

Aluminum

Patricia A. Plunkert, the aluminum commodity specialist for the U.S. Geological Survey has compiled the following information about aluminum, a metal that is used in virtually all segments of the economy.

Aluminum is the second most abundant metallic element in Earth's crust after silicon. Even so, it is a comparatively new industrial metal that has been produced in commercial quantities for little more than 100 years. Aluminum is lightweight, ductile, malleable and corrosion resistant, and is a good conductor of heat and electricity. Weighing about one-third as much as steel or copper per unit of volume, aluminum is used more than any other metal except iron. Aluminum can be fabricated into desired forms and shapes by every major metalworking technique to add to its versatility.

The largest markets for aluminum are transportation, packaging, construction, electrical, consumer durables, and machinery and equipment. The transportation sector, which is the largest market for aluminum in the United States and worldwide, includes the manufacture of automobiles, buses, trailers, ships, railroad and subway cars, as well as aerospace applications and mobile homes. Aluminum's light weight and recyclability have provided the impetus for its increased use by the automotive industry to help meet corporate average fuel-economy standards.

Until a few years ago, though, packaging was the largest market for aluminum in the United States. Aluminum is used in such products as beverage cans, food containers, and household and institutional foil. Beverage cans in the United States are made almost exclusively of aluminum, but because of consumer preference, aluminum faces stiffer competition from steel cans and glass and plastic containers in other areas of the world.

Primary aluminum is produced from bauxite deposits, which form from the weathering of aluminum-bearing rocks under conditions of warm, wet climates; good subsurface drainage; and long periods of tectonic stability. In the weathering process, the aluminum is retained as hydrated aluminum oxide minerals, and other constituents are leached from the parent rock.

World bauxite reserves have been estimated at 23 billion metric tons. Guinea and Australia together possess more than one-half of the world's reserves. More than 25 percent of reserves occur in the Western hemisphere, principally in Brazil, Jamaica, Guyana and Suriname.

The United States is entirely dependent on foreign sources for metallurgical-grade bauxite. Most of the U.S. imports come from Brazil, Guinea and Jamaica and are shipped to refineries in Louisiana and Texas. Although the United States is the world's leading consumer of aluminum metal, it is no longer the dominant producer. The U.S. share of world production has fallen from just over 40 percent in 1960 to less than 10 percent in 2004. China and Russia have emerged as the leading metal producers with a combined production of almost 35 percent of the world total in 2004. Total world production in 2004 was 29.8 million metric tons.

The recovery of aluminum metal from scrap has become a major component of domestic aluminum supply. In 1960, 450,000 metric tons of aluminum were recovered from new and old

scrap. In 2004, more than 3 million metric tons of metal were recovered from scrap in the United States. In 2004, more than 51 billion used aluminum beverage cans were recycled, accounting for more than one-half of all aluminum beverage can shipments that year.

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Sample of aluminum metal. Image from *Minerals in Your World*.