CHROMIUM

(Data in thousand metric tons, gross weight, unless otherwise noted)

Domestic Production and Use: The United States consumes about 14% of world chromite ore production in various forms of imported materials (chromite ore, chromium chemicals, chromium ferroalloys, and chromium metals). Imported chromite was consumed by two chemical firms and two refractory firms to produce chromium chemicals and chromite-containing refractories, respectively. Consumption of chromium ferroalloys and metal was predominantly for the production of stainless and heat-resisting steel and superalloys, respectively. The value of chromium material consumption was about $421 million.

Salient Statistics—United States:[1]	1995	1996	1997	1998	1999[e]
Production: Mine	—	—	—	—	—
Secondary	112	98	120	105	103
Imports for consumption	416	362	350	381	429
Exports	27	51	30	62	23
Government stockpile releases	44	52	47	93	10
Consumption: Reported[2] (excludes secondary)	298	277	345	[e]280	196
Apparent[3] (includes secondary)	565	467	488	531	522
Price, chromite, yearend:					
South African, dollars per metric ton, South Africa	61	75	73	68	63
Turkish, dollars per metric ton, Turkey	144	225	180	145	145
Stocks, industry, yearend	80	74	72	58	55
Net import reliance[4] as a percent of apparent consumption	80	79	75	80	80

Recycling: In 1999, chromium contained in purchased stainless steel scrap accounted for 20% of apparent consumption.

Import Sources (1995-98): Chromium contained in chromite ore and chromium ferroalloys and metal: South Africa, 44%; Russia, 14%; Turkey, 10%; Zimbabwe, 9%; and other, 23%.

Tariff:[5] Item	Number	Normal Trade Relations 12/31/99
Ore and concentrate	2610.00.0000	Free.
Ferrochromium, high-carbon	7202.41.0000	1.9% ad val.

Depletion Allowance: 23% (Domestic), 15% (Foreign).

Government Stockpile: The Defense Logistics Agency, U.S. Department of Defense, submitted the Annual Materials Plan for 2000 in February 1999. In addition to the stockpile-grade uncommitted inventory listed below, the stockpile contains the following nonstockpile-grade uncommitted inventory, in thousand metric tons: 33, metallurgical chromite ore; 0.4, high-carbon ferrochromium.

Stockpile Status—9-30-99[6]

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1999	Disposals FY 1999	Average chromium content
Chromite ore:						
Chemical-grade	162	43.4	162	90.7	—	28.6%
Metallurgical-grade	149	187	149	227	174	28.6%
Refractory-grade	234	40.6	234	90.7	—	[e]23.9%
Chromium ferroalloys:						
Ferrochromium:						
High-carbon	645	0.137	195	22.7	20.3	71.4%
Low-carbon	275	3.12	275	22.7	2.42	71.4%
Ferrochromium-silicon	49.4	1.27	49.4	—	—	42.9%
Chromium metal	7.72	—	—	—	—	[e]100%

Events, Trends, and Issues: Chromite ore is not produced in the United States, Canada, or Mexico. Chromite ore is produced in the Western Hemisphere only in Brazil and Cuba. Most of Brazilian production is consumed in Brazil; some is exported to Norway. Cuban production is relatively small. The largest chromite ore producing countries, accounting for about 80% of world production, are India, Kazakhstan, South Africa, and Turkey. South Africa alone accounts for over 40% of world production and has been the major supplier of chromium in the form of chromite ore

Prepared by **John F. Papp [(703) 648-4963, jpapp@usgs.gov, fax: (703) 648-7757]**

CHROMIUM

and ferrochromium to Western industrialized countries. Stainless steel, the major end use market for chromium, has shown long-term growth equivalent to about one or two new ferrochromium furnaces annually. To meet this demand, South African plants were built or expanded. Production capacity expansion continues to be achieved through the addition of furnaces; however, the emphasis has shifted to expansion through plant enhancements that improve recovery and reduce cost, such as agglomeration and preheating of furnace feed and recovery from slag. South African chromite ore and ferrochromium producers financed these process changes through joint ventures with stainless steel producers in Asia. By financing capacity growth and production efficiency, consumers lower their cost and secure their supply; producers secure market share and stabilize production rates.

Economic and political reorganization in the countries of the Commonwealth of Independent States resulted in reduced demand in those countries. This reduction may eventually be followed by strong growth-driven demand resulting from the institution of reforms in those countries. The economic slowdown that started with the Asian financial crisis in 1997 resulted in reduced demand for stainless steel in Asia and forced Asian produced stainless steel prices down. This resulted in pressure to lower the price of stainless steel produced in North America and Europe. Oversupply of stainless steel in the world market kept ferrochromium in excess supply until late in 1999 when the price of ferrochromium rose, indicating a return to supply balance.

The U.S. Environmental Protection Agency regulates chromium releases into the environment. The U.S. Occupational Safety and Health Administration regulates workplace exposure.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves[7]	Reserve base[7]
	1998	1999[e]	(shipping grade)[8]	
United States	—	—	—	10,000
Albania	100	100	6,100	6,100
Brazil	330	330	14,000	17,000
Finland	611	610	41,000	120,000
India	1,363	1,400	27,000	67,000
Iran	200	200	2,400	2,400
Kazakhstan	1,600	1,600	320,000	320,000
Russia	130	130	4,000	460,000
South Africa	5,500	5,600	3,000,000	5,500,000
Turkey	1,600	1,600	8,000	20,000
Zimbabwe	660	660	140,000	930,000
Other countries	600	600	31,000	39,000
World total (rounded)	12,700	12,800	3,600,000	7,500,000

World Resources: World resources exceed 11 billion tons of shipping-grade chromite, sufficient to meet conceivable demand for centuries. About 95% of chromium resources is geographically concentrated in southern Africa. Reserves and reserve base are geographically concentrated in southern Africa and Kazakhstan. The largest U.S. chromium resource is in the Stillwater Complex in Montana.

Substitutes: There is no substitute for chromite ore in the production of ferrochromium, chromium chemicals, or chromite refractories. There is no substitute for chromium in stainless steel, the largest end use, or for chromium in superalloys, the major strategic end use. Chromium-containing scrap can substitute for ferrochromium in metallurgical uses. Substitutes for chromium-containing alloys, chromium chemicals, and chromite refractories generally increase cost or limit performance. In 1978, the National Academy of Sciences found that substituting chromium-free materials for chromium-containing products could save about 60% of chromium used in alloying metals, about 15% of chromium used in chemicals, and 90% of chromite used in refractories, given 5 to 10 years to develop technically acceptable substitutes and to accept increased cost.

[e]Estimated.

[1]Data in thousand metric tons of contained chromium, unless noted otherwise.

[2]The years 1995 through 1998 include chromite ore; 1999 excludes chromite ore.

[3]Calculated demand for chromium is production + imports - exports + stock adjustment.

[4]Defined as imports - exports + adjustments for Government and industry stock changes.

[5]In addition to the tariff items listed, certain imported chromium materials (see U.S. Code, chapter 26, sections 4661 and 4672) are subject to excise tax.

[6]See Appendix B for definitions.

[7]See Appendix C for definitions. Reserves and reserve base data are rounded to no more than two significant figures.

[8]Shipping-grade chromite ore is deposit quantity and grade normalized to 45% Cr_2O_3.