

Tungsten

U.S. Geological Survey tungsten commodity specialist Kim B. Shedd has compiled the following information on tungsten, an important metal used in wear-resistant materials and lighting.

Tungsten has the highest melting point of all metals, one of the highest densities and, when combined with carbon, is almost as hard as diamond. These and other properties make it useful in a wide variety of important commercial, industrial and military applications.

One hundred years ago, the main use of tungsten was as an additive to steel, and scientists were just beginning to research the use of tungsten filaments in lightbulbs. Today, although lamp filaments may be the most familiar use of tungsten, the leading use is in cemented carbides. Cemented carbides, which are also called hardmetals, are made by pressing and sintering tungsten carbide particles in a binder matrix of cobalt metal powder. The resulting wear-resistant parts are used in tools and equipment by the construction, metalworking, mining, and oil and gas drilling industries.

Today, tungsten is still used to make high-speed and tool steels. Pure tungsten metal or alloy is also used to make metal contacts, electrodes and wires in a variety of electrical, electronic, heating, lighting and welding applications. Tungsten heavy alloys are used to make armaments, heat sinks, radiation shielding, and weights and counterweights. Tungsten is also used in superalloys and wear-resistant alloys. A relatively new use for tungsten alloys and composites is as a substitute for lead in bullets and shot. The main chemical use for tungsten is to make catalysts.

Government stockpiles have played an important role in tungsten supply and demand over the years. During the Cold War, large quantities of tungsten materials were stockpiled in the United States and Soviet Union. From 1992 until 2004, tungsten materials were released from former Soviet stockpiles and exported to Western markets. Sales of tungsten materials from the U.S. government's National Defense Stockpile began in 1999 and continue today. At proposed disposal rates, sales of U.S. government stocks of tungsten ores and concentrates could last about seven more years.

China has long been the world's leading tungsten ore producer. More than 90 percent of the world's tungsten is mined there.

In the late 1990s, the Chinese government began a program to make full use of its tungsten resources and to try to stabilize world tungsten prices. This program included regulating the production of tungsten concentrates through mine closures and production quotas, and regulating tungsten exports by restricting the volumes and types of tungsten materials and products that could be sent out of the country. The export of tungsten ore concentrates was forbidden, and over the years there has been a gradual shift toward exporting more value-added downstream tungsten materials and products.

In recent years, most of the remaining tungsten mine production took place in Austria, Bolivia, Canada, Portugal, Russia and possibly North Korea. High prices in the past few years have

resulted in various companies working towards developing tungsten deposits or reopening inactive tungsten mines in Australia, China, Peru, Russia, the western United States and Vietnam.

Demand for tungsten tends to follow general economic conditions and industrial activity. During the past decade, the growth in China's economy has resulted in a significant increase in Chinese consumption of tungsten raw materials to produce downstream products, such as cemented carbide tools, for its domestic market. China is now estimated to be the world's leading tungsten consumer.

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Tungsten is found in several ores, including wolframite (shown here) and scheelite. Image from *Minerals in Your World*.