

**CHROMIUM STATISTICS<sup>1</sup>**

**U.S. GEOLOGICAL SURVEY**

[All values in metric tons (t) contained chromium unless otherwise noted]

Last modification: February 8, 2008

Year	Primary production	Secondary production	Imports	Exports	Industry stocks	Government stocks	Reported chromite ore consumption	Reported chromium ferroalloy and metal consumption	Apparent consumption	Unit value (\$/t)	Unit value (98\$/t)	World production
1900	44		5,540						5,580	56	1,090	16,500
1901	116		6,390						6,510	59	1,160	27,900
1902	99		12,500						12,600	47	882	26,400
1903	47		7,230						7,280	42	765	29,500
1904	39		7,640						7,680	46	836	36,600
1905	7		17,100						17,100	43	769	44,500
1906	34		13,700						13,700	41	738	49,700
1907	91		13,200						13,300	37	652	34,700
1908	113		8,800						8,910	40	731	20,700
1909	188		12,500						12,700	38	685	33,300
1910	64		12,200						12,300	35	608	33,600
1911	38		12,000						12,000	35	603	25,100
1912	63		17,300						17,400	30	498	38,000
1913	80		20,700						20,800	30	501	45,500
1914	186		25,500						25,700	28	449	48,500
1915	1,030		24,100						25,100	33	526	57,400
1916	14,800		36,500						51,300	44	660	87,000
1917	13,800		22,700						36,400	59	750	81,300
1918	25,900		31,500						57,400	118	1,280	96,500
1919	1,600		19,600						21,200	72	680	52,900
1920	787		48,500						49,300	41	333	53,200
1921	89		26,100						26,200	25	232	41,400
1922	112		28,600						28,700	26	255	43,300
1923	71		40,700						40,800	28	265	63,500
1924	91		37,600						37,600	29	280	90,200
1925	34		47,600						47,600	26	239	95,300
1926	44		68,100						68,200	25	232	112,000
1927	63		70,000						70,100	25	235	124,000
1928	208		68,600	1,380					67,500	25	240	140,000
1929	85		101,000	927					99,700	27	255	197,000
1930	25		103,000	781					102,000	34	334	173,000
1931	90		71,500	698					70,900	46	498	127,000
1932	53		30,600	978					29,700	53	635	101,000
1933	257		35,800						36,000	40	503	123,000

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1934	111		57,800						57,900	39	480	183,000
1935	161		80,900						81,100	45	530	241,000
1936	81		98,300						98,400	45	529	317,000
1937	720		172,000						173,000	43	482	392,000
1938	262		114,000						114,000	43	494	362,000
1939	1,070		93,900						95,000	41	477	347,000
1940	849		210,000			16,600	157,000		211,000	42	486	457,000
1941	3,960		310,000	530		20,800	220,000		309,000	41	455	509,000
1942	32,100		279,000	1,350		83,000	239,000		248,000	56	562	637,000
1943	43,300		251,000	8,390		90,900	262,000		278,000	65	617	542,000
1944	12,200		227,000	596		719,000	232,000		231,000	70	651	411,000
1945	3,800		253,000	4,190		721,000	220,000	79,300	251,000	70	634	318,000
1946	1,120		207,000	1,980	87,700	758,000	197,000	67,300	169,000	52	434	352,000
1947	259		308,000	2,990	105,000	852,000	213,000	62,300	194,000	64	466	521,000
1948	992		427,000	4,850	160,000	945,000	232,000	67,400	275,000	76	513	644,000
1949	119		334,000	2,190	194,000	1,040,000	172,000	48,200	204,000	76	522	650,000
1950	112		374,000	904	160,000	1,130,000	258,000	81,200	314,000	74	503	720,000
1951	1,870		394,000	907	169,000	1,220,000	321,000	107,000	293,000	80	501	823,000
1952	5,540		456,000	1,240	196,000	1,320,000	308,000	142,000	339,000	94	580	963,000
1953	15,500		604,000	785	269,000	1,410,000	354,000	156,000	452,000	110	669	1,130,000
1954	41,900		387,000	3,130	334,000	1,500,000	241,000	114,000	268,000	85	516	924,000
1955	39,700		493,000	5,150	296,000	1,600,000	423,000	165,000	472,000	86	523	1,040,000
1956	54,500		595,000	5,790	362,000	1,690,000	499,000	162,000	515,000	96	577	1,200,000
1957	44,400		640,000	1,630	481,000	1,780,000	480,000	132,000	470,000	112	652	1,370,000
1958	38,500		356,000	1,830	453,000	1,880,000	332,000	106,000	327,000	112	631	1,130,000
1959	27,900		475,000	8,710	529,000	1,970,000	359,000	153,000	325,000	135	756	1,150,000
1960	27,400		387,000	13,300	532,000	2,060,000	323,000	137,000	311,000	86	476	1,250,000
1961	21,700		369,000	8,420	492,000	2,160,000	317,000	147,000	329,000	70	379	1,220,000
1962	0	99,300	405,000	4,370	527,000	2,220,000	300,000	150,000	402,000	125	673	1,280,000
1963	0	110,000	396,000	6,000	508,000	2,250,000	323,000	169,000	488,000	116	619	1,170,000
1964	0	129,000	419,000	4,360	388,000	2,270,000	396,000	208,000	650,000	124	652	1,290,000
1965	0	130,000	466,000	3,450	361,000	2,210,000	434,000	221,000	893,000	130	670	1,490,000
1966	0	149,000	590,000	10,400	405,000	2,190,000	404,000	233,000	708,000	121	609	1,360,000
1967	0	133,000	390,000	10,700	397,000	2,170,000	383,000	202,000	547,000	132	644	1,430,000

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<b>Year</b>	<b>Primary production</b>	<b>Secondary production</b>	<b>Imports</b>	<b>Exports</b>	<b>Industry stocks</b>	<b>Government stocks</b>	<b>Reported chromite ore consumption</b>	<b>Reported chromium ferroalloy and metal consumption</b>	<b>Apparent consumption</b>	<b>Unit value (\$/t)</b>	<b>Unit value (98\$/t)</b>	<b>World production</b>
1968	0	135,000	352,000	20,100	321,000	2,130,000	371,000	208,000	577,000	138	645	1,560,000
1969	0	183,000	351,000	29,100	266,000	2,080,000	398,000	218,000	619,000	138	614	1,670,000
1970	0	147,000	427,000	29,000	267,000	2,030,000	394,000	194,000	593,000	128	538	1,910,000
1971	0	149,000	420,000	16,000	382,000	1,960,000	308,000	180,000	505,000	188	755	2,000,000
1972	0	149,000	399,000	14,300	341,000	1,910,000	320,000	217,000	623,000	197	767	1,970,000
1973	0	166,000	359,000	18,300	226,000	1,840,000	389,000	286,000	694,000	211	774	2,030,000
1974	0	206,000	397,000	13,300	195,000	1,710,000	398,000	327,000	747,000	321	1,060	2,230,000
1975	0	121,000	530,000	49,800	367,000	1,610,000	232,000	183,000	535,000	587	1,780	2,530,000
1976	0	168,000	475,000	44,600	398,000	1,530,000	262,000	225,000	642,000	503	1,440	2,430,000
1977	0	168,000	460,000	59,000	461,000	1,390,000	254,000	244,000	651,000	498	1,340	2,600,000
1978	0	165,000	426,000	24,300	412,000	1,390,000	250,000	270,000	617,000	460	1,150	2,990,000
1979	0	186,000	384,000	25,600	314,000	1,390,000	295,000	294,000	644,000	586	1,310	2,590,000
1980	0	154,000	421,000	29,900	212,000	1,290,000	233,000	229,000	727,000	638	1,260	2,830,000
1981	0	157,000	463,000	33,200	228,000	1,290,000	209,000	230,000	570,000	708	1,270	2,550,000
1982	0	121,000	214,000	11,300	177,000	1,290,000	135,000	143,000	374,000	678	1,150	2,390,000
1983	0	155,000	211,000	12,000	154,000	1,290,000	83,400	208,000	377,000	649	1,060	2,540,000
1984	0	163,000	323,000	34,400	111,000	1,250,000	136,000	210,000	527,000	724	1,140	2,950,000
1985	0	164,000	304,000	40,200	102,000	1,260,000	143,000	188,000	433,000	763	1,160	3,180,000
1986	0	161,000	363,000	38,700	97,900	1,270,000	107,000	191,000	474,000	680	1,010	3,530,000
1987	0	178,000	322,000	10,600	107,000	1,240,000	141,000	231,000	512,000	658	944	3,450,000
1988	0	213,000	449,000	15,500	132,000	1,220,000	160,000	243,000	649,000	1,050	1,440	3,870,000
1989	0	176,000	380,000	27,200	135,000	1,260,000	163,000	214,000	486,000	1,240	1,630	4,320,000
1990	0	185,000	346,000	16,300	121,000	1,270,000	120,000	226,000	515,000	892	1,110	3,950,000
1991	0	175,000	310,000	18,200	115,000	1,250,000	115,000	208,000	491,000	900	1,080	4,060,000
1992	0	187,000	324,000	17,900	115,000	1,280,000	116,000	218,000	462,000	878	1,020	3,420,000
1993	0	171,000	330,000	20,900	100,000	1,210,000	109,000	218,000	564,000	689	777	3,080,000
1994	0	170,000	273,000	33,200	98,800	1,170,000	104,000	206,000	460,000	694	764	3,090,000
1995	0	189,000	415,000	26,700	77,000	1,120,000	105,000	193,000	643,000	1,210	1,300	4,530,000
1996	0	177,000	362,000	51,000	72,400	1,070,000	87,200	190,000	545,000	934	970	3,660,000
1997	0	194,000	350,000	30,300	69,500	1,020,000	108,000	225,000	563,000	1,020	1,040	4,330,000
1998	0	177,000	384,000	62,400	57,100	929,000	83,600	192,000	597,000	909	909	4,460,000
1999	0	193,000	476,000	60,300	52,500	910,000		217,000	632,000	709	694	4,810,000
2000	0	207,000	453,000	86,300	13,600	825,000		220,000	657,000	761	721	4,750,000
2001	0	141,000	239,000	43,000	16,700	816,000		208,000	344,000	854	786	3,740,000

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2002		218,521	404,672	133,638	8,385	643,385		241,274	670,212	790	716	4,505,659
2003		250,156	440,929	187,673	9,871	560,241		244,904	585,069	892	790	4,735,215
2004		233,001	488,622	170,923	7,897	465,901		267,774	647,015	1,375	1,186	5,463,772
2005		254,777	503,073	219,695	8,603	374,929		256,851	628,421	1,508	1,259	5,944,937
2006		234,458	520,236	212,197	9,644	271,659		257,815	644,725	1,412	1,142	5,849,910

<sup>1</sup>Compiled by T.G. Goonan and J.F. Papp.

Data are calculated, estimated, or reported. See notes for more information.

## Chromium Worksheet Notes

### Data Sources

The sources of data for this chromium worksheet are the mineral statistics publications of the U.S. Bureau of Mines and the U.S. Geological Survey—Minerals Yearbook (MYB) and its predecessor, Mineral Resources of the United States (MR), and Mineral Commodity Summaries (MCS) and its predecessor, Commodity Data Summaries (CDS). The years of publication and corresponding years of data coverage are listed in the References section. Blank cells in the worksheet indicate that data either were not available or were withheld from publication because they are proprietary.

### Primary Production

Primary production is an estimate of U.S. chromite ore production measured in contained chromium. U.S. chromite ore production has been intermittent. Production was last reported in 1961. Government purchase programs during World War I (1914–18), World War II (1939–45), and stockpile-building period (1951–61) associated with the Korean War (1950–52) and the Cold War were responsible for most production from U.S. chromite deposits. Chromite ore production was estimated from chromite ore shipments reported in gross weight. The grade of domestic chromite ore shipments was assumed to be the same as that of imports for the same year.

### Secondary Production

Secondary production is an estimate of chromium supply from recycled materials measured in contained chromium. Secondary chromium production was estimated from stainless steel scrap receipts reported in gross weight that were first reported in 1962. Stainless steel was not produced in large quantities until after World War II. The chromium content of stainless steel scrap was assumed to be 17 percent (Papp, 1991). The method of secondary production was changed in 2002 to account for scrap trade.

### Imports

Imports are an estimate of the amount of chromite ore and value-added products—chromium chemicals, ferroalloys, and metal—imported into the United States measured in contained chromium. Imports reported here exclude steel mill and manufactured products that contain chromium-alloyed steel and steel scrap. Over the years, the United States has imported most of its chromium requirements, either as chromite ore, to be converted domestically into value-added products, or as the value-added products themselves. In most years, the chromic oxide content of chromite ore and the chromium content of value-added materials were reported. For those years for which contents were not reported, they were estimated based on those years in which they were reported. Stainless steel mill products were added to imports in 2002.

### Exports

Exports are an estimate of the amount of chromite ore and value-added products exported from the United States measured in contained chromium. Exports of chromium-containing materials were not reported prior to 1941 in the sources referenced. Exports exclude steel mill and manufactured products that contain chromium-alloyed steel and steel scrap. The reported chromium content of chromium-containing export materials was used where it was available. Where it was not reported, an approximation of chromium content was made based on imports of a similar material. Stainless steel mill products were added to exports in 2002.

### Industry and Government Stocks

Stocks are an estimate of the amount of industry and government chromium-containing material stocks reported at the end of each year and measured in contained chromium. Industry stocks were classified by industry and by material; government stocks, by material.

The appearance of stocks data for each year suggests a continuous series of information. Actually, overlapping data series for particular materials or material within an industry that start and stop contribute to one stocks series. Chromite ore consumer stocks contribute over the 1946–99 time period; however, chromite ore producer stocks were never reported. Chromium ferroalloy consumer stocks contribute from 1956 through the present and metal consumer stocks contribute from 1972 through the present. Chromium ferroalloy and metal producer stocks contribute over the 1956–97 time period.

U.S. Government stocks were first accounted for in a complete way in 1944 when those stocks included only chromite ore and high-carbon ferrochromium. There was a hiatus in reporting Government stocks from 1947–60 for chromite ore and from 1947–64 for high-carbon ferrochromium. In 1962, reported metallurgical and refractory grade chromite ore stocks appear to have been too large. High-carbon ferrochromium government stocks in 1945 and chromite ore stocks in 1946 appeared inconsistent with data that precede and follow them, so they were replaced with interpolated values. Government stocks were not reported in 1966 and 1978. Low-carbon ferrochromium, ferrochromiumsilicon, and chromium metal stocks were first reported in 1965. For those time periods during which Government stocks could be interpolated, they were.

Because materials drop in and out of the material stock data series, computing stock change as current minus previous-year government plus industry stocks, or even government and industry stocks independently, can give misleading results in the sense that some of the change results from materials dropping in and out of the supporting data series. To avoid counting materials dropping in or out of a stocks data series as stock changes, stock changes were estimated by material for Government and industrial stocks, and

then accumulated. Since it takes 2 years to compute a stock change, the current and previous year, a stock change could be estimated starting in the second year of a data series.

### **Reported Chromite Ore and Chromium Ferroalloy and Metal Consumption**

Reported consumption is an estimate of the amount of chromium contained in the industry-reported consumption of chromite ore and chromium ferroalloys and metal. Industry-reported consumption is an estimate of the amount of chromium contained in the reported consumption of chromite ore and chromium ferroalloys and metal. Industry-reported consumption of chromite ore began in 1940 and ended in 1998. Industry-reported consumption of chromium ferroalloys and metal started in 1945 and continued through the present.

### **Apparent Consumption**

Apparent consumption, as defined here, is the sum of production (i.e., primary plus secondary), plus net imports (i.e., imports minus exports), plus stock change (i.e., previous-year minus current-year) measured in contained chromium. Chromium apparent consumption is an accounting balance of chromium-containing materials on a national scale that indicates national chromium consumption. Apparent consumption reported here is calculated from the primary production, secondary production, imports, and exports data series presented here; however, stock change is not computed from the stocks data presented here. (See the stocks section for an explanation of the estimation of stock change.)

Using general category names like production, imports, exports, and stocks, hides changes that occurred over the time period. As one goes back in time, certain of the variables that go into the calculation of apparent consumption drop out due to lack of reported data. For example, secondary production drops out in 1961; stock adjustments drop out in 1940; and exports drop out in 1940 through 1933 then dropped out again in 1927. Primary production drops in 1961. These changes can be seen in the chromium statistics table. There are more subtle changes that cannot be seen in the general category data series. Materials that constitute imports, exports, and stocks change over time. For example, chromite ore contributes to imports over the entire time period while chromium ferroalloy imports were not reported before 1911 and exports were not reported before 1913. In 1989, the Harmonized Tariff System was implemented causing changes in many of the trade material categories.

### **Unit Value (\$/t)**

Unit value for chromium is estimated annually based on the U.S. dollar (expressed as current dollars) value and chromium content of reported exports, imports, and production. Unit value is apparent consumption estimated in monetary units divided by apparent consumption estimated in mass units. Unit value is a mass-weighted average value computed as apparent consumption is computed. Values are based on trade. Secondary production value per unit of contained chromium is assumed to be the same as that of imported high-carbon ferrochromium.

### **Unit Value (98\$/t)**

The Consumer Price Index, with 1998 as the base year, is used to adjust unit value in current dollars to the unit value in constant 1998 dollars.

### **World Production**

World production is an estimate of world chromite ore mine production measured in contained chromium. World production reported in gross weight was converted to contained chromium by assuming that its chromic oxide content was the same as that of chromite ore imported into the United States. Before content of chromite ore was reported, a time-averaged value was used.

### **References**

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