

## COBALT

(Data in metric tons of cobalt content unless otherwise noted)

**Domestic Production and Use:** The United States did not mine or refine cobalt in 2005; however, negligible amounts of byproduct cobalt were produced as intermediate products from some mining operations. U.S. supply comprised imports, stock releases, and secondary materials, such as cemented carbide scrap, spent catalysts, and superalloy scrap. There were two domestic producers of extra-fine cobalt powder: one produced powder from imported primary metal and another produced powder from cemented carbide scrap. In addition to the powder producers, seven companies were known to produce cobalt compounds. Nearly 70 industrial consumers were surveyed on a monthly or annual basis. Data reported by these consumers indicate that approximately 43% of U.S. cobalt use was in superalloys, which are used mainly in aircraft gas turbine engines; 9% was in cemented carbides for cutting and wear-resistant applications; 22% was in various other metallic uses; and the remaining 26% was in a variety of chemical uses. The total estimated value of cobalt consumed in 2005 was \$350 million.

<b>Salient Statistics—United States:</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005<sup>e</sup></b>
Production:					
Mine	—	—	—	—	—
Secondary	2,810	2,750	2,130	2,300	2,400
Imports for consumption	9,410	8,450	8,080	8,720	10,500
Exports	3,210	2,080	2,710	2,510	2,700
Shipments from Government stockpile excesses	3,050	524	2,380	1,630	1,000
Consumption:					
Reported (includes secondary)	9,540	7,880	7,590	8,450	9,000
Apparent <sup>1</sup> (includes secondary)	11,800	9,830	10,000	9,920	11,000
Price, average annual spot for cathodes, dollars per pound	10.55	6.91	10.60	23.93	15.80
Stocks, industry, yearend	1,330	1,140	1,010	1,240	1,440
Net import reliance <sup>2</sup> as a percentage of apparent consumption	76	72	79	77	78

**Recycling:** In 2005, cobalt contained in purchased scrap represented an estimated 27% of cobalt reported consumption.

**Import Sources (2001-04):** Cobalt contained in metal, oxide, and salts: Finland, 18%; Norway, 18%; Russia, 17%; Canada, 10%; and other, 37%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations<sup>3</sup> 12-31-05</b>
Unwrought cobalt, alloys	8105.20.3000	4.4% ad val.
Unwrought cobalt, other	8105.20.6000	Free.
Cobalt mattes and other intermediate products; cobalt powders	8105.20.9000	Free.
Cobalt waste and scrap	8105.30.0000	Free.
Wrought cobalt and cobalt articles	8105.90.0000	3.7% ad val.
Chemical compounds:		
Cobalt oxides and hydroxides	2822.00.0000	0.1% ad val.
Cobalt sulfates	2833.29.1000	1.4% ad val.
Cobalt chlorides	2827.34.0000	4.2% ad val.
Cobalt carbonates	2836.99.1000	4.2% ad val.
Cobalt acetates	2915.23.0000	4.2% ad val.
Cobalt ores and concentrates	2605.00.0000	Free.

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

**Government Stockpile:** Sales of National Defense Stockpile cobalt began in March 1993. Disposal limits for cobalt materials in the fiscal year 2006 Annual Materials Plan were unchanged from those of fiscal year 2005.

### Stockpile Status—9-30-05<sup>4</sup>

<b>Material</b>	<b>Uncommitted inventory</b>	<b>Committed inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 2005</b>	<b>Disposals FY 2005</b>
Cobalt	1,570	239	1,570	2,720	1,120

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**Events, Trends, and Issues:** The availability of refined cobalt worldwide increased during the first half of 2005 compared with that of the first half of 2004, as world refinery production was higher and shipments of cobalt from the National Defense Stockpile continued to contribute to supply. Cobalt prices trended downward during the first 10 months of 2005, reflecting adequate supply to meet demand.

In recent years, exports of cobalt-rich ores from Congo (Kinshasa) to refineries mainly in China have helped to balance cobalt supply and demand. Future export of these ores could be affected by declining cobalt prices, which could make their export less economical, and by efforts by the Government of Congo (Kinshasa) to require that cobalt ores be processed before being exported.

Health, safety, and environmental issues are becoming increasingly significant to metals such as cobalt. The European Commission's new chemicals policy, if implemented as proposed, would affect all suppliers of cobalt materials to the European market by requiring them to collect and submit risk assessment data on each material produced in or imported into the European Union.

**World Mine Production, Reserves, and Reserve Base:** Reserves and reserve base estimates for Australia were revised downward from those previously published based on information reported by the Government of Australia. Reserves estimate for Canada was revised downward based on information reported by major Canadian nickel sulfide ore producers.

	Mine production		Reserves <sup>5</sup>	Reserve base <sup>5</sup>
	<u>2004</u>	<u>2005<sup>e</sup></u>		
United States	—	—	NA	860,000
Australia	6,700	6,600	1,300,000	1,600,000
Brazil	1,400	1,400	35,000	40,000
Canada	5,200	5,700	130,000	350,000
Congo (Kinshasa)	16,000	16,000	3,400,000	4,700,000
Cuba	3,600	3,600	1,000,000	1,800,000
Morocco	1,600	1,600	20,000	NA
New Caledonia <sup>6</sup>	1,400	1,400	230,000	860,000
Russia	4,700	5,000	250,000	350,000
Zambia	10,000	9,000	270,000	680,000
Other countries	<u>1,800</u>	<u>2,100</u>	<u>200,000</u>	<u>1,500,000</u>
World total (rounded)	52,400	52,400	7,000,000	13,000,000

**World Resources:** Identified cobalt resources of the United States are estimated to be about 1 million tons. Most of these resources are in Minnesota, but other important occurrences are in Alaska, California, Idaho, Missouri, Montana, and Oregon. With the exception of resources in Idaho and Missouri, any future cobalt production from these deposits would be as a byproduct of another metal. Identified world cobalt resources are about 15 million tons. The vast majority of these resources are in nickel-bearing laterite deposits, with most of the rest occurring in nickel-copper sulfide deposits hosted in mafic and ultramafic rocks in Australia, Canada, and Russia, and in the sedimentary copper deposits of Congo (Kinshasa) and Zambia. In addition, millions of tons of hypothetical and speculative cobalt resources exist in manganese nodules and crusts on the ocean floor.

**Substitutes:** In most applications, substitution of cobalt would result in a loss in product performance. Potential substitutes include barium or strontium ferrites, neodymium-iron-boron, or nickel-iron alloys in magnets; nickel, cermet, or ceramics in cutting and wear-resistant materials; nickel-base alloys or ceramics in jet engines; nickel in petroleum catalysts; rhodium in hydroformylation catalysts; cobalt-manganese-nickel in lithium-ion batteries; and cerium, iron, lead, manganese, or vanadium in paints.

<sup>e</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>The sum of U.S. secondary production, as estimated from consumption of purchased scrap, and net import reliance.

<sup>2</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>3</sup>No tariff for Canada or Mexico. Tariffs for other countries for some items may be eliminated under special trade agreements.

<sup>4</sup>[See Appendix B for definitions.](#)

<sup>5</sup>[See Appendix C for definitions.](#)

<sup>6</sup>Overseas territory of France.