000	187,000	212,000	201,000	
Chromium metal (gross weight)	4,500 r/	4,970	4,670 r/	4,690	4,980	
Stocks, December 31 (gross weight):						
Government:						
Chromite ore	1,190,000	1,090,000	885,000	820,000	636,000	
Chromium ferroalloys	1,050,000	1,020,000	974,000	973,000	919,000	
Chromium metal	7,720	7,720	7,720	7,720	7,550	
Industry, producer	6,450	10,900	W	W	W	
Industry, consumer:						
Chromite ore	173,000	175,000	159,000	130,000	W	
Chromium ferroalloys	27,400	16,700	17,300	25,000 r/	26,300	
Chromium metal	211 r/	227	195 r/	245	191	
Prices, average annual:						
Chromite ore, per ton gross weight 7/	\$75	\$73	\$68	\$63	NA	
Ferrochromium, per pound chromium content 8/	\$0.510	\$0.480	\$0.467	\$0.366	\$0.414	
Standard chromium metal, per pound gross weight 9/	\$4.75	\$5.20	\$4.73	\$4.43	\$4.43	
Vacuum chromium metal, per pound gross weight 9/	\$5.27	\$5.39	\$5.38	\$5.38	\$5.42	
Value of trade: 10/						
Exports	thousands	\$111,000	\$107,000	\$102,000	\$92,500	\$110,000
Imports	do.	\$463,000	\$450,000	\$421,000	\$420,000	\$427,000
Net exports 11/	do.	(\$352,000)	(\$343,000)	(\$319,000)	(\$327,000)	(\$317,000)
Stainless steel (gross weight):						
Production 12/		1,870,000	2,160,000	2,010,000	2,190,000	2,190,000
Shipments 13/		1,730,000	1,880,000	1,850,000	1,890,000	1,930,000
Exports		162,000	199,000	206,000	216,000	264,000
Imports		781,000	774,000	862,000	941,000	989,000

See footnotes the at end of table.

TABLE 1--Continued
SALIENT CHROMIUM STATISTICS 1/

(Metric tons, contained chromium, unless otherwise specified)

	1996	1997	1998	1999	2000	
Stainless steel (gross weight)--Continued:						
Scrap:						
Receipts	579,000	705,000 r/	610,000 r/	694,000 r/	817,000	
Consumption	1,040,000	1,140,000	1,040,000	1,140,000	1,220,000	
Exports	303,000	370,000	298,000	260,000	468,000	
Imports	50,500	64,100	57,200	66,100	56,200	
Value of trade:						
Exports	thousands	\$583,000	\$653,000	\$622,000	\$628,000	\$782,000
Imports	do.	\$1,880,000	\$1,720,000	\$1,680,000	\$1,560,000	\$2,010,000
Scrap exports	do.	\$234,000	\$231,000	\$176,000	\$151,000	\$310,000
Scrap imports	do.	\$28,500	\$33,700	\$21,600	\$27,700	\$35,500
Net exports 11/ 14/	do.	(\$1,090,000)	(\$870,000)	(\$903,000)	(\$811,000)	(\$955,000)

e/ Estimated. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. -- Zero.

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

2/ Calculated assuming chromite ore to average 44% Cr₂O₃, which is 68.42% chromium.

3/ Calculated assuming chromium content of ferrochromium to average 57%.

4/ Calculated assuming chromium content of stainless steel to average 17%.

5/ Industry stocks include chromium ferroalloy and metal producer stocks before 1998; and chromite ore consumer stocks before 2000.

6/ Includes chromium ferroalloys and metal and other chromium materials in the United States.

7/ Time-weighted average price of South African chromite ore, as reported in Platt's Metals Week.

8/ Time-weighted average price of imported high-carbon chromium that contains 50% to 55% chromium, as reported in Platt's Metals Week.

9/ Time-weighted average price of electrolytic chromium metal, as reported in American Metal Market.

10/ Includes chromite ore and chromium ferroalloys, metal, and chemicals.

11/ Data indicate that imports are greater than exports.

12/ Data on stainless steel production from American Iron and Steel Institute Annual Reports and quarterly production of stainless and heat-resisting raw steel.

13/ Data on stainless steel shipments from American Iron and Steel Institute Annual Reports.

14/ Includes stainless steel and stainless steel scrap.

TABLE 2
PRINCIPAL U.S. PRODUCERS OF CHROMIUM PRODUCTS IN 2000, BY INDUSTRY

Industry and company	Plant
Metallurgical:	
Eramet Marietta Inc.	Marietta, OH.
JMC (USA) Inc.	Research Triangle Park, NC.
Refractory:	
National Refractories and Minerals Corp.	Moss Landing, CA, and Columbiana, OH.
RHI Refractories America Inc.	Womelsdorf, PA.
Chemical:	
Elementis Chromium LP	Corpus Christi, TX.
Occidental Chemical Corp.	Castle Hayne, NC.

TABLE 3
U.S. CONSUMPTION OF CHROMIUM FERROALLOYS AND METAL, BY END USE 1/

(Metric tons, gross weight, unless noted)

End use	Ferrochromium		Ferrochromium silicon	Other	Total
	Low-carbon 2/	High-carbon 3/			
1998:					
Steel:					
Carbon	4,440	7,950	138	W	12,500
Stainless and heat-resisting	7,230	226,000	W	W	233,000
Full-alloy	4,050	22,300	1,530	34 r/	28,000
High-strength, low-alloy, electric	2,170	1,790	W	W	3,960 r/
Tool	(4)	W	W	W	W
Cast irons	(4)	2,510	W	W	2,510
Superalloys	2,470	W	W	4,050	6,520
Welding materials 5/	161	249	W	W	409
Other alloys 6/	480	1,200	--	1,310	2,990 r/

See footnotes at end of table.

TABLE 3--Continued
U.S. CONSUMPTION OF CHROMIUM FERROALLOYS AND METAL, BY END USE 1/

(Metric tons, gross weight, unless noted)

End use	Ferrochromium		Ferrochromium silicon	Other	Total
	Low-carbon 2/	High-carbon 3/			
1998--Continued:					
Miscellaneous and unspecified	(4/)	6,540 r/	36,700 r/	3,190 r/	46,400 r/
Total 7/	21,000	268,000	38,300	8,580 r/ 8/	336,000
Chromium content	14,200	157,000	13,800	6,450 r/	192,000
Stocks, December 31, 1998	2,460	13,900	730	461 r/ 9/	17,500
1999:					
Steel:					
Carbon	4,100	6,330	165 r/	W	10,600
Stainless and heat-resisting	9,930 r/	274,000	W	W	284,000
Full-alloy	3,830	20,900 r/	1,410 r/	W	26,100 r/
High-strength, low-alloy, electric	2,130	2,300	W	W	4,430
Tool	(4/)	W	--	W	W
Cast irons	(4/)	1,720 r/	W	W	1,710
Superalloys	1,730	3,820	W	3,720	9,280
Welding materials 5/	219	232	1	363	815
Other alloys 6/	412	W	--	1,710	2,120 r/
Miscellaneous and unspecified	(4/)	2,010	44,800	3,240	50,000
Total 7/	22,300	312,000 r/	46,300	9,040 10/	390,000 r/
Chromium content	15,000	179,000 r/	16,300	6,720	217,000 r/
Stocks, December 31, 1999	2,200 r/	21,700 r/	769 r/	545 11/	25,200 r/
2000:					
Steel:					
Carbon	4,200	7,170	127	W	11,500
Stainless and heat-resisting	9,660	252,000	27,800	W	290,000
Full-alloy	4,230	22,100	1,640	50	28,000
High-strength, low-alloy, electric	2,730	9,880	(4/)	W	12,600
Tool	(4/)	W	(4/)	W	W
Cast irons	(4/)	2,090	(4/)	57	2,150
Superalloys	1,380	W	297	3,730	5,400
Welding materials 5/	203	243	1	W	447
Other alloys 6/	(4/)	W	--	1,550	1,550
Miscellaneous and unspecified	(4/)	5,370	(4/)	2,260	7,630
Total 7/	22,400	299,000	29,900	7,650 12/	359,000
Chromium content	15,200	174,000	10,200	6,470	206,000
Stocks, December 31, 2000	2,160	23,300	713	451 13/	26,600

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Miscellaneous and unspecified." -- Zero.

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

2/ Contains less than 3% carbon.

3/ Contains 3% or more carbon.

4/ Withheld to avoid disclosing company proprietary data.

5/ Includes structural and hard-facing welding material.

6/ Includes cutting materials and magnetic, aluminum, copper, nickel, and other alloys.

7/ Includes estimates.

8/ Includes 4,670 tons of chromium metal.

9/ Includes 195 tons of chromium metal.

10/ Includes 4,690 tons of chromium metal.

11/ Includes 245 tons of chromium metal.

12/ Includes 4,980 tons of chromium metal.

13/ Includes 191 tons of chromium metal.

TABLE 4
U.S. GOVERNMENT STOCKPILE YEAREND INVENTORIES AND CHANGE FOR CHROMIUM-CONTAINING MATERIALS 1

(Metric tons, gross weight)

Material	1999	2000	Change	
			Quantity	Percentage 3/
Chromite ore:				
Chemical	205,000	203,000	(2,630)	(1)
Metallurgical	340,000	193,000	(147,000)	(43)
Refractory	274,000	241,000	(33,900)	(12)

See footnotes at end of table.

TABLE 4--Continued
U.S. GOVERNMENT STOCKPILE YEAREND INVENTORIES AND CHANGE FOR CHROMIUM-CONTAINING MATERIALS 1

(Metric tons, gross weight)

Material	1999	2000	Change	
			Quantity	Percentage 3/
Chromium ferroalloys:				
Ferrochromium-silicon	50,700	34,200	(16,400)	(32)
High-carbon ferrochromium	645,000	615,000	(29,500)	(5)
Low-carbon ferrochromium	278,000	270,000	(7,760)	(3)
Chromium metal:				
Aluminothermic	2,670	2,500	(169)	(6)
Electrolytic	5,050	5,050	--	--

-- Zero.

1/ Includes specification- and nonspecification-grade materials.

2/ Data are rounded to no more than three significant digits.

3/ Quantity change as a percentage of stocks in earlier year.

Source: Defense Logistics Agency, Defense National Stockpile Center.

TABLE 5
TIME-VALUE RELATIONS FOR CHROMITE ORE, FERROCHROMIUM, AND CHROMIUM METAL 1/ 2.

(Annual average value, dollars per metric ton)

Material	1999		2000	
	Contained chromium	Gross weight	Contained chromium	Gross weight
Chromite ore:				
Not more than 40% chromic oxide	215	65	841	210
More than 40%, but less than 46% chromic oxide	866	266	178	56
46% or more chromic oxide	181	62	191	62
Average 3/	184	62	198	64
Ferrochromium:				
Not more than 3% carbon:				
Not more than 0.5% carbon	XX	XX	1,090	707
More than 0.5%, but not more than 3% carbon	XX	XX	1,540	1,000
Average 3/	1,560	1,040	1,470	956
More than 3%, but not more than 4% carbon	572	372	--	--
More than 4% carbon	658	387	710	409
Average 3/	723	429	797	466
Chromium metal	XX	6,270	XX	5,980

XX Not applicable. -- Zero.

1/ Based on Customs value of chromium contained in imported material.

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

3/ Mass-weighted average.

TABLE 6
PRICE QUOTATIONS FOR CHROMIUM MATERIALS AT BEGINNING AND END OF 2000 1/

Material	January	December	Year average 2/
Chromite ore:			
South Africa	60- 65	NA	NA
Turkey	140-150	NA	NA
High-carbon ferrochromium, imported:			
50% to 55% chromium	37.00-40.00	39.00-41.00	41.44
60% to 65% chromium	38.00-40.50	37.00-39.00	40.13
Low-carbon ferrochromium, imported:			
0.05% carbon	67-70	60-65	69
0.10% carbon	53-54	47-50	57
Chromium metal, domestic:			
Electrolytic, standard	415-470	435-445	443
Electrolytic, vacuum	525-550	520-565	542

NA Not available.

1/ Sources: chromite ore and ferrochromium prices--Platt's Metals Week; chromium metal prices--American Metal Market.

2/ Time-weighted average.

TABLE 7
U.S. EXPORTS OF CHROMIUM MATERIALS, BY TYPE 1/

HTSUSA 2/	Type	1999		2000		Principal destinations, 2000
		Quantity (kilograms)	Value (thousands)	Quantity (kilograms)	Value (thousands)	
2610.00.0000	Chromite ore and concentrate, gross weight	110,000,000	\$8,580	138,000,000	\$10,200	Sweden (92%); Canada (3%); Mexico (3%).
8112.20.0000	Metals and alloys, chromium metal, gross weight 3/	2,370,000	17,100	1,260,000	13,100	Japan (48%); Canada (26%); Germany (8%); Netherlands (4%); Mexico (3%); Australia (2%); Brazil (2%); Hong Kong (2%); Belgium (1%).
Chromium ferroalloys:						
7202.41.0000	High-carbon ferrochromium, gross weight 4/	4,250,000	3,180	33,500,000	17,500	Switzerland (57%); Slovenia (30%); Canada (6%); Mexico (5%); Australia (2%).
7202.41.0000	High-carbon ferrochromium, contained weight 4/	2,550,000	--	22,200,000	--	
7202.49.0000	Low-carbon ferrochromium, gross weight 5/	1,290,000	1,560	1,570,000	2,180	Canada (41%); Mexico (40%); France (9%); United Kingdom (3%); India (2%); Sweden (2%); Venezuela (1%).
7202.49.0000	Low-carbon ferrochromium, contained weight 5/	776,000	--	945,000	--	
7202.50.0000	Ferrochromium-silicon, gross weight	250,000	243	2,700,000	1,490	Netherlands (98%); Canada (2%).
7202.50.0000	Ferrochromium-silicon, contained weight	87,700	--	946,000	--	
	Total ferroalloys, gross weight	5,790,000	4,980	37,700,000	21,200	
	Total ferroalloys, contained weight	3,420,000	--	24,100,000	--	
Chemicals, gross weight:						
Chromium oxides:						
2819.10.0000	Chromium trioxide	11,100,000	21,800	11,600,000	22,800	Canada (35%); Korea, Republic of (9%); Australia (6%); Japan (6%); Mexico (6%); Taiwan (6%); Brazil (5%); Germany (4%); New Zealand (4%); Indonesia (3%); Hong Kong (2%); Peru (2%); Singapore (2%); Thailand (2%); Chile (1%); Philippines (1%); South Africa (1%).
2819.90.0000	Other	3,310,000	13,400	5,170,000	20,300	Germany (40%); Canada (19%); United Kingdom (13%); Belgium (6%); Guinea (3%); Guatemala (3%); Taiwan (3%); China (2%); Malaysia (2%); Mexico (2%); Australia (1%); Japan (1%); Netherlands (1%).
2833.23.0000	Chromium sulfates	14,000	69	23,500	32	Canada (85%); Germany (15%).
Salts of oxometallic or peroxometallic acids:						
2841.20.0000	Zinc and lead chromate	523,000	1,830	287,000	620	Mexico (42%); Canada (30%); India (13%); Dominican Republic (7%); Argentina (4%); Korea, Republic of (1%).
2841.30.0000	Sodium dichromate	26,500,000	17,500	19,400,000	14,400	Mexico (53%); Thailand (16%); Uruguay (8%); Panama (4%); Argentina (3%); Belgium (3%); Colombia (3%); Canada (1%); Germany (1%).
2841.40.0000	Potassium dichromate	82,600	151	95,400	144	Indonesia (79%); Canada (11%); South Africa (6%); Italy (2%); Dominican Republic (1%).
2841.50.0000	Other chromates, dichromates, and peroxochromates	297,000	893	639,000	2,140	Canada (55%); Korea, Republic of (23%); Mexico (8%); Malaysia (5%); Italy (4%); United Kingdom (2%).
3206.20.0000	Pigments and preparations, gross weight	1,470,000	6,200	1,040,000	5,340	Mexico (41%); Canada (33%); Costa Rica (5%); Trinidad and Tobago (3%); Belgium (2%); Colombia (2%); Nigeria (2%); Singapore (2%); Taiwan (2%); Brazil (1%); Venezuela (1%).

-- Zero.

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

2/ Harmonized Tariff Schedule of the United States of America code.

3/ Articles thereof and waste and scrap.

4/ More than 4% carbon.

5/ Not more than 4% carbon.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF CHROMITE ORE, BY COUNTRY 1/

Country	Not more than 40% Cr ₂ O ₃ (HTS 2610.00.0020) 2/			More than 40%, but less than 46% Cr ₂ O ₃ (HTS 2610.00.0040) 2/			46% or more Cr ₂ O ₃ (HTS 2610.00.0060) 2/			Total		
	Gross weight (metric tons)	Cr ₂ O ₃ content (metric tons)	Value 3/ (thou- sands)	Gross weight (metric tons)	Cr ₂ O ₃ content (metric tons)	Value 3/ (thou- sands)	Gross weight (metric tons)	Cr ₂ O ₃ content (metric tons)	Value 3/ (thou- sands)	Gross weight (metric tons)	Cr ₂ O ₃ content (metric tons)	Value 3/ (thou- sands)
	1999:											
Canada	380	146	\$168	40	19	\$11	57	18	\$10	477	183	\$189
Philippines	4,000	1,320	456	--	--	--	--	--	--	4,000	1,320	456
South Africa	21,100	9,710	1,020	49	21	12	226,000	113,000	14,000	247,000	123,000	15,000
Total	25,500	11,200	1,650	89	40	24	226,000	113,000	14,000	252,000	124,000	15,700
2000:												
Canada	1,130	440	541	68	29	36	86	43	14	1,290	512	592
Italy	--	--	--	--	--	--	32	15	6	32	15	6
Philippines	3,390	1,210	409	--	--	--	--	--	--	3,390	1,210	409
South Africa	--	--	--	33,100	15,100	1,810	230,000	109,000	14,300	263,000	125,000	16,100
Total	4,520	1,650	950	33,100	15,100	1,840	230,000	109,000	14,300	268,000	126,000	17,100

-- Zero.

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

2/ Harmonized Tariff Schedule of the United States of America code.

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 to the United States.

Source: U.S. Census Bureau.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF FERROCHROMIUM, BY COUNTRY 1/

Country	Not more than 3% carbon (HTS 7202.49.5000) 2/			More than 3% carbon, but not more than 4% carbon (HTS 7202.49.1000) 2/			More than 4% carbon (HTS 7202.41.0000) 2/			Total (all grades)		
	Gross weight (metric tons)	Chromium content (metric tons)	Value (thou- sands)	Gross weight (metric tons)	Chromium content (metric tons)	Value (thou- sands)	Gross weight (metric tons)	Chromium content (metric tons)	Value (thou- sands)	Gross weight (metric tons)	Chromium content (metric tons)	Value (thou- sands)
1999:												
Albania	--	--	--	--	--	--	3,750	2,360	\$1,780	3,750	2,360	\$1,780
China	758	511	\$927	--	--	--	4,360	2,590	2,380	5,120	3,100	3,310
Finland	--	--	--	--	--	--	5,060	2,780	1,940	5,060	2,780	1,940
France	--	--	--	--	--	--	6	4	7	6	4	7
Germany	6,840	4,780	14,000	--	--	--	--	--	--	6,840	4,780	14,000
India	--	--	--	--	--	--	5,010	3,090	1,930	5,010	3,090	1,930
Japan	1,010	697	2,330	--	--	--	--	--	--	1,010	697	2,330
Kazakhstan	3,960	2,770	3,060	--	--	--	154,000	106,000	68,500	158,000	108,000	71,500
Russia	16,800	11,500	13,200	--	--	--	7,830	5,230	5,070	24,600	16,700	18,300
South Africa	5,950	3,440	3,970	--	--	--	229,000	114,000	69,900	235,000	117,000	73,900
Sweden	34	24	74	--	--	--	--	--	--	34	24	74
Turkey	--	--	--	--	--	--	83,700	52,500	31,900	83,700	52,500	31,900
United Kingdom	61	43	131	3,000	1,950	\$1,120	2	1	2	3,060	1,990	1,250
United States	--	--	--	--	--	--	4	3	12	4	3	11
Zimbabwe	3,590	2,380	2,900	--	--	--	68,400	42,300	34,100	72,000	44,700	37,000
Total	39,000	26,100	40,700	3,000	1,950	1,120	562,000	331,000	218,000	604,000	359,000	259,000
2000:												
Brazil	40	25	\$90	--	--	--	--	--	--	40	25	\$90
China	159	111	236	60	42	\$73	192	126	\$147	411	279	456
Croatia	--	--	--	--	--	--	8,450	5,300	3,630	8,450	5,300	3,630
Georgia	130	91	213	--	--	--	--	--	--	130	91	213
Germany	7,520	5,090	14,400	23	16	74	--	--	--	7,540	5,110	14,500
India	--	--	--	--	--	--	3,850	2,260	1,610	3,850	2,260	1,610
Japan	1,940	1,330	4,320	114	79	266	--	--	--	2,060	1,410	4,590
Kazakhstan	4,620	3,210	3,300	1,850	1,300	1,250	131,000	89,900	60,500	138,000	94,400	65,000
Russia	32,200	20,300	24,700	2,690	1,840	1,890	7,040	4,630	4,110	41,900	26,700	30,700
South Africa	451	293	662	2,960	1,680	1,760	260,000	131,000	91,700	264,000	133,000	94,100
Sweden	39	28	87	133	95	282	--	--	--	172	123	369
Turkey	2,960	2,140	2,190	--	--	--	45,800	28,400	20,500	48,800	30,500	22,700
United Kingdom	23	16	23	--	--	--	--	--	--	23	16	23
Zimbabwe	220	148	145	1,320	881	877	60,400	36,800	29,500	61,900	37,800	30,500
Total	50,300	32,700	50,400	9,150	5,930	6,470	517,000	298,000	212,000	577,000	337,000	269,000

-- Zero.

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

2/ Harmonized Tariff Schedule of the United States of America code.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF CHROMIUM MATERIALS, BY TYPE 1/

HTS 2/	Type	1999		2000		Principal sources, 2000
		Quantity (kilograms)	Value (thousands)	Quantity (kilograms)	Value (thousands)	
Metals and alloys:						
Chromium metal:						
8112.20.3000	Waste and scrap, gross weight	17,800	\$150	40,700	\$598	Russia (30%); United Kingdom (26%); Netherlands (13%); China (12%); Germany (12%); Singapore (5%); Mexico (1%).
8112.20.6000	Other than waste and scrap, gross weight	9,010,000	56,400	9,900,000	58,800	China (25%); Russia (25%); France (24%); United Kingdom (21%); Kazakhstan (2%); Germany (1%).
7202.50.0000	Ferrochromium-silicon, gross weight	36,000,000	18,700	20,700,000	10,300	Kazakhstan (46%); Russia (30%); Zimbabwe (18%); South Africa (6%).
7202.50.0000	Ferrochromium-silicon, contained weight	12,700,000	--	7,670,000	--	
Chemicals (gross weight):						
Chromium oxides and hydroxides:						
2819.10.0000	Chromium trioxide	6,730,000	12,000	8,030,000	13,700	Kazakhstan (68%); China (11%); Turkey (10%); Italy (5%); Poland (2%); Japan (1%); United Kingdom (1%).
2819.90.0000	Other	4,300,000	14,800	3,220,000	12,100	Japan (28%); China (25%); Germany (25%); United Kingdom (10%); Poland (4%); Netherlands (3%); Austria (2%); Belgium (1%); Colombia (1%); France (1%); Turkey (1%).
2833.23.0000	Sulfates of chromium	391,000	386	239,000	227	United Kingdom (46%); Mexico (30%); Poland (15%); Argentina (8%); Germany (1%).
Salts of oxometallic or peroxometallic acids:						
2841.20.0000	Chromates of lead and zinc	159,000	355	289,000	563	Norway (38%); Canada (23%); Korea, Republic of (21%); China (9%); United Kingdom (6%); Japan (3%).
2841.30.0000	Sodium dichromate	10,400,000	7,770	16,900,000	10,500	United Kingdom (98%); China (2%).
2841.40.0000	Potassium dichromate	177,000	329	205,000	392	United Kingdom (45%); India (20%); Kazakhstan (20%); Netherlands (10%); Canada (5%); Japan (1%).
2841.50.0000	Other chromates and dichromates; peroxochromates	471,000	1,050	56,900	183	Korea, Republic of (49%); Austria (30%); United Kingdom (20%); India (2%).
2849.90.2000	Chromium carbide	252,000	2,870	182,000	2,010	Japan (48%); Germany (37%); United Kingdom (12%); Canada (2%); Austria (1%).
Pigments and preparations based on chromium (gross weight):						
3206.20.0010	Chrome yellow	6,760,000	19,000	7,000,000	18,700	Canada (54%); Korea, Republic of (11%); Mexico (11%); Hungary (9%); China (8%); Colombia (4%); Japan (1%).
3206.20.0020	Molybdenum orange	1,550,000	6,600	1,620,000	7,110	Canada (87%); Mexico (6%); Philippines (3%); China (1%); Colombia (1%); Germany (1%); Hungary (1%); Japan (1%).
3206.20.0030	Zinc yellow	34,000	32	19,000	21	Brazil (89%); Colombia (5%); Italy (5%).
3206.20.0050	Other	1,250,000	4,330	1,530,000	6,290	China (39%); France (39%); Germany (10%); Canada (4%); Poland (2%); Belgium (1%); Japan (1%); Korea, Republic of (1%); Switzerland (1%); United Arab Emirates (1%).

-- Zero.

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

2/ Harmonized Tariff Schedule of the United States of America code.

Source: U.S. Census Bureau.

TABLE 11
PRINCIPAL WORLD CHROMITE ORE PRODUCERS, 2000

Country 1/	Company	Country 1/	Company
Albania	Albkrom (Government owned).	South Africa--Continued	Canadian Gold S.A. (Pty.) Ltd.
Brazil	Cia. de Ferro Ligas da Bahia S.A. Elkem ASA (Norway). Mineração Vila Nova Ltda. Magnesita S.A.		Goudini Chrome (Pty.) Ltd. Hernic Ferrochrome (Pty.) Ltd. National Manganese Mines Pty. Ltd. Pilanesberg Chrome (Pty.) Ltd. Rooderand Chrome Mine (Pty.) Ltd. South Africa Chrome and Alloys Ltd. Chromden Mine. Horizon Chrome Mine. Samancor Ltd. Eastern Chrome Mines. Western Chrome Mines. Vereeniging Refractories Ltd. Bophuthatswana Chrome Co. (Pty.) Ltd. Marico Chrome Corp. (Pty.) Ltd. Xstrata A.G. (Switzerland). Xstrata S.A. (Pty.) Ltd. Chromecorp (Pty.) Ltd. Consolidated Metallurgical Industries Ltd.
China	Huazang Smelter. Shashen. Xizang Kangjinla. Xinjiang Karamay Gold Mine. Xinjiang Nonferrous Metals Industry Co.		
Finland	Outokumpu Oy; Outokumpu Steel Oy; Outokumpu Chrome Oy.		
India	Ferro Alloys Corp. Ltd. Indian Metals and Ferroalloys Ltd. Indian Charge Chrome Ltd. Misrilal Mines Ltd. Mysore Mineral Ltd. Orissa Mining Corp. Ltd. Tata Iron and Steel Co. Ltd.		
Indonesia	PT. Palabim Mining-PT. Bituminusa.	Sudan	Advanced Mining Works Co. Ltd.
Iran	Faryab Mining Co.	Turkey	Aycan Madencilik Ltd. Sti. Bilfer Madencilik A.S. Birlik Madencilik Dis Tic. Insaat San. ve Tic. A.S. Cevher Madencilik ve Ticaret A.S. Dedeman Madencilik Sanayi ve Ticaret A.S. Eti Holdings A.S. Hâyrî Ögelman Mining Co. Ltd. Pinarbasi Madencilik Sanayi ve Ticaret Ltd. Tekfen Dis. Ticaret A.S. Tevfik Refik Bayoglu Madencilik. Tut. Gen. Ticaret Ltd. Sti. Türk Maadin A.S.
Kazakhstan	Donskoy Ore Dressing Complex.		
Madagascar	Kraomita Malagasy.	United Arab Emirates	Derkek Raphael & Co. Dewent Mining Ltd.
Oman	Oman Chromite Company SAOG.		
Philippines	Benguet Corporation. Heritage Resources & Mining Corporation. Krominco Inc. Velore Mining Corporation.	Zimbabwe	Maranatha Ferrochrome (Pvt.) Ltd. Amble Mining Co. Zimasco (Pvt.) Ltd. Zimbabwe Alloys Ltd.
Russia	Saranov Complex.		
South Africa	ASA Metals (Pty.) Ltd. African Mining and Trust Co. Ltd. Rustenburg Minerals Development Co. (Pty.) Ltd. Zeerust Chrome Mine Ltd. Bafokeng Chrome Holdings. Bayer AG (Germany). Bayer (Pty.) Ltd.		

1/ Other chromite-producing countries included Burma, Cuba, Pakistan, and Vietnam.

TABLE 12
PRINCIPAL WORLD FERROCHROMIUM PRODUCERS, 2000

Country 1/	Company	Country 1/	Company
Albania	Albkrom (Government owned).	India--Continued:	Srinivasa Ferro Alloys Ltd.
Brazil	Cia. de Ferro Ligas da Bahia S.A.		Standard Chrome Ltd.
Chile	Carbomet Industrial SA.		The Sandur Manganese & Iron Ores Ltd.
China	Dandong Ferroalloy Plant.		Tata Iron and Steel Co. Ltd.
	Emei Ferroalloy (Group) Co. Ltd.		Bamnipal Plant.
	Gansu Huazang Metallurgical Group Co. Ltd.		Joda Plant.
	Hanzhong Ferroalloy Works (Government owned).		VBC Ferro Alloys Ltd.
	Hengshang Iron & Steel.		V.K. Ferro Alloys Private Ltd.
	Hunan Ferroalloy (Government owned).	Iran	Faryab Mining Co.
	Hunan Lengshuijiang Electrochemical Works.		Abadan Ferroalloys Refinery.
	Jiangyin Ferroalloy Factory (Government owned).	Italy	Darfo S.p.A.
	Jilin Dongfeng Ferroalloy Works.		Fornileghe S.p.A.
	Jilin Ferroalloy Group Co. Ltd.		Mineralsider S.p.A.
	Jilin Huinan Ferroalloy Works.	Japan	Nippon Denko Co. Ltd.
	Jinzhou Ferroalloy (Group) Co. Ltd.		NKK Corp.
	Liaoyang Ferroalloy Group Corp.		NKK Materials Co. Ltd.
	Nanjing Ferroalloy Plant (Government owned).		Showa Denko K.K.
	Ningjin Metal Smelting Co. Ltd.		Shunan Denko K.K.
	Qinghai Datong Ferroalloy Works	Kazakhstan	Aksusky Ferroalloy Plant.
	Quinhai Sanchuan Ferroalloy Co. Ltd.		Aktyubinsk Ferroalloy Plant.
	Taonan Ferroalloy Works.	Norway	Elkem ASA.
	Urad Zhongqi Ferrochrome Group Corp.	Poland	Huta "Laziska" Ferroalloy Plant.
	Xibei Ferroalloy Works (Government owned).	Russia	Chelyabinsk Electrometallurgical Integrated Plant
	Zhejiang Hengshan Ferroalloy Works.		Klutchevsk Ferroalloy Plant.
Croatia	Dalmacija Ferro-Alloys Works.		Metall Joint Venture.
Finland	Outokumpu Oy;		Serov Ferroalloys Plant.
	Outokumpu Steel Oy;	Slovakia	Oravske Ferozliatinarske Zavody.
	Outokumpu Chrome Oy.	Slovenia	Tovarna Dusika Ruse-Metalurgija d.d.
Germany	Elektrowerk Weisweiler GmbH.	South Africa	ASA Metals (Pty.) Ltd.
India	Andhra Ferro Alloys Ltd.		Associated Manganese Mines of South Africa Ltd
	Baheti Metal & Ferro Alloys Ltd.		Feralloys Ltd.
	Bharat Thermit Ltd.		Hernic Ferrochrome (Pty.) Ltd.
	Deepak Ferro Alloys Ltd.		Samancor Ltd.
	Eastern Metals & Ferro Alloys Ltd.		Batlhako Ferrochrome Ltd.
	Ferro Alloys Corp. Ltd.		Ferrometals Division.
	Charge Chrome Plant.		Middelburg Ferrochrome Division.
	Ferro-Alloys Unit.		Palmiet Ferrochrome Division.
	GMR Vasavi Industries Ltd.		Tubatse Ferrochrome Division.
	Hi-Tech Electrothermics Ltd.		Xstrata A.G. (Switzerland).
	Indian Metals and Ferroalloys Ltd.		Xstrata S.A. (Pty.) Ltd.
	Indian Charge Chrome Ltd.		Chromecorp (Pty.) Ltd.
	Industrial Development Corp.		Consolidated Metallurgical Industries Ltd.
	Ispat Alloys Ltd.		Lydenburg Works.
	Jindal Strips Ltd.		Rustenburg Works.
	Ferro Alloys Division.	Sweden	Vargön Alloys AB.
	Mandsaur Ferro Alloys Ltd.	Turkey	Eti Holdings A.S.
	Metramet Ferroalloys Pvt. Ltd.		Eti Elektromatalurji.
	Monnet Industries Ltd.		Eti Krom A.S.
	Nav Chrome Ltd.	United States	Eramet Marietta Inc.
	Nava Bharat Ferro Alloys Ltd.	Zimbabwe	Maranatha Ferrochrome (Pvt.) Ltd.
	Raghuvir Ferro Alloy Pvt. Ltd.		Zimasco (Pvt.) Ltd.
	Shri Girija Smelters Ltd.		Zimbabwe Alloys Ltd.

1/ Other ferrochromium-producing countries include Spain and Taiwan.

TABLE 13
ANNUAL WORLD PRODUCTION CAPACITY OF CHROMITE ORE, FERROCHROMIUM,
CHROMIUM METAL, CHROMIUM CHEMICALS, AND STAINLESS STEEL IN 2000 1/

(Thousand metric tons, contained chromium)

Country	Ore	Ferro- chromium	Metal	Chemicals	Stainless steel
Albania	48	27	--	--	--
Argentina	--	--	--	6	--
Austria	--	--	--	--	8
Bangladesh	--	--	--	--	3
Belgium	--	--	--	--	119
Brazil	135	62	--	--	41
Burma	1	--	--	--	--
Canada	--	--	--	--	39
Chile	--	1	--	--	--
China	48	272	6	21	60
Croatia	--	17	--	--	--
Cuba	15	--	--	--	7
Czech Republic	--	--	--	--	5
Finland	184	128	--	--	102
France	--	--	7	--	204
Germany	--	17	1	--	255
Greece	4	--	--	--	--
India	462	183	(2/)	8	111
Indonesia	4	--	--	--	--
Iran	112	9	--	2	--
Italy	--	32	--	--	204
Japan	--	113	1	17	660
Kazakhstan	903	398	2	42	--
Korea, Republic of	--	--	--	--	306
Macedonia	2	--	--	5	--
Madagascar	42	--	--	--	--
Norway	--	106	--	--	--
Oman	9	--	--	--	--
Pakistan	8	--	--	3	--
Philippines	33	--	--	--	--
Poland	--	12	--	5	--
Romania	--	--	--	9	--
Russia	46	180	16	60	60
Slovakia	--	38	--	--	--
Slovenia	--	15	--	--	13
South Africa	2,060	1,500	--	24	95
Spain	--	1	--	--	204
Sudan	14	--	--	--	--
Sweden	--	86	--	--	128
Taiwan	--	1	--	--	167
Turkey	626	69	--	10	54
Ukraine	--	--	--	--	33
United Arab Emirates	23	--	--	--	--
United Kingdom	--	--	7	52	92
United States	--	20	3	56	390
Vietnam	16	--	--	--	--
Zimbabwe	213	227	--	--	--
Total	5,010	3,510	43	320	3,360

-- Zero.

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

2/ Less than 1/2 unit.

TABLE 14
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	World total	Afghanistan	Albania 3/	Argentina	Australia	Brazil 4/	Burma	Canada	China	Colombia	Cuba	Cyprus 6/	Egypt 7/	Finland
1900	53,200	NA	--	NA	3,340	NA	NA	NA	--	--	--	--	--	--
1901	90,200	NA	--	NA	2,520	NA	NA	NA	--	--	--	--	--	--
1902	85,300	NA	--	NA	454	NA	NA	NA	--	--	--	--	--	--
1903	95,500	NA	--	NA	1,980	NA	NA	NA	--	--	--	--	--	--
1904	118,000	NA	--	NA	403	NA	NA	NA	--	--	--	--	--	--
1905	144,000	NA	--	NA	53	NA	NA	NA	--	--	--	--	--	--
1906	161,000	NA	--	NA	15	NA	NA	NA	--	--	--	--	--	--
1907	112,000	NA	--	NA	30	NA	NA	NA	--	--	--	--	--	--
1908	67,000	NA	--	NA	--	NA	NA	NA	--	--	--	--	--	--
1909	108,000	NA	--	NA	--	NA	NA	NA	--	--	--	--	--	--
1910	108,000	NA	--	NA	--	NA	NA	NA	--	--	--	--	--	--
1911	81,100	NA	--	NA	--	NA	NA	NA	--	--	--	--	--	--
1912	123,000	NA	--	NA	23	NA	NA	NA	--	--	--	--	--	--
1913	147,000	NA	--	NA	688	NA	NA	NA	--	--	--	--	--	--
1914	157,000	NA	--	NA	659	NA	NA	NA	--	--	--	--	--	--
1915	185,000	NA	--	NA	769	NA	NA	NA	--	--	--	--	--	--
1916	281,000	NA	--	NA	621	NA	NA	NA	--	--	35	--	--	--
1917	263,000	NA	--	NA	1,140	NA	NA	NA	--	--	17	--	--	--
1918	312,000	NA	--	NA	611	NA	NA	NA	--	--	8,960	--	--	--
1919	171,000	NA	--	NA	254	NA	NA	NA	--	--	14,700	--	--	--
1920	172,000	NA	--	NA	1,640	NA	NA	NA	--	--	721	--	--	--
1921	134,000	NA	--	NA	63	NA	NA	NA	--	--	610	--	--	--
1922	140,000	NA	--	NA	537	NA	NA	NA	--	--	--	--	--	--
1923	205,000	NA	--	NA	1,210	NA	NA	NA	--	--	10,600	--	--	--
1924	292,000	NA	--	NA	785	NA	NA	NA	--	--	19,900	2,860	--	--
1925	308,000	NA	--	NA	978	NA	NA	NA	--	--	30,300	2,020	--	--
1926	363,000	NA	--	NA	607	NA	NA	NA	--	--	36,600	650	--	--
1927	400,000	NA	--	NA	--	NA	NA	NA	--	--	17,300	723	--	--
1928	452,000	NA	--	NA	--	NA	NA	NA	--	--	34,200	--	--	--
1929	635,000	NA	--	NA	131	NA	NA	NA	--	--	53,800	2,480	--	--
1930	559,000	NA	--	NA	171	NA	NA	NA	--	--	41,600	1,570	--	--
1931	383,000	NA	--	NA	26	NA	NA	NA	--	--	15,200	203	--	--
1932	299,000	NA	--	NA	99	NA	NA	NA	--	--	500	1,000	--	--
1933	409,000	NA	--	NA	905	NA	NA	NA	--	--	24,200	--	--	--
1934	619,000	NA	--	NA	1,740	NA	NA	NA	--	--	50,200	982	--	--
1935	785,000	NA	--	NA	605	NA	NA	NA	--	--	48,500	1,200	--	--
1936	1,060,000	NA	--	NA	422	NA	NA	NA	--	--	71,100	508	--	--
1937	1,280,000	NA	--	NA	466	NA	NA	NA	--	--	94,600	1,640	--	--
1938	1,140,000	NA	499	NA	952	NA	NA	NA	--	--	33,600	5,670	--	--
1939	1,190,000	NA	3,080	NA	118	NA	NA	NA	--	--	59,600	1,120	--	--
1940	1,460,000	NA	14,000	NA	500	NA	NA	NA	--	--	52,300	2,540	--	--
1941	1,660,000	NA	20,000	NA	356	NA	NA	NA	--	--	163,000	4,820	--	--
1942	2,030,000	NA	38,100	NA	365	NA	NA	NA	--	--	286,000	2,940	312	--
1943	1,820,000	NA	30,800	NA	1,000	NA	NA	NA	--	--	354,000	7,990	910	--

See footnotes at end of table.

TABLE 14--Continued
 CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	World total	Afghanistan	Albania 3/	Argentina	Australia	Brazil 4/	Burma	Canada	China	Colombia	Cuba	Cyprus 6/	Egypt 7/	Finland
1944	1,400,000	NA	--	NA	780	NA	NA	NA	--	--	192,000	469	150	--
1945	1,060,000	NA	--	NA	287	NA	NA	NA	--	--	173,000	1,070	150	--
1946	1,170,000	NA	--	NA	--	NA	NA	NA	--	--	174,000	1,160	--	--
1947	1,730,000	NA	--	NA	--	NA	NA	NA	--	--	159,000	5,280	266	--
1948	2,130,000	NA	16,500	NA	564	NA	NA	NA	--	--	117,000	6,900	191	--
1949	2,150,000	NA	39,900	NA	642	NA	NA	NA	--	--	97,400	14,900	50	--
1950	2,360,000	550	52,000	--	905	3,230	--	--	--	--	65,800	18,400	36	--
1951	2,810,000	75	45,400	--	1,400	2,420	--	--	--	--	79,100	12,700	--	--
1952	3,360,000	--	51,700	--	1,420	2,650	--	--	--	--	61,800	13,500	--	--
1953	3,900,000	--	47,000	--	2,790	3,580	--	--	--	--	70,000	8,270	210	--
1954	3,270,000	--	100,000	--	5,020	1,910	--	--	--	--	72,600	9,140	530	--
1955	3,650,000	--	122,000	--	--	4,120	--	--	--	--	77,200	8,710	840	--
1956	4,140,000	--	132,000	--	6,190	4,110	--	--	--	--	53,700	5,310	255	--
1957	4,640,000	--	167,000	--	3,100	7,940	--	--	--	--	115,000	5,150	103	--
1958	3,830,000	--	201,000	--	788	5,290	--	--	--	--	75,100	12,000	--	--
1959	3,910,000	--	248,000	--	122	6,220	--	--	--	50	39,700	12,400	250	--
1960	4,430,000	--	289,000	--	537	5,670	--	--	--	70	29,700	14,200	300	--
1961	4,200,000	--	232,000	--	--	15,500	--	--	--	185	25,400	18,000	1,390	--
1962	4,410,000	--	251,000	--	375	24,800	--	--	--	140	35,400	6,540	--	--
1963	3,910,000	--	294,000	--	163	17,100	--	--	--	110	56,600	4,910	--	--
1964	4,160,000	--	307,000	--	73	9,440	--	--	--	400	--	2,990	--	--
1965	4,810,000	--	310,000	--	23	17,000	--	--	--	260	--	4,990	--	--
1966	4,390,000	--	313,000	--	--	15,000	--	--	--	--	--	10,500	--	NA
1967	4,570,000	--	327,000	--	140	15,000	--	--	--	--	--	21,800	--	6,380
1968	4,940,000	--	388,000	--	--	17,000	--	--	--	--	--	25,100	--	36,200
1969	5,321,000	--	429,000	--	--	15,000	--	--	--	(5/)	--	24,000	0	72,000
1970	6,053,000	--	468,000	--	--	27,000	--	--	--	(5/)	--	34,000	0	121,000
1971	6,435,000	--	502,000	(5/)	--	28,000	--	--	--	1,000	20,000	42,000	0	112,000
1972	6,101,000	--	558,000	--	--	71,000	--	--	--	(5/)	20,000	24,000	0	97,000
1973	6,696,000	--	611,000	--	--	73,000	--	--	--	12,000	20,000	30,000	1,000	148,000
1974	7,461,000	--	715,000	(5/)	--	108,000	--	--	--	12,000	20,000	34,000	(5/)	165,000
1975	8,288,000	--	779,000	--	--	173,000	--	--	--	12,000	32,000	27,000	(5/)	331,000
1976	8,493,000	--	830,000	--	--	186,000	--	--	--	5,000	19,000	9,000	(5/)	175,000
1977	9,448,000	--	880,000	--	--	310,000	--	--	--	--	20,000	15,000	1,000	402,000
1978	10,944,000	--	989,000	--	--	958,000	--	--	--	--	29,000	15,000	1,000	407,000
1979	9,323,000	--	750,000	--	--	340,000	--	--	--	--	28,000	15,000	(5/)	435,000
1980	9,902,000	--	762,000	--	--	313,000	--	--	--	--	28,000	16,000	--	362,000
1981	9,088,000	--	710,000	--	--	237,000	--	--	--	--	21,000	10,000	--	412,000
1982	8,480,000	--	675,000	--	--	276,000	--	--	--	--	27,000	3,000	--	345,000
1983	8,210,000	--	685,000	--	--	161,000	--	--	--	--	34,000	--	--	246,000
1984	9,780,000	--	720,000	--	--	260,000	--	--	--	--	37,900	--	--	446,000
1985	10,900,000	--	825,000	--	--	190,000	--	--	--	--	37,700	--	--	506,000
1986	11,800,000	--	850,000	--	--	353,000	--	--	50,000	--	50,000	--	--	678,000
1987	11,900,000	--	1,080,000	--	--	338,000	--	--	32,000	--	52,400	--	--	543,000

See footnotes at end of table.

TABLE 14--Continued
 CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	World total	Afghanistan	Albania 3/	Argentina	Australia	Brazil 4/	Burma	Canada	China	Colombia	Cuba	Cyprus 6/	Egypt 7/	Finland
1988	12,900,000	--	1,110,000	--	--	410,000	--	--	26,000	--	52,200	--	800	700,000
1989	14,000,000	--	900,000	--	--	476,000	5,000	--	25,000	--	50,600	--	2,450	513,000
1990	13,200,000	--	957,000	--	--	263,000	1,000	--	25,000	--	50,000	--	399	504,000
1991	13,300,000	--	587,000	--	--	340,000	1,000	--	25,000	--	50,000	--	649	473,000
1992	11,100,000	--	322,000	--	--	449,000	6,200	--	25,000	--	10,400 r/	--	600	499,000
1993	9,300,000	--	115,000	--	--	308,000	1,000	--	54,000	--	17,600 r/	--	--	511,000
1994	10,400,000	--	118,000	--	--	360,000	1,000	--	62,000	--	28,800 r/	--	--	573,000
1995	14,000,000	--	160,000	--	--	448,000	1,000	--	94,000	--	30,700 r/	--	--	598,000
1996	11,600,000	--	143,763 r/	--	6,000	408,495	1,000 e/	--	130,000 e/	--	37,300	--	--	582,000 r/
1997	13,700,000 r/	--	106,304 r/	--	31,000	300,000	3,299	--	200,000 r/ e/	--	44,000	--	--	589,000
1998	13,400,000 r/	--	102,189 r/	--	130,000	301,000 r/	4,059	--	21,000 r/ e/	--	49,044	--	--	610,000 r/ e/
1999	14,100,000 r/	--	71,434 r/	--	130,000 e/	420,000 r/ e/	3,200 e/	--	-- r/ e/	--	35,750	--	--	635,000 r/ e/
2000 e/	14,400,000	--	70,000	--	130,000	400,000	3,000	--	--	--	40,000	--	--	640,000

See footnotes at end of table.

TABLE 14--Continued
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Greece	Guatemala	India	Indonesia	Iran	Japan	Kazakh- stan 8/	Macedo- nia 10/	Madaga- scar 11/	Morocco	New Caledonia	Oman	Pakistan 12/	Philippines
1900	5,600	NA	--	--	--	--	XX	XX	--	--	13,000	--	XX	--
1901	4,850	NA	--	--	--	--	XX	XX	--	--	17,600	--	XX	--
1902	11,700	NA	--	--	--	--	XX	XX	--	--	17,500	--	XX	--
1903	8,480	NA	260	--	--	--	XX	XX	--	--	34,400	--	XX	--
1904	15,400	NA	3,650	--	--	--	XX	XX	--	--	47,200	--	XX	--
1905	8,900	NA	2,750	--	--	--	XX	XX	--	--	76,900	--	XX	--
1906	11,500	NA	4,450	--	--	--	XX	XX	--	--	84,200	--	XX	--
1907	11,700	NA	7,390	--	--	--	XX	XX	--	--	29,800	--	XX	--
1908	4,350	NA	4,820	--	--	--	XX	XX	--	--	15,800	--	XX	--
1909	9,600	NA	9,400	--	--	--	XX	XX	--	--	40,000	--	XX	--
1910	9,460	NA	1,770	--	--	2,120	XX	XX	--	--	40,000	--	XX	--
1911	4,610	NA	3,860	--	--	1,520	XX	XX	--	--	21,900	--	XX	--
1912	6,470	NA	2,940	--	--	1,620	XX	XX	--	--	27,300	--	XX	--
1913	6,340	NA	5,770	--	--	1,330	XX	XX	--	--	45,900	--	XX	--
1914	7,060	NA	5,980	--	--	2,120	XX	XX	--	--	71,100	--	XX	--
1915	10,400	NA	3,830	--	--	2,990	XX	XX	--	--	82,100	--	XX	--
1916	9,880	NA	20,500	--	--	8,280	XX	XX	--	--	69,700	--	XX	--
1917	6,750	NA	27,500	--	--	8,940	XX	XX	--	--	54,800	--	XX	--
1918	10,900	NA	58,700	--	--	6,250	XX	XX	--	--	55,200	--	XX	--
1919	8,050	NA	37,000	--	--	6,010	XX	XX	--	--	46,400	--	XX	--
1920	7,380	NA	27,200	--	--	3,970	XX	XX	--	--	31,300	--	XX	--
1921	8,030	NA	35,300	--	--	3,370	XX	XX	--	--	22,900	--	XX	--
1922	9,210	NA	23,100	--	--	3,760	XX	XX	--	--	13,200	--	XX	--
1923	14,800	NA	55,100	--	--	4,530	XX	XX	--	--	24,100	--	XX	--
1924	15,100	NA	46,200	--	--	5,360	XX	XX	--	--	23,000	--	XX	--
1925	8,080	NA	38,100	--	--	5,820	XX	XX	--	--	34,700	--	XX	--
1926	20,000	NA	33,900	--	--	7,050	XX	XX	--	--	33,200	--	XX	--
1927	17,300	NA	58,100	--	--	9,780	XX	XX	--	--	33,500	--	XX	--
1928	21,000	NA	46,200	--	--	9,810	XX	XX	--	--	50,800	--	XX	--
1929	24,200	NA	50,400	--	--	9,160	XX	XX	--	--	52,600	--	XX	--
1930	23,400	NA	51,500	--	--	11,300	XX	XX	--	--	61,900	--	XX	--
1931	5,630	NA	20,200	--	--	9,070	XX	XX	--	--	74,100	--	XX	--
1932	1,550	NA	18,200	--	--	12,500	XX	XX	--	--	69,400	--	XX	--
1933	14,800	NA	15,800	--	--	19,900	XX	XX	--	--	50,100	--	XX	--
1934	30,700	NA	21,900	--	--	27,200	XX	XX	--	--	55,200	--	XX	--
1935	29,800	NA	39,800	--	--	28,800	XX	XX	--	--	55,300	--	XX	1,290
1936	47,300	NA	50,800	--	--	35,100	XX	XX	--	--	47,800	--	XX	11,900
1937	52,600	NA	63,300	--	--	45,000	XX	XX	--	--	48,000	--	XX	69,900
1938	42,500	NA	44,900	--	--	52,800	XX	XX	--	--	52,200	--	XX	66,900
1939	57,100	NA	49,900	--	--	57,400	XX	XX	--	--	57,300	--	XX	134,000
1940	29,700	NA	56,400	--	--	56,700	XX	XX	--	--	55,800	--	XX	204,000
1941	16,200	NA	50,900	--	--	54,500	XX	XX	--	--	64,500	--	XX	233,000
1942	24,300	NA	50,400	--	435	67,500	XX	XX	--	--	67,600	--	XX	49,900
1943	15,500	NA	33,800	--	1,270	58,500	XX	XX	--	--	47,000	--	XX	59,900

See footnotes at end of table.

TABLE 14--Continued
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Greece	Guatemala	India	Indonesia	Iran	Japan	Kazakh- stan 8/	Macedo- nia 10/	Madaga- scar 11/	Morocco	New Caledonia	Oman	Pakistan 12/	Philippines
1944	18,300	NA	40,200	--	12	71,100	XX	XX	--	--	55,200	--	XX	69,900
1945	2,410	NA	31,600	--	--	28,500	XX	XX	--	--	59,800	--	XX	--
1946	9,060	NA	45,500	--	--	7,080	XX	XX	--	--	24,900	--	XX	58,900
1947	2,640	NA	35,300	--	--	2,410	XX	XX	--	--	50,500	--	22,000	195,000
1948	1,500	NA	22,900	--	--	9,340	XX	XX	--	--	75,000	--	18,200	257,000
1949	3,720	NA	19,700	--	--	27,100	XX	XX	--	--	89,000	--	17,200	247,000
1950	12,600	289	17,000	--	--	33,000	XX	XX	--	--	84,800	--	18,400	251,000
1951	25,300	1,140	17,000	--	8,830	40,900	XX	XX	--	--	88,800	--	18,000	335,000
1952	32,200	105	36,800	--	20,000	47,200	XX	XX	--	--	108,000	--	17,700	544,000
1953	36,800	400	65,800	--	21,500	37,600	XX	XX	--	--	122,000	--	23,800	557,000
1954	26,800	132	46,200	--	21,200	32,800	XX	XX	--	--	85,000	--	22,300	401,000
1955	25,300	260	90,800	--	34,900	26,600	XX	XX	--	--	46,100	--	28,900	595,000
1956	78,900	888	53,500	--	32,800	39,900	XX	XX	--	--	48,900	--	23,100	709,000
1957	87,200	998	79,800	--	38,600	46,500	XX	XX	--	--	64,200	--	16,400	726,000
1958	65,500	1,060	64,000	--	35,000	41,900	XX	XX	--	--	47,400	--	24,100	416,000
1959	20,700	410	95,600	--	55,000	57,700	XX	XX	--	--	44,000	--	16,300	653,000
1960	34,900	181	100,000	--	68,000	67,500	XX	XX	--	--	39,200	--	18,400	734,000
1961	31,100	100	48,700	--	73,700	70,200	XX	XX	10,500	--	36,700	--	25,500	640,000
1962	56,200	20	66,600	--	89,800	58,100	XX	XX	18,500	--	15,500	--	21,500	531,000
1963	51,200	--	69,000	--	99,800	43,700	XX	XX	11,200	--	--	--	14,500	459,000
1964	50,900	--	35,000	--	98,000	44,000	XX	XX	11,800	--	--	--	13,500	468,000
1965	50,600	--	59,700	--	129,000	41,800	XX	XX	2,380	--	--	--	14,500	555,000
1966	55,800	--	77,700	--	141,000	32,800	XX	XX	--	--	--	--	27,100	560,000
1967	12,000	--	110,000	--	109,000	45,200	XX	XX	--	--	1,240	--	26,400	420,000
1968	13,100	--	206,000	--	89,800	27,900	XX	XX	--	--	--	--	26,000	439,000
1969	24,000	--	227,000	--	150,000	30,000	XX	XX	80,000	--	--	--	23,000	469,000
1970	26,000	--	271,000	--	200,000	33,000	XX	XX	131,000	--	--	--	29,000	566,000
1971	15,000	--	261,000	--	176,000	32,000	XX	XX	150,000	--	--	--	24,000	430,000
1972	22,000	--	295,000	--	180,000	24,000	XX	XX	112,000	--	--	--	26,000	349,000
1973	18,000	--	288,000	--	140,000	24,000	XX	XX	158,000	--	--	--	17,000	581,000
1974	10,000	--	396,000	--	175,000	26,000	XX	XX	156,000	--	--	--	10,000	530,000
1975	35,000	--	500,000	--	172,000	24,000	XX	XX	194,000	--	2,000	--	10,000	520,000
1976	34,000	--	402,000	--	160,000	22,000	XX	XX	221,000	--	10,000	--	11,000	431,000
1977	42,000	--	353,000	--	233,000	18,000	XX	XX	165,000	--	8,000	--	8,000	538,000
1978	37,000	--	266,000	--	198,000	9,000	XX	XX	138,000	--	8,000	--	11,000	540,000
1979	45,000	--	310,000	--	136,000	12,000	XX	XX	128,000	--	12,000	--	3,000	556,000
1980	42,000	--	319,000	--	82,000	14,000	XX	XX	180,000	--	2,000	--	3,000	496,000
1981	24,000	--	335,000	--	32,000	11,000	XX	XX	100,000	--	5,000	--	2,000	439,000
1982	29,000	--	364,000	--	41,000	11,000	XX	XX	44,000	--	50,000	--	4,000	322,000
1983	27,000	--	360,000	--	48,000	8,000	XX	XX	45,000	--	92,000	24,000	6,000	267,000
1984	61,400	--	423,000	--	59,000	7,420	XX	XX	59,800	--	84,200	7,000	3,000	261,000
1985	58,900	--	569,000	--	56,000	11,900	XX	XX	127,000	--	78,800	--	5,190	272,000
1986	60,100	--	630,000	--	54,000	10,600	XX	XX	82,900	--	72,200	4,820	8,300	174,000
1987	63,800	--	624,000	--	92,100	11,800	XX	XX	107,000	NA	61,800	--	10,200	188,000

See footnotes at end of table.

TABLE 14--Continued
 CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Greece	Guatemala	India	Indonesia	Iran	Japan	Kazakh- stan 8/	Macedo- nia 10/	Madaga- scar 11/	Morocco	New Caledonia	Oman	Pakistan 12/	Philippines
1988	49,500	--	821,000	7,640	60,300	9,510	XX	XX	64,200	1,000	70,300	--	3,330	129,000
1989	62,300	--	1,000,000	7,640	72,600	11,700	XX	XX	62,500	1,000	60,300	12,800	27,100	217,000
1990	35,400	--	1,050,000	8,000	77,200	8,080	XX	XX	151,000	300	6,220	--	18,200	183,000
1991	37,200	--	940,000	1,950	90,100	8,000	XX	XX	149,000	500	--	--	31,500	191,000
1992	4,000	--	1,080,000	2,000	130,000	8,000	3,500,000	6,000	161,000	302	8,170	1,760	22,900	65,700
1993	10,000	--	1,000,000	2,500	124,000	7,000	2,900,000	5,000	144,000	--	--	10,200	22,200	61,700
1994	5,000	--	909,000	2,500	354,000	--	2,100,000	5,000	90,200	--	--	6,170	6,240	76,000
1995	5,000	--	1,540,000	10,000	371,000	--	2,420,000	5,000	106,000	--	--	5,300	17,000	111,000
1996	11,725	--	1,363,205	13,300 e/	130,220	--	1,190,000	5,000 e/	137,210	--	--	15,252	27,987	107,068
1997	12,020	--	1,363,049	2,156	168,984	--	1,798,300	5,000 e/	139,700	--	--	18,000	23,763	87,500
1998	12,000 e/	--	1,311,310	4,700 e/	313,937 r/	--	1,602,700	5,000 e/	104,300	--	--	28,684	8,885	53,871
1999	12,000 e/	--	1,473,000 r/	6,355	311,235 r/	--	2,405,000	5,000 e/	100,000 r/ e/	--	--	26,009 r/	16,279	19,566
2000 e/	12,000	--	1,500,000	6,400	310,000	--	2,607,000 9/	5,000	100,000	--	--	15,110 9/	26,643 9/	15,000

See footnotes at end of table.

TABLE 14--Continued
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Portugal	Russia 13/	Sierra Leone	South Africa 14/	Sudan	Thailand	Turkey	U.S.S.R. 15/	United Arab Emirates	United States	Vietnam 16/	Yugoslavia 17/	Zimbabwe 18/	PNRC 19/
1900	NA	XX	--	--	--	NA	9,750	19,100	--	142	NA	100	--	2,120
1901	NA	XX	--	--	--	NA	41,000	22,200	--	374	NA	505	--	1,160
1902	NA	XX	--	--	--	NA	34,600	19,700	--	320	NA	270	--	816
1903	NA	XX	--	--	--	NA	30,400	16,400	--	152	NA	147	--	3,180
1904	NA	XX	--	--	--	NA	19,200	26,600	--	125	NA	279	--	5,510
1905	NA	XX	--	--	--	NA	20,200	27,100	--	23	NA	186	--	7,780
1906	NA	XX	--	--	--	NA	32,600	19,000	--	109	NA	320	--	8,200
1907	NA	XX	--	--	--	NA	28,900	26,400	--	295	NA	164	836	6,530
1908	NA	XX	--	--	--	NA	11,500	10,900	--	365	NA	500	12,100	6,550
1909	NA	XX	--	--	--	NA	--	22,200	--	608	NA	332	23,200	2,240
1910	NA	XX	--	--	--	NA	--	14,400	--	209	NA	320	39,900	271
1911	NA	XX	--	--	--	NA	--	1,200	--	122	NA	250	47,500	142
1912	NA	XX	--	--	--	NA	--	21,300	--	204	NA	200	62,800	--
1913	NA	XX	--	--	--	NA	14,000	15,000	--	259	NA	305	57,500	--
1914	NA	XX	--	--	--	NA	9,830	15,000	--	601	NA	211	43,700	307
1915	NA	XX	--	--	--	NA	--	15,000	--	3,330	NA	370	55,000	11,500
1916	NA	XX	--	--	--	NA	--	15,000	--	47,800	NA	966	80,600	27,700
1917	NA	XX	--	--	--	NA	--	14,000	--	44,400	NA	1,810	66,200	37,300
1918	NA	XX	--	--	--	NA	1,000	14,000	--	83,800	NA	500	28,400	43,700
1919	NA	XX	--	--	--	NA	3,500	4,000	--	5,160	NA	500	32,000	13,200
1920	NA	XX	--	--	--	NA	25,000	2,770	--	2,540	NA	10	54,700	14,600
1921	NA	XX	--	1,080	--	NA	10,000	4,010	--	287	NA	10	45,500	2,540
1922	NA	XX	--	87	--	NA	2,500	847	--	361	NA	15	84,800	1,330
1923	NA	XX	--	--	--	NA	--	3,000	--	231	NA	--	87,700	3,880
1924	NA	XX	--	4,570	--	NA	3,400	11,900	--	293	NA	300	157,000	1,260
1925	NA	XX	--	13,800	--	NA	7,510	30,100	--	110	NA	12,200	123,000	895
1926	NA	XX	--	12,000	--	NA	6,670	30,400	--	143	NA	16,000	164,000	1,570
1927	NA	XX	--	17,000	--	NA	18,300	19,300	--	204	NA	8,760	198,000	2,200
1928	NA	XX	--	31,800	--	NA	11,800	29,500	--	671	NA	16,700	199,000	120
1929	NA	XX	--	64,000	--	NA	16,200	52,900	--	273	NA	43,000	266,000	234
1930	NA	XX	--	13,700	--	NA	28,200	66,700	--	81	NA	51,600	206,000	1,600
1931	NA	XX	--	23,300	--	NA	25,400	67,000	--	272	NA	58,400	81,600	2,890
1932	NA	XX	--	19,400	--	NA	55,200	65,900	--	157	NA	39,100	15,700	480
1933	NA	XX	--	34,100	--	NA	75,400	109,000	--	857	NA	26,200	35,000	2,620
1934	NA	XX	--	61,400	--	NA	120,000	127,000	--	375	NA	48,500	72,100	1,030
1935	NA	XX	--	90,400	--	NA	150,000	178,000	--	523	NA	53,000	106,000	1,370
1936	NA	XX	--	176,000	--	NA	164,000	217,000	--	273	NA	54,000	183,000	5,000
1937	NA	XX	741	169,000	--	NA	193,000	200,000	--	2,360	NA	59,900	276,000	9,690
1938	NA	XX	505	177,000	--	NA	214,000	200,000	--	825	NA	58,500	186,000	4,730
1939	NA	XX	10,800	160,000	--	NA	192,000	200,000	--	3,670	NA	59,500	139,000	9,440
1940	NA	XX	17,800	164,000	--	NA	170,000	299,000	--	2,710	NA	71,000	248,000	11,900
1941	NA	XX	13,900	142,000	--	NA	136,000	340,000	--	12,900	NA	69,900	324,000	14,800
1942	NA	XX	10,700	338,000	--	NA	116,000	399,000	--	102,000	NA	99,800	348,000	27,400
1943	NA	XX	16,300	163,000	--	NA	155,000	327,000	--	145,000	NA	65,300	287,000	48,600

See footnotes at end of table.

TABLE 14--Continued
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Portugal	Russia 13/	Sierra Leone	South Africa 14/	Sudan	Thailand	Turkey	U.S.S.R. 15/	United Arab Emirates	United States	Vietnam 16/	Yugoslavia 17/	Zimbabwe 18/	PNRC 19/
1944	NA	XX	9,850	88,900	--	NA	182,000	299,000	--	41,400	NA	9,980	277,000	38,200
1945	NA	XX	578	99,100	--	NA	148,000	299,000	--	12,700	NA	5,990	186,000	11,800
1946	NA	XX	10,300	212,000	--	NA	103,000	299,000	--	3,730	NA	68,000	151,000	4,320
1947	NA	XX	16,800	373,000	--	NA	157,000	499,000	--	860	NA	54,400	155,000	4,760
1948	NA	XX	7,890	413,000	--	NA	286,000	599,000	--	3,280	NA	62,600	231,000	5,090
1949	NA	XX	22,100	404,000	--	NA	452,000	349,000	--	393	NA	109,000	244,000	11,600
1950	45	XX	7,520	496,000	--	--	423,000	454,000	--	367	--	115,000	292,000	14,500
1951	33	XX	16,500	545,000	--	--	619,000	544,000	--	6,400	--	99,600	300,000	5,200
1952	108	XX	23,900	580,000	--	--	807,000	544,000	--	19,300	--	107,000	323,000	16,000
1953	5	XX	24,700	724,000	--	--	913,000	544,000	--	53,400	--	127,000	420,000	98,100
1954	21	XX	19,100	641,000	--	--	562,000	544,000	--	148,000	--	124,000	401,000	777
1955	--	XX	21,100	542,000	--	--	649,000	680,000	--	139,000	--	126,000	408,000	20,500
1956	--	XX	19,900	627,000	--	--	833,000	739,000	--	188,000	--	119,000	407,000	19,100
1957	--	XX	16,000	666,000	--	--	955,000	771,000	--	151,000	--	120,000	593,000	14,700
1958	--	XX	14,500	631,000	--	--	573,000	798,000	--	130,000	--	114,000	561,000	20,600
1959	--	XX	18,100	680,000	--	--	388,000	853,000	--	95,300	6,620	107,000	493,000	24,300
1960	--	XX	5,460	772,000	--	--	481,000	916,000	--	97,100	19,400	101,000	606,000	30,800
1961	--	XX	--	898,000	--	--	403,000	921,000	--	74,400	29,000	108,000	536,000	1,530
1962	--	XX	11,400	913,000	7,980	--	527,000	1,150,000	--	--	--	97,000	461,000	63,900
1963	--	XX	2,780	792,000	17,000	--	284,000	1,230,000	--	--	--	93,800	374,000	--
1964	--	XX	--	850,000	17,000	--	413,000	1,300,000	--	--	--	88,400	448,000	--
1965	--	XX	--	942,000	29,900	--	567,000	1,420,000	--	--	--	79,900	586,000	--
1966	--	XX	--	1,060,000	17,200	--	529,000	1,500,000	--	--	--	54,200	NA	--
1967	--	XX	--	1,150,000	25,000	--	371,000	1,570,000	--	--	--	47,200	318,000	--
1968	--	XX	--	1,150,000	22,100	--	419,000	1,650,000	--	--	--	45,300	381,000	--
1969	--	XX	--	1,197,000	25,000	--	454,000	1,700,000	--	--	--	39,000	363,000	--
1970	--	XX	--	1,427,000	47,000	--	519,000	1,751,000	--	--	--	41,000	363,000	--
1971	--	XX	--	1,644,000	21,000	--	603,000	1,796,000	--	--	--	34,000	544,000	--
1972	--	XX	--	1,483,000	23,000	--	395,000	1,851,000	--	--	--	28,000	544,000	--
1973	--	XX	--	1,649,000	32,000	--	436,000	1,905,000	--	--	--	10,000	544,000	--
1974	--	XX	--	1,877,000	20,000	--	666,000	1,950,000	--	--	NA	1,000	590,000	--
1975	--	XX	--	2,076,000	15,000	(5/)	717,000	2,077,000	--	--	NA	2,000	590,000	--
1976	--	XX	--	2,409,000	22,000	--	581,000	2,087,000	--	--	14,000	2,000	864,000	--
1977	--	XX	--	3,059,000	19,000	1,000	508,000	2,177,000	--	--	13,000	2,000	677,000	--
1978	--	XX	--	3,144,000	18,000	(5/)	381,000	3,302,000	--	--	13,000	2,000	478,000	--
1979	--	XX	--	3,297,000	28,000	(5/)	372,000	2,300,000	--	--	14,000	(5/)	542,000	--
1980	--	XX	--	3,414,000	25,000	--	373,000	2,903,000	--	--	15,000	(5/)	553,000	--
1981	--	XX	--	2,870,000	25,000	--	401,000	2,903,000	--	--	15,000	(5/)	536,000	--
1982	--	XX	--	2,431,000	19,000	--	453,000	2,939,000	--	--	16,000	--	432,000	--
1983	--	XX	--	2,466,000	20,000	--	346,000	2,939,000	--	--	16,000	--	420,000	--
1984	--	XX	--	3,410,000	20,000	--	487,000	2,940,000	--	--	16,000	--	477,000	--
1985	--	XX	--	3,700,000	8,800	30	589,000	3,360,000	--	--	4,000	10,000	536,000	--
1986	--	XX	--	3,910,000	8,500	361	618,000	3,640,000	--	--	4,000	8,780	533,000	--
1987	--	XX	--	3,790,000	13,000	5	762,000	3,570,000	--	--	4,000	13,200	570,000	--

See footnotes at end of table.

TABLE 14--Continued
CHROMITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons, gross weight)

Year	Portugal	Russia 13/	Sierra Leone	South Africa 14/	Sudan	Thailand	Turkey	U.S.S.R. 15/	United Arab Emirates	United States	Vietnam 16/	Yugoslavia 17/	Zimbabwe 18/	PNRC 19/
1988	--	XX	--	4,240,000	8,000	776	851,000	3,700,000	--	--	4,000	11,500	561,000	--
1989	--	XX	--	4,950,000	25,000	416	1,080,000	3,800,000	--	--	4,000	12,700	627,000	--
1990	--	XX	--	4,620,000	12,500	--	836,000	3,800,000	--	--	--	10,800	573,000	--
1991	--	XX	--	5,100,000	10,000	--	940,000	3,800,000	--	--	--	6,000	564,000	--
1992	--	121,000	--	3,360,000	10,000	--	759,000	XX	1,000	--	--	XX	522,000	--
1993	--	121,000	--	2,840,000	11,500	--	767,000	XX	19,000	--	--	XX	252,000	--
1994	--	143,000	--	3,640,000	25,000	--	1,270,000	XX	55,000	--	63,000	XX	517,000	--
1995	--	151,000	--	5,090,000	45,000	--	2,080,000	XX	37,000	--	25,000	XX	707,000	--
1996	--	96,700 9/	--	5,078,000	12,000 e/	--	1,279,032	XX	56,000	--	37,000	XX	697,311 9/	--
1997	--	150,000 e/	--	6,162,000	30,500 e/	--	1,702,633	XX	61,000 e/	--	51,000	XX	670,000 e/	--
1998	--	130,000 e/	--	6,480,000	20,000 e/	--	1,404,470	XX	76,886	--	54,000	XX	605,000 e/	--
1999	--	100,000 e/	--	6,817,050	10,000 e/	--	770,352	XX	60,000	--	48,300 r/	XX	654,000 r/ e/	--
2000 e/	--	100,000	--	6,620,754 9/	10,000	--	1,000,000	XX	60,000	--	55,000	XX	640,000	--

e/ Estimated. r/ Revised. NA Not available. XX Not applicable. -- Zero.

1/ Chromite ore production was reported by country starting in the 1911 Chromite Minerals Yearbook Chapter (reporting production for the years 1906 through 1910) when production was reported in metric tons. Chromite ore production by country has since been reported continually in the Chromite Minerals Yearbook chapters through 1946 and in its successor, the Chromium Minerals Yearbook chapters since 1947. In the 1958 Chromium Minerals Yearbook chapter, chromite ore production by country was reported in units of short tons for the 1900 through 1958 time period. From 1959 through 1970, chromite ore production by country was reported in short tons. From 1971 through 1987, chromite ore production by country was reported in thousand short tons. Since 1988 (1984 year-of-data), chromite ore production has been reported in metric tons. Country chromite ore production data presented here are those reported in the Minerals Yearbook chapters converted from short to metric tons where necessary and rounded to thousand tons from 1969 through 1983, and rounded to no more than three significant digits from 1900 through 1968 and from 1984 through 1995. Since unrounded data were not available before 1996, world production was computed from country production converted in units but not yet rounded; world production was then rounded to no more than three significant digits. From 1996 through 2000, chromite ore world production and estimated country production were rounded to no more than three significant digits. From 1996 through 2000 chromite ore world production and estimated country production were rounded to no more than three significant digits. Chromite ore production by country from 1900 through 1949 came from the 1958 chapter review; the remainder, from chromium chapters.

2/ Figures for all countries represent marketable output unless otherwise noted.

3/ Direct shipping plus concentrate production from 1995 through 2000.

4/ Average Cr₂O₃ content was as follows: 1996--42.2%; 1997--37.4%; 1998-99--45% (revised); and 2000--45%.

5/ Less than 500 short tons.

6/ Production estimates as exports from 1950 through 1960.

7/ Egypt reported as United Arab Republic from 1956 through 1961.

8/ Kazakhstan formerly part of the U.S.S.R. from 1900 through 1991.

9/ Reported figure.

10/ Macedonia reported as Yugoslavia from 1900 through April 1992.

11/ Madagascar reported as Malagasy or Malagasy Republic from 1950 through 1974.

12/ Pakistan reported with India from 1900 through 1946.

13/ Russia reported as the U.S.S.R. from 1900 through 1991.

14/ South Africa reported as the Union of South Africa from 1900 through 1957.

15/ The U.S.S.R. dissolved in December 1991.

16/ Reported as North Vietnam from 1959 through 1961.

17/ Yugoslavia part of Austria-Hungary from 1900 through 1917; Kingdom of the Serbs, Croats and Slovenes from 1918 through 1928. Dissolved in April 1992.

18/ Zimbabwe reported as Southern Rhodesia from 1900 through 1950 and 1960 through 1975, and as Federation of Rhodesia and Nyasaland from 1951 through 1959.

19/ Production not reported by country includes data from Afghanistan, Argentina, Brazil, Bulgaria, Canada, Guatemala, Indochina, Lebanon, Mexico, Norway, Portugal, Romania, Sweden, and the United Kingdom from 1900 through 1949; Bulgaria and Romania from 1950 through 1962; and North Vietnam for 1962.

Source: U.S. Geological Survey and U.S. Bureau of Mines publications, including Mineral Resources of the United States, Minerals Yearbooks, Commodity Data Summaries, and Mineral Commodity Summaries.

TABLE 15
FERROCHROMIUM: WORLD PRODUCTION, BY COUNTRY 1/

(Metric tons, gross weight)

Year	World total	Albania	Australia	Brazil	Chile	China	Croatia 2/
1974	1,855,000	--	4,000	38,000	--	--	XX
1975	1,695,000	--	4,000	53,000	--	--	XX
1976	2,136,000	--	--	60,000	--	59,000	XX
1977	2,419,000	--	--	66,000	--	73,000	XX
1978	2,649,000	--	--	63,000	--	91,000	XX
1979	2,996,000	NA	--	84,000	--	91,000	XX
1980	2,858,000	4,000	--	93,000	--	118,000	XX
1981	2,649,000	28,000	--	119,000	--	118,000	XX
1982	2,306,000	30,000	--	97,000	--	118,000	XX
1983	2,370,000	35,000	--	77,000	--	118,000	XX
1984	2,830,000	40,000	--	125,000	--	118,000	XX
1985	2,974,000	43,000	--	127,000	--	122,000	XX
1986	3,210,000	46,000	--	109,000	--	--	XX
1987	3,310,000	26,300	--	105,000	475	NA	XX
1988	3,800,000	33,700	--	130,000	2,210	NA	XX
1989	3,890,000	38,800	--	113,000	2,840	180,000	XX
1990	3,760,000	24,000	--	83,800	1,870	340,000	XX
1991	3,880,000	25,000	--	82,200	2,510	380,000	XX
1992	3,620,000	21,700	--	91,100	2,110	410,000	56,500
1993	3,270,000	35,600	--	83,900	680	372,000	27,300
1994	3,700,000	33,800	--	77,100	1,580	370,000	31,700
1995	4,710,000	43,000	--	101,000	2,730	500,000	26,100
1996	3,950,000	31,189	--	77,231 3/	2,079	423,000 e/	10,559
1997	4,830,000 r/	31,144 r/	--	74,485 r/ 3/	-- r/	480,000 e/	24,231
1998	4,750,000 r/	30,252 r/	--	72,507 r/ 3/	-- r/	424,000 e/	11,770
1999	4,930,000 r/	28,120 r/	--	90,784 r/ 3/	-- r/	400,000 e/	-- r/
2000 e/	5,130,000	9,900	--	91,000 3/	--	450,000	15,753 4/
	Czecho-						
Year	slovakia 5/	Finland	France	Germany 6/	Greece	India	Iran
1974	(7/)	48,000	112,000	(7/)	--	15,000	--
1975	(7/)	40,000	56,000	(7/)	--	10,000	--
1976	30,000	40,000	102,000	89,000	--	17,000	--
1977	30,000	34,000	102,000	79,000	--	18,000	--
1978	30,000	44,000	93,000	75,000	--	22,000	--
1979	28,000	49,000	95,000	81,000	--	22,000	--
1980	27,000	53,000	44,000	77,000	--	16,000	--
1981	27,000	52,000	27,000	70,000	--	32,000	--
1982	25,000	54,000	38,000	62,000	--	42,000	--
1983	25,000	59,000	20,000	57,000	18,000	35,000	--
1984	24,000	59,000	19,000	64,000	33,000	55,000	--
1985	25,000	133,000	1,000	69,000	34,000	66,000	--
1986	28,200	134,000	1,000	82,000	38,300	84,100	--
1987	29,000	143,000	1,000	71,000	49,000	126,000	--
1988	29,200	156,000	13,200	56,900	44,100	140,000	--
1989	29,800	169,000	18,100	55,400	43,600	151,000	--
1990	37,500	157,000	25,000	58,500	30,300	169,000	--
1991	41,200	190,000	23,100	38,300	10,500	229,000	--
1992	52,500	187,000	6,690	26,500	--	193,000	--
1993	XX	218,000	--	16,400	--	228,000	--
1994	XX	254,000	--	17,300	--	251,000	7,150
1995	XX	247,000	--	21,700	--	304,000	11,900
1996	XX	227,811	--	25,303	--	261,666 8/	10,500
1997	XX	236,652	--	25,856	--	286,973 8/	11,450
1998	XX	230,906	--	20,879	--	345,125 8/	13,745
1999	XX	256,290 r/	--	16,960	--	350,000 e/ 8/	13,680 r/
2000 e/	XX	260,600 6/	--	17,000	--	352,000 8/	14,000

See footnotes at end of table.

TABLE 15--Continued
FERROCHROMIUM: WORLD PRODUCTION, BY COUNTRY 1/

(Metric tons, gross weight)

Year	Italy	Japan	Kazakh- stan 9/	Mace- donia 2/	Mexico	Norway	Philippines
1974	40,000	542,000	XX	XX	--	31,000	--
1975	44,000	486,000	XX	XX	--	27,000	--
1976	45,000	464,000	XX	XX	4,000	32,000	--
1977	40,000	399,000	XX	XX	3,000	23,000	--
1978	37,000	274,000	XX	XX	5,000	15,000	10,000
1979	43,000	366,000	XX	XX	5,000	12,000	10,000
1980	41,000	403,000	XX	XX	--	11,000	10,000
1981	10,000	306,000	XX	XX	3,000	12,000	10,000
1982	36,000	328,000	XX	XX	6,000	10,000	12,000
1983	12,000	298,000	XX	XX	3,000	4,000	27,000
1984	13,000	318,000	XX	XX	7,000	4,000	48,000
1985	58,000	340,000	XX	XX	6,000	--	51,000
1986	55,900	281,000	XX	XX	2,670	--	55,000
1987	59,000	264,000	XX	XX	6,300	--	47,000
1988	87,100	295,000	XX	XX	9,300	--	73,000
1989	87,300	334,000	XX	XX	2,570	--	82,000
1990	53,000	304,000	XX	XX	275	60,000	55,700
1991	47,200	279,000	XX	XX	72	83,000	23,700
1992	60,300	276,000	400,000	3,960	70	102,000	27,400
1993	53,500	211,000	328,000	4,380	--	80,000	11,900
1994	22,700	193,000	373,000	3,160	--	120,000	16,200
1995	51,000	210,000	512,000	3,770	--	148,000	50,500
1996	29,915	193,695 3/	352,000	3,780	--	108,900	6,736
1997	11,295	186,432 3/	600,000	460	--	145,124	--
1998	11,487	142,931 3/	535,000	--	--	174,678	--
1999	12,000 e/	119,777 3/	597,946	--	--	159,714	--
2000 e/	12,000	130,074 3/ 4/	640,000	--	--	165,000	--
Year	Poland	Romania	Russia 9/	Slovakia 10/	Slovenia 10/	South Africa	Southern Rhodesia 11/
1974	(7/)	--	XX	XX	XX	184,000	181,000
1975	(7/)	--	XX	XX	XX	217,000	200,000
1976	50,000	--	XX	XX	XX	350,000	186,000
1977	50,000	--	XX	XX	XX	350,000	XX
1978	47,000	--	XX	XX	XX	660,000	XX
1979	49,000	--	XX	XX	XX	780,000	XX
1980	47,000	34,000	XX	XX	XX	800,000	XX
1981	41,000	36,000	XX	XX	XX	753,000	XX
1982	35,000	39,000	XX	XX	XX	472,000	XX
1983	48,000	42,000	XX	XX	XX	675,000	XX
1984	48,000	45,000	XX	XX	XX	867,000	XX
1985	49,000	44,000	XX	XX	XX	852,000	XX
1986	36,200	44,000	XX	XX	XX	870,000	XX
1987	35,900	42,000	XX	XX	XX	965,000	XX
1988	36,300	23,400	XX	XX	XX	994,000	XX
1989	28,200	26,800	XX	XX	XX	1,050,000	XX
1990	13,700	20,600	XX	XX	XX	1,020,000	XX
1991	1,930	20,400	XX	XX	XX	1,150,000	XX
1992	35,300	6,970	400,000	XX	17,100	771,000	XX
1993	38,400	3,910	256,000	50,600	8,810	834,000	XX
1994	7,350	3,890	266,000	48,600	13,400	1,100,000	XX
1995	18,300	15,100	290,000	65,300	23,200	1,520,000	XX
1996	1,100 r/	9,650	135,000 e/	19,900	22,819	1,478,000 12/	XX
1997	6,200 r/	950	247,000 e/	11,394	9,232	1,939,500 12/	XX
1998	4,200 r/	873	203,000	11,715	10,621	2,025,300 12/	XX
1999	3,500 e/	--	249,000	6,986	560	2,155,202 r/ 12/	XX
2000 e/	3,500	--	274,000	7,000	600	2,200,000 12/	XX

See footnotes at end of table.

TABLE 15--Continued
FERROCHROMIUM: WORLD PRODUCTION, BY COUNTRY 1/

(Metric tons, gross weight)

Year	Spain	Sweden	Turkey	U.S.S.R. 13/	United States	Yugo- slavia 14/	Zim- babwe 11/
1974	22,000	101,000	9,000	184,000	306,000	39,000	XX
1975	18,000	93,000	9,000	206,000	179,000	54,000	XX
1976	20,000	116,000	25,000	210,000	195,000	43,000	XX
1977	16,000	134,000	35,000	535,000	197,000	36,000	200,000
1978	14,000	166,000	40,000	553,000	160,000	51,000	200,000
1979	20,000	190,000	30,000	553,000	224,000	65,000	200,000
1980	16,000	144,000	32,000	390,000	167,000	69,000	260,000
1981	17,000	146,000	41,000	400,000	149,000	69,000	184,000
1982	15,000	117,000	40,000	415,000	83,000	51,000	180,000
1983	14,000	120,000	30,000	415,000	18,000	64,000	158,000
1984	14,000	134,000	48,000	420,000	86,000	63,000	178,000
1985	17,000	135,000	50,000	420,000	100,000	73,000	156,000
1986	14,000	126,000	50,000	798,000	95,600	68,600	187,000
1987	16,000	112,000	52,500	806,000	107,000	56,300	187,000
1988	25,400	143,000	54,000	1,050,000	120,000	93,300	190,000
1989	29,000	154,000	59,700	828,000	147,000	90,400	173,000
1990	15,000	118,000	62,000	700,000	109,000	82,700	222,000
1991	6,000	121,000	84,700	700,000	68,300	91,000	187,000
1992	--	133,000	85,800	XX	60,900	--	191,000
1993	2,390	128,000	90,000	XX	63,000	--	124,000
1994	2,300	134,000	97,600	XX	67,400	--	183,000
1995	1,320	130,000	94,300	XX	72,500	--	254,000
1996	805	138,110	101,450	XX	36,800 15/	--	243,000
1997	490	101,842	108,320	XX	60,700 15/	--	233,386
1998	1,145	123,958	110,175	XX	W 15/	--	246,782
1999	935	113,140	110,000 e/	XX	W 15/	--	244,379 r/
2000 e/	1,000	135,000	110,000	XX	W 15/	--	246,324 4/

e/ Estimated. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Ferrochromium production was reported by country starting in the 1976 Ferroalloys Minerals Yearbook Chapter (data series starting in 1974) as part of the world ferroalloy production table. Ferrochromium production was reported in units of thousand short tons from the 1976 chapter through the 1989 chapter. In the 1990 Ferroalloys Minerals Yearbook Chapter (1986 data), reporting units changed to metric tons. Ferrochromium production by country was added to the Chromium Minerals Yearbook Chapter in 1988 where production was reported for 1988 as thousand metric tons. Reporting ferrochromium production by country in the Chromium chapter lapsed for 2 years after which it was reintroduced in 1991 as a 5-year table (first year-of-data 1987) in units of metric tons. Ferrochromium production by country has since been reported in the Chromium chapter. In 1994, a policy of rounding data to no more than three significant digits was implemented. The policy applies to published data such as production for a specific country for a specific year. Information computed from that data, such as world production, is to be computed from unrounded data. Country ferrochromium production data presented here is that reported in the Minerals Yearbook Chapters converted from short to metric tons where necessary and rounded to thousand metric tons from 1974 through 1985 and rounded to no more than three significant digits from 1986 through 1995. Since unrounded data were not available before 1996, world production was computed from country production converted in units but not yet rounded; world production was then rounded to no more than three significant digits. From 1996 through 2000 ferrochromium world production, U.S. production, and estimated country production were rounded to no more than three significant digits.

2/ Croatia and Macedonia reported as part of Yugoslavia from 1974 through 1991.

3/ Includes high- and low-carbon ferrochromium.

4/ Reported figure.

5/ Czechoslovakia dissolved on December 31, 1992.

6/ Reported as East and West or Democratic and Federal Republic of Germany from 1974 through 1990.

7/ Undistributed.

8/ Includes ferrochrome and charge chrome.

9/ Kazakhstan and Russia reported as part of the U.S.S.R. from 1974 through 1991.

10/ Slovakia reported as part of Czechoslovakia from 1974 through 1992; Slovenia reported as part of Czechoslovakia from 1974 through 1991.

11/ Zimbabwe reported as Southern Rhodesia from 1974 through 1976.

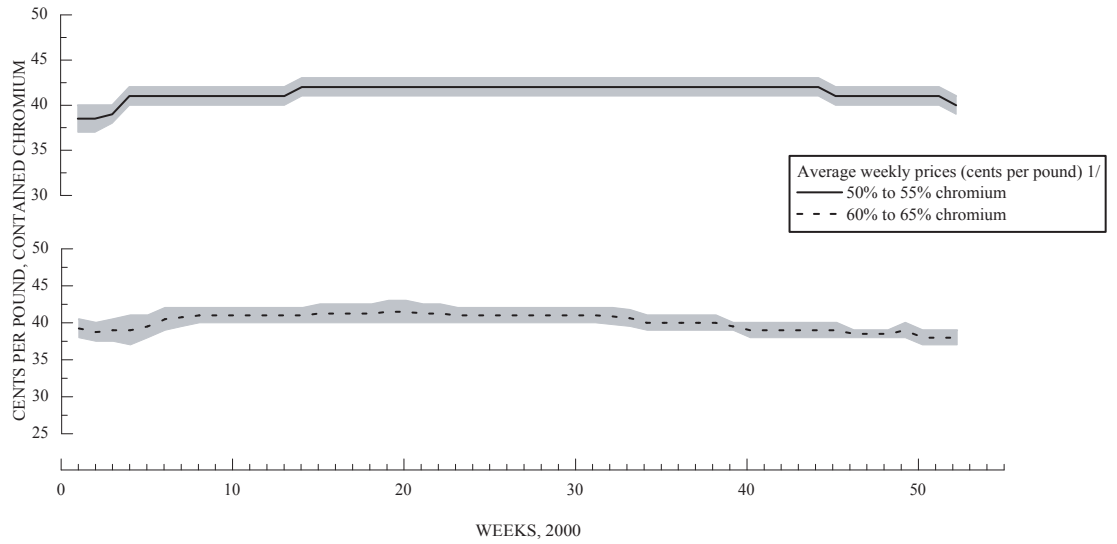
12/ Includes high- and low-carbon ferrochromium and ferrochromium silicon.

13/ The U.S.S.R. dissolved in December 1991.

14/ Yugoslavia dissolved in April 1992.

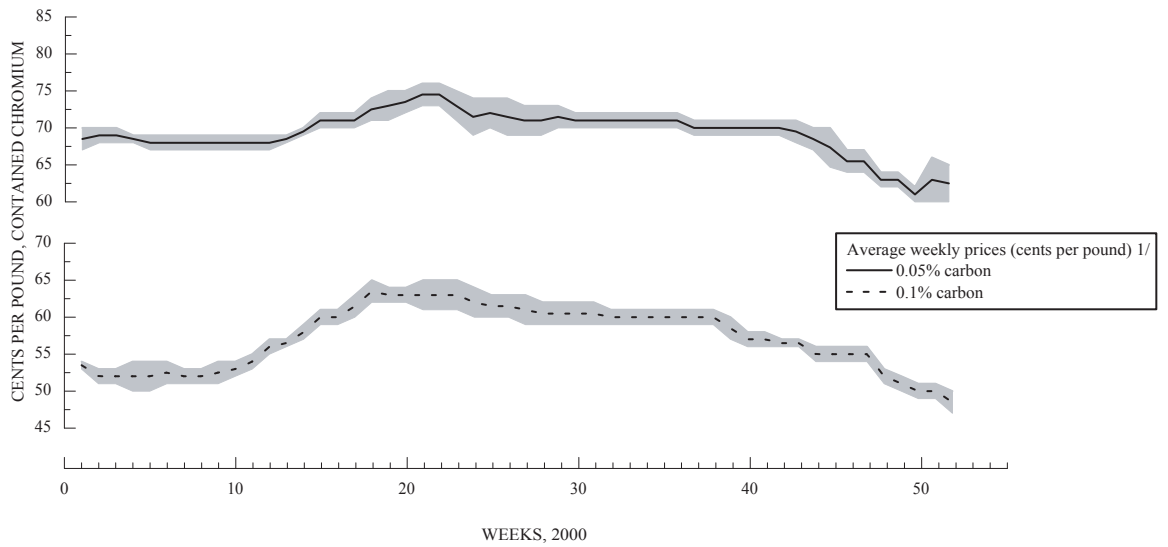
15/ Includes high- and low-carbon ferrochromium, ferrochromium silicon, chromium metal, and other chromium materials.

FIGURE 1
U.S. IMPORTED HIGH-CARBON FERROCHROMIUM IN 2000



1/ Average weekly price shown against price range background.
 Source: Platt's Metals Week

FIGURE 2
U.S. IMPORTED LOW-CARBON FERROCHROMIUM IN 2000



1/ Average weekly price shown against price range background.
 Source: Platt's Metals Week