

40 Common Minerals and Their Uses

Aluminum

The most abundant metal element in Earth's crust. Aluminum originates as an oxide called alumina. Bauxite ore is the main source of aluminum and is imported from Jamaica, Brazil, Guinea, Guyana, etc. It's used in transportation (automobiles), packaging, building/construction, electrical, machinery and other applications. The U.S. was 52 percent import reliant for aluminum in 2016.

Antimony

A native element, antimony metal is extracted from stibnite ore and other minerals. It is used as a hardening alloy for lead, especially storage batteries and cable sheaths. It's also used in bearing metal, type metal, solder, collapsible tubes and foil, sheet and pipes and semiconductor technology. Antimony is used as a flame retardant, in fireworks and in antimony salts, which are used in the rubber, chemical and textile industries, as well as medicine and glassmaking. The U.S. was 83 percent import reliant in 2016.

Barium

A heavy metal contained in barite. It's used as a heavy additive in oil well drilling; in the paper and rubber industries; as a filler or extender in cloth, ink and plastics products; in radiography ("barium milkshake"); as a deoxidizer for copper; a sparkplug in alloys; and in making expensive white pigments.

Bauxite

Rock composed of hydrated aluminum oxides. In the U.S., it is primarily converted to alumina. See "aluminum." The U.S. was more than 75 percent import reliant on bauxite in 2016.

Beryllium

Used in the nuclear industry and to make light, but strong alloys used by the aircraft industry. Beryllium salts are used in fluorescent lamps, X-ray tubes and as a deoxidizer in bronze metallurgy. It is used in computers, telecommunication and electronics products, aerospace and defense applications, appliances, automotive and consumer electronics, and medical applications. The U.S. was 10 percent import reliant in 2016.

Chromite

The U.S. consumes about 5 percent of world chromite ore production in various forms of imported materials, such as chromite ore, chromite chemicals, chromium ferroalloys, chromium metal and stainless steel. It's used as an alloy in stainless and heat resisting steel products. It's also used in chemical and metallurgical industries (chrome fixtures, etc.). Superalloys require chromium. It is produced in South Africa, Kazakhstan and Russia. The U.S. was 58 percent import reliant for chromium in 2016.

Clays

It's used in floor and wall tile as an absorbent, in sanitation, mud drilling, foundry sand bonding, in iron pelletizing, brick, light weight aggregate and cement. Ball clay is used in floor and wall tile. Bentonite is used for drilling mud, pet waste absorbent, iron ore pelletizing and foundry sand bond. Kaolin is used for paper coating and filling, refractory products, fiberglass, paint, rubber and catalyst manufacture. Common clay is used in brick, light aggregate and cement. The U.S. was not import reliant in 2016.



Cobalt

It's used primarily in superalloys for aircraft gas turbine engines, cemented carbides for cutting tools and wear-resistant applications, chemicals (paint dryers, catalysts, magnetic coatings) and permanent magnets. The U.S. has cobalt resources in Minnesota, Alaska, California, Idaho, Missouri, Montana and Oregon. Cobalt production comes principally from Congo, China, Canada, Russia, Australia and Zambia. The U.S. was 74 percent import reliant in 2016.

Copper

It's used in building construction; electric and electronic products (cables and wires, switches, plumbing, heating); transportation equipment; roofing; chemical and pharmaceutical machinery; and alloys (brass, bronze and beryllium alloyed with copper are particularly vibration resistant); alloy castings; electroplated protective coatings; and undercoats for nickel, chromium, zinc, etc. More recently, copper is being used in medical equipment due to its anti-microbial properties. The United States has copper mines in Arizona, New Mexico, Utah, Nevada, Montana and Michigan. Leading producers are Chile, China, Peru, U.S., Congo and Australia. The U.S. was 34 percent import reliant in 2016.

Feldspar

A rock-forming mineral, it's industrially important in glass and ceramic industries; patter and enamelware; soaps; bond for abrasive wheels; cements; insulating compositions; fertilizer; tarred roofing materials; and as a sizing, or filler, in textiles and paper. In pottery and glass, feld-spar functions as a flux. End uses for feldspar in the U.S. include glass (60 percent) and pottery and other uses (40 percent). The U.S. was 10 percent import reliant in 2016.

Fluorite (fluorspar)

It's used in production of hydrofluoric acid, which is used in the pottery, ceramics, optical, electroplating and plastics industries; in the metallurgical treatment of bauxite; as a flux in open hearth steel furnaces and in metal smelting; in carbon electrodes; emery wheels; electric arc welders; toothpaste; and paint pigment. It is a key ingredient in the processing of aluminum and uranium. The U.S. was 100 percent import reliant in 2016.

Gallium

Gallium is used in integrated circuits, light-emitting diodes (LEDs), photodetectors and solar cells. It has a new use in chemotherapy for some types of cancer. Integrated circuits are used in defense applications, high performance computers and telecommunications. Optoelectronic devices were used in areas such as aerospace, consumer goods, industrial equipment, medical equipment and telecommunications. Leading sources are China, Germany, UK and Ukraine. The U.S. was 100 percent import reliant in 2016.

Gold

Gold is used in jewelry and arts; dentistry and medicine; medallions and coins; ingots as a store of value; scientific and electronic instruments; and as an electrolyte in the electroplating industry. It is mined in Alaska and several western states. Leading producers are China, Australia, Russia, U.S. and Canada. The U.S. was not import reliant in 2016.

Gypsum

Processed and used as prefabricated wallboard or an industrial or building plaster; used in cement manufacturing; agriculture and other uses. The U.S. was 12 percent import reliant in 2016.



Halite (sodium chloride salt)

It's used in human and animal diet, both a seasoning and a preservative. It's also used to prepare sodium hydroxide, soda ash, caustic soda, hydrochloric acid, chlorine, metallic sodium, ceramic glazes, metallurgy, curing of hides, mineral waters, soap manufacturing, home water softeners, highway de-icing, photography and in scientific equipment for optical parts. Single crystals used for spectroscopy, ultraviolet and infrared transmission. The U.S. was 23 percent import reliant for salt in 2016.

Indium

Indium tin oxide is used for electrical conductivity purposes in flat panel devices most commonly in liquid crystal displays (LCDs). It is also used in solders, alloys, compounds, electrical components, semiconductors and research. Indium ore is not recovered from ores in the U.S. China is the leading producer. It is also produced in Korea, Japan, Canada, France and Belgium. The U.S. was 100 percent import reliant in 2016.

Iron Ore

Used to manufacture steels of various types. It's used in powdered iron, metallurgy products, magnets, high-frequency cores, auto parts, catalysts. Radioactive iron (iron 59) is used in medicine and in biochemical and metallurgical research. Iron blue is used in paints, printing inks, plastics, cosmetics and paper dyeing. Black iron oxide is used as pigment, polishing compounds, metallurgy, medicine and magnetic inks. Most U.S. production is in Michigan and Minnesota. Australia, China, Brazil and Russia are the major producers. The U.S. was not import reliant in 2016.

Lead

It's used in lead-acid batteries, tanks, solders and seals or bearings. It's also used in electrical

and electronic applications (TV tubes and glass); construction, communications and protective coatings; ballast or weights; ceramics or crystal glass; X-ray and gamma radiation shielding; soundproofing material and ammunition. Industrial type batteries are used as a source of uninteruptible power equipment for computer and telecommunications networks and mobile power. Lead is mined mainly in Missouri, but also in Alaska, Idaho and Washington. The U.S. was 30 percent import reliant in 2016.

Lithium

Compounds are used in ceramics and glass; batteries; lubricating greases; air treatment; primary aluminum production; lubricants and greases; rocket propellants; vitamin A synthesis; silver solder; batteries; and medicine. Lithium ion batteries have become a substitute for nickel-cadmium batteries in hand held/portable electronic devices. There is one brine operation in Nevada. Australia, Chile, Argentina and China are major producers. The U.S. was more than 50 percent reliant for lithium in 2016.

Manganese

Ore is essential to iron and steel production. It's also used in the making of manganese ferroalloys. Construction, machinery and transportation end uses account for most U.S. consumption of manganese. Manganese ore has not been produced in the U.S. since 1970. Major producers are South Africa, China, Australia, Gabon and Brazil. The U.S. was 100 percent import reliant in 2016.



Mica

Mica commonly occurs as flakes, scales or shreds. Ground mica is used in paints, joint cement, dusting agents, oil well-drilling muds and plastics, roofing, rubber and welding rods. Sheet mica is fabricated into parts for electronic and electronic equipment. China and Russia are leading producers. The U.S. was 100 percent import reliant in 2016.

Molybdenum

It's used in alloy steels to make automotive parts, construction equipment, gas transmission pipes, stainless steels, tool steels, cast irons, super alloys and chemicals and lubricants. As a pure metal, molybdenum is used because of its high melting temperature (4,730 F) as filament supports in light bulbs, metalworking dies and furnace parts. Major producers are China, Chile, U.S. and Peru. The U.S. was not import reliant in 2016.

Nickel

Vital as an alloy to stainless steel, it plays a key role in the chemical and aerospace industries. End uses are transportation, fabricated metal products, electrical equipment, petroleum and chemical industries, household appliances and industrial machinery. Major producers are the Philippines, Canada, Russia, Australia and New Caledonia. The U.S. was 25 percent import reliant in 2016.

Perlite

Expanded perlite is used in building construction products like roof insulation boards and as fillers. It's also used for horticulture aggregate and filter aids. It's produced in New Mexico and other western states and processed in more than 20 states. Leading producers are Turkey, Greece, U.S., Japan and Hungary. The U.S. was 19 percent import reliant in 2016.

Platinum Group Metals (PGMs)

PGMs includes platinum, palladium, rhodium, iridium, osmium and ruthenium. They commonly occur together in nature and are among the scarcest of the metallic elements. Platinum is used principally in catalysts for the control of automobile and industrial plant emissions, jewelry, catalysts to produce acids, organic chemicals and pharmaceuticals. PGMs are found in bushings for making glass fibers used in fiber-reinforced plastic and other advanced materials, electrical contacts, capacitors, conductive and resistive films used in electronic circuits and dental alloys used for making crowns and bridges. South Africa, Russia, U.S., Zimbabwe and Canada are major producers. The U.S. was more than 45 percent import reliant for most PGMs in 2016.

Phosphate Rock

It's used to produce phosphoric acid for ammoniated phosphate fertilizers, feed additives for livestock, elemental phosphorus, and a variety of phosphate chemicals for industrial and home consumption. U.S. production occurs in Florida, North Carolina, Idaho and Utah. The U.S. is a major producer. It was 3 percent import reliant in 2016.

Potash

It's a carbonate of potassium. It's used as a fertilizer, in medicine, in the chemical industry. It also can produce decorative color effects on brass, bronze and nickel. The leading producers are Canada, Russia and Belarus. The U.S. was 90 percent import reliant in 2016.

Pyrite

It's used in the manufacture of sulfur, sulfuric acid and sulfur dioxide. Pellets of pressed pyrite dust are used to recover iron, gold, copper, cobalt and nickel. It's also used to make inexpensive jewelry.



Quartz (Silica)

As a crystal, quartz is used as a semiprecious gemstone. Crystalline varieties include amethyst, citrine, rose quartz, smoky quartz, etc. Cryptocrystalline forms include agate, jasper, onyx, etc. Because of its piezoelectric properties, quartz is used for pressure gauges, oscillators, resonators and wave stabilizes. Because of its ability to rotate the plane of polarization of light and its transparency in ultraviolet rays, it's used in heat-ray lamps, prism and spectrographic lenses. It's also used in manufacturing glass, paints, abrasives, refractory materials and precision instruments.

Rare Earth Elements (Rare Earth Elements (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium ytterbium and lutetium)

They are used mainly in petroleum fluid cracking catalysts, metallurgical additives and alloys, glass polishing and ceramics, permanent magnets and phosphors. It is estimated that 40 pounds of rare earths are used in a hybrid car for rechargeable battery, permanent magnet motor and regenerative braking systems. The U.S. no longer produces rare earth (bastnasite). More than 80 percent of global production is in China. The U.S. was import reliant for 100 percent of its rare earth metals in 2016.

Silica

Aluminum and aluminum alloy producers and the chemical industry are major users of silicon metal. Silica is also used in manufacture of computer chips, glass and refractory materials, ceramics, abrasives, water filtration systems, component of hydraulic cements, filler in cosmetics, pharmaceutical, paper, insecticides, anti-caking agents in foods, flatting agents in paints, thermal insulators, and photovoltaic cells.

China is the leading producer. The U.S. was 38 percent reliant on silicon metal in 2016.

Silver

It's used in coins and medals, electrical and electronic devices, industrial applications, jewelry, silverware and photography. The physical properties of silver include ductility, electronics conductivity, malleability and reflectivity. It's used in lining vats and other equipment for chemical reaction vessels, water distillation, in the manufacture of ethylene, mirrors, silver plating, table cutlery, dental, medical and scientific equipment, bearing metal, magnet windings, brazing alloys and solder. It's also used in catalytic converters, cell phone covers, electronics, circuit boards, bandages for wound care and batteries. Silver is produced in the U.S. at more than 30 base and precious metal mines primarily in Alaska and Nevada. The leading global producers include Mexico, Peru, China, Chile and Australia. The U.S. was 67 percent reliant in 2016.

Sodium Carbonate (soda ash or trona)

Used in glass container manufacture; in fiberglass and specialty glass; also used in production of flat glass; in liquid detergents; in medicine; as a food additive; photography; cleaning and boiler compounds; pH control of water. Most U.S. production comes from Wyoming. The U.S. is a major producer and was not import reliant in 2016.

Sulfur

It's used in the manufacture of sulfuric acid, fertilizers, petroleum refining and metal mining. Elemental sulphur and byproduct sulfuric acid were produced in more than 100 operations in 27 states. The U.S., China, Russia and Canada are major producers. The U.S. was 9 percent import reliant in 2016.



Tantalum

Tantalum is a refractory metal with unique electrical, chemical and physical properties used to produce electronic components, including tantalum capacitors (found in auto electronics, pagers, personal computers and portable telephones). High-purity tantalum metals can be found in products ranging from weapon systems to superconductors, high-speed tools, catalysts, sutures and body implants, electronic circuitry and thin-film components. It's used in optical glass and electroplating devices. Leading producers are Congo, Rwanda, Brazil and China. The U.S. was 100 percent reliant in 2016.

Titanium

Titanium mineral concentrates are used primarily by titanium dioxide pigment producers. A small amount is used in welding rod coatings and for manufacturing carbides, chemicals and metals. It is produced in Florida, Georgia and Virginia. Leading producing countries are South Africa, China, Australia, Mozembique and Canada. The U.S. was 91 percent reliant in 2016.

Titanium and titanium dioxide are used in aerospace applications (i.e., jet engines, airframes and space and missile applications). It is also used in armor, chemical processing, marine, medical, power generation, sporting goods and other non-aerospace applications. Titanium sponge metal was produced in three operations in Nevada and Utah. The leading global producers are China, Japan, Russia, Kazakhstan and Ukraine.

Tungsten

More than half of the tungsten consumed in the U.S. was used in cemented carbide parts for cutting and wear-resistant materials - primarily in the construction, metalworking, mining, and oiland gas-drilling industries. The remaining tung-

sten was consumed to make tungsten heavy alloys for applications requiring high density, including electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications. It can also be found in steels, superalloys, wear-resistant alloys and chemicals for various applications. China is by far the leading producer. Vietnam, Russia, Bolivia, Austria and Spain also produce tungsten. The U.S. produces very little. It was more than 25 percent import reliant in 2016.

Uranium

Nearly 20 percent of U.S. electricity is produced using uranium in nuclear generation. It is also used for nuclear medicine, atomic dating, powering nuclear submarines and other uses in the U.S. defense system. The U.S. received about 80 percent of its uranium from other countries in 2016.

Vanadium

Vanadium's metallurgical use is primarily as an alloying agent for iron and steel - accounting for about 94 percent of domestic vanadium consumption. Of the other uses for vanadium, the major non-metallurgical use is in catalysts for the production of maleic anhydride and sulfuric acid. China, Russia and South Africa are large producers. The U.S. was 100 percent reliant in 2016.

Zeolites

Zeolites are used in animal feed, cat litter, cement, aquaculture (fish hatcheries for removing ammonia from the water), water softener and purification, catalysts, odor control and for removing radioactive ions from nuclear plant effluent. The U.S. was not import reliant in 2016.



Zinc

Of the total zinc consumed in the U.S., most was used in galvanizing. Other primary uses included brass, bronze and zinc-based alloys. Zinc compounds and dust were used principally by the agriculture, chemical, paint, and rubber industries.

Major co-products of zinc mining and smelting, in order of decreasing tonnage, were lead, sulfuric acid, cadmium, silver, gold and germanium. Zinc is used as protective coating on steel, as die casting, as an alloying metal with copper to make brass and as chemical compounds in rubber and paints. It's also used as sheet zinc and for galvanizing iron; electroplating; metal spraying; automotive parts; electrical fuses; anodes; dry cell batteries; nutrition; chemicals; roof gutter; engravers' plates; cable wrappings; organ pipes; and pennies. Zinc oxide is used in medicine, paints, vulcanized rubber and sun block. Zinc dust can be used for primers, paints, precipitation of noble metals and removal of impurities from solutions in zinc electrowinning. U.S. production is in five states and 12 mines. Leading producers are China, Australia, Peru, the U.S. and India. The U.S. was 82 percent import reliant in 2016.

Sources: The U.S. Geological Survey, Facts About Minerals (National Mining Association); Mineral Information Institute; the Energy Information Administration