CHROMIUM

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

Domestic Production and Use: The United States consumes about 13% of world chromite ore production in various forms of imported materials (chromite ore, chromium ferroalloys, chromium metal, and chromium chemicals). Imported chromite was consumed by two chemical firms, one metallurgical firm, and four refractory firms to produce chromium chemicals, chromium ferroalloys, and chromite-containing refractories, respectively. Consumption of chromium ferroalloys and metal by end use was: stainless and heat-resisting steel, 76%; full-alloy steel, 8%; superalloys, 2%; and others, 14%. The value of chromium material consumption was about $412 million.

Salient Statistics—United States:[1]	1994	1995	1996	1997	1998[e]
Production: Mine	—	—	—	—	—
Secondary	99	112	98	120	111
Imports for consumption	273	416	362	350	418
Exports	33	27	51	30	57
Government stockpile releases	49	44	52	47	37
Consumption: Reported (excludes secondary)	310	298	277	345	296
Apparent[2] (includes secondary)	390	565	467	488	520
Price, chromite, yearend:					
South African, dollars per metric ton, South Africa	55	61	75	73	68
Turkish, dollars per metric ton, Turkey	108	144	225	180	145
Stocks, industry, yearend	101	80	74	72	60
Net import reliance[3] as a percent of apparent consumption	75	80	79	75	79

Recycling: In 1998, chromium contained in purchased stainless steel scrap accounted for 21% of apparent consumption.

Import Sources (1994-97): Chromium contained in chromite ore and chromium ferroalloys and metal: South Africa, 39%; Russia, 16%; Turkey, 11%; Zimbabwe, 8%; Kazakhstan, 6%; and other, 20%.

Tariff:[4] Item	Number	Normal Trade Relations (NTR) 12/31/98	Non-NTR[5] 12/31/98
Ore and concentrate	2610.00.0000	Free	Free.
Ferrochromium, high-carbon	7202.41.0000	1.9% ad val.	7.5% ad val.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: The National Defense Stockpile Agency submitted the Annual Materials Plan for 1999 in February 1998. In addition to the stockpile-grade uncommitted inventory listed below, the stockpile contains the following nonstockpile-grade uncommitted inventory, in thousand metric tons: 36.6, metallurgical chromite ore; 0.6, high-carbon ferrochromium; 10.4, low-carbon ferrochromium; and 1.24, ferrochromium-silicon.

Stockpile Status—9-30-98[6]

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1998	Disposals FY 1998	Average chromium content
Chromite ore:						
Chemical-grade	162	48.2	132	90.7	—	28.6%
Metallurgical-grade	319	95.4	319	227	45.8	28.6%
Refractory-grade	202	85.2	58.0	90.7	5.44	[e]23.9%
Chromium ferroalloys:						
Ferrochromium:						
High-carbon	645	15.2	91.8	35.2	35.2	71.4%
Low-carbon	276	3.32	276	6.87	6.87	71.4%
Ferrochromium-silicon	49.4	1.78	49.4	3.26	3.26	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 eighty percent of world production, are India, Kazakhstan, South Africa, and Turkey. South

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

CHROMIUM

Africa alone accounts for nearly one-half of world production and has been the major supplier of chromium in the form of chromite ore 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 pre-heating 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, which resulted in pressure to lower the price of stainless steel produced in North America and Europe. Oversupply of stainless steel in the world market was expected to result in slowed or negative production growth which, in turn, would be reflected in reduced demand for ferrochromium.

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]
	1997	1998[e]	(shipping grade)[8]	
United States	—	—	—	10,000
Brazil	330	300	14,000	17,000
Finland	611	600	41,000	120,000
India	1,360	1,400	27,000	67,000
Iran	200	200	2,400	2,400
Kazakhstan	1,000	1,000	410,000	410,000
Russia	150	130	4,000	460,000
South Africa	5,780	6,000	3,000,000	5,500,000
Turkey	1,750	1,700	8,000	20,000
Zimbabwe	680	670	140,000	930,000
Other countries	639	600	35,000	43,000
World total (may be rounded)	12,500	12,600	3,700,000	7,600,000

World Resources: World resources exceed 11 billion tons of shipping-grade chromite, sufficient to meet conceivable demand for centuries. About 95% of chromium resources are 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. According to the National Academy of Sciences, 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]Calculated demand for chromium is production + imports - exports + stock adjustment.

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

[4]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.

[5]See Appendix B.

[6]See Appendix C for definitions.

[7]See Appendix D 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.