

# Cobalt

*Adapted from the cobalt section of the USGS Mineral Commodity Summaries 2002, prepared by Kim B. Shedd.*

The United States did not mine or refine cobalt in 2001. However, a small number of mining operations produced negligible amounts of byproduct cobalt as intermediate products. U.S. cobalt supply comprised imports, stock releases, and secondary materials, such as superalloy scrap, cemented carbide scrap, and spent catalysts. There were two domestic producers of extra-fine cobalt powder: One produced powder from imported primary metal, and another produced powder from recycled materials. In addition to the powder producers, at least seven companies produced cobalt compounds.

A survey of nearly 90 industrial consumers indicated that approximately 44 percent of U.S. cobalt use was in superalloys, which are used primarily in aircraft gas turbine engines; 9 percent was in cemented carbides for cutting and wear-resistant applications; 20 percent was in various other metallic uses; and the remaining 27 percent was in a variety of chemical uses. The total estimated value of cobalt consumed in 2001 was \$250 million.

World production of refined cobalt has steadily increased since 1993. Some of the increase has been from new operations and some has been from a net increase in production by established producers. During this period, sales of cobalt from the National Defense Stockpile and cobalt in recycled scrap have also contributed to supply.

World demand for cobalt is strongly influenced by general economic conditions and by demand from industries that consume large quantities of cobalt, such as superalloy melters and manufacturers of rechargeable batteries. In 2001, several factors reduced overall demand for cobalt, including weak economic conditions in major consuming countries such as the United States and Japan, and a decrease in the production of rechargeable batteries. The terrorist attacks of September 11 in the United States caused economic uncertainty, concern that renewed U.S. industrial activity would be delayed, and financial problems for the U.S. commercial airline industry, a major consumer of superalloys.

Since 1995, the general trend in cobalt prices has been downward. This trend is likely to continue if cobalt supply continues to increase at a faster rate than that of cobalt demand, or if cobalt demand decreases without a reduction in supply.

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 U.S. resources would be as a byproduct of another metal.

Identified world cobalt resources are about 11 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.

Past periods of high prices and concern about availability have resulted in various efforts to conserve, reduce, or substitute for cobalt. In many applications, further substitution of cobalt would result in a loss in product performance.

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The mineral cobaltite is a rare, but important, source of cobalt. Image from *Minerals in Your World*.