Magnesium

Deborah A. Kramer, the Magnesium Commodity Specialist for the U.S. Geological Survey, has compiled the following information about magnesium, an important mineral for aluminum production.

Magnesium, often confused with last month's mineral of the month manganese, is valued primarily because of its light weight and high strength-to-weight ratio. Magnesium is the eighth most abundant element and constitutes about 2 percent of the Earth's crust. It is the third most plentiful element dissolved in seawater, with a concentration averaging 0.13 percent. Magnesium is found in over 60 minerals, and also is recovered from seawater, wells, and lake brines and bitterns.

Magnesium metal has been produced continuously in the United States since it was first recovered in 1916. The height of magnesium production in the United States was during World War II, when 15 magnesium plants were operating to supply magnesium for aircraft production.

Today, magnesium is produced at only one plant in the United States. Its largest use is as an alloying addition to increase the hardness and corrosion resistance of aluminum. The single largest application for magnesium-containing alloys of aluminum is the aluminum beverage can, which has a magnesium content of about 4.5 percent in the lid and about 1.1 percent in the can body. Without magnesium in the alloys, aluminum beverage cans would be as flexible as a toothpaste tube.

Magnesium and its alloys have structural uses in the forms of die castings, sand and permanent mold castings, and wrought products. Automakers have introduced magnesium components such as clutch housings, instrument panel supports, headlamp assemblies and grill covers to reduce vehicular weight. From the 1977 to the 2004 model years, magnesium die castings in automotive applications have increased from an average of 1 pound per vehicle to 10 pounds per vehicle. The power tool market includes magnesium castings in chain saws and lawnmower housings. Die-cast magnesium also is used in video camera, cell phone and computer components.

In the iron and steel industry, magnesium is used as an external hot-metal desulfurization agent, and it is used in the production of nodular iron. Magnesium is used as a catalyst for producing certain organic chemicals and petrochemicals and as a reducing agent for producing other nonferrous metals. Anodes of magnesium are frequently used in underground pipes and water tanks, water heaters and marine applications.

World production of primary magnesium metal in 2004 was about 584,000 metric tons, with China as the world's leading producer, accounting for about 426,000 metric tons. The sole magnesium plant in the United States has the capacity to produce 43,000 metric tons per year, but U.S. consumption in 2004 was about 140,000 metric tons, much of which was supplied by imports. In 2004, Canada, China, Israel and Russia supplied 92 percent of the 99,000 metric tons of U.S. imports.

Magnesium recycled from old scrap supplied about 15 percent of U.S. consumption. Magnesium is recycled from new scrap generated mainly during the production of magnesium structural

products. Recycled magnesium also comes from old scrap such as used beverage cans and other discarded consumer products.

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Sample of magnesium metal with penny for scale. Image from *Minerals in Your World*.