

Rock & Mineral Uses

There is little we do that does not involve rocks and minerals and the metals we extract from them. Sadly, people seldom stop to think about them. There are thousands of known minerals. We thought you might be interested in learning how a few of them affect you every day.

When individuals can relate to how mining affects them personally, they are a lot more likely to remember the message. That is what this information is all about.

What follows doesn't even begin to scratch the surface of the essential role that rocks and minerals play in our lives.

Based on current consumption, it is estimated that you - and every other person in the United States - will use more than a million pounds of rocks, minerals and metals during your lifetime including:

800 pounds of LEAD

Primarily used in the construction of batteries. Also used as a radiation shielding during x-ray treatment by your doctor and dentist and as a protective shield on your TV screen to protect you from radiation from that source.

750 pounds of ZINC

Primarily used as a rust inhibitor for steel in the construction of cars, buildings, bridges, ships and trains.

1,500 pounds of COPPER

Primarily used in the manufacture of copper wire to conduct electricity needed in your car, home, office, school, church, appliances.

3,600 pounds of ALUMINUM

Cans, aircraft and automobile construction, sporting and electronic equipment, appliances.

32,000 pounds of IRON

Used to make steel for cars, subways, ships, cans, building construction, heavy equipment, appliances, power transmission turbines and towers.

27,000 pounds of CLAYS

Used to coat the pages of newspapers magazines, stationery, brochures and boxes so that the ink used in printing on them will be bright and will not run. Also used as a brightener and abrasive in toothpaste and to provide a smooth coating for your stomach in medicines.

28,000 pounds of SALT

Used in food preservation (almost all canned and frozen food contain salt), to enhance the taste of foods and to melt the ice on streets and highways during the winter. Also used in the manufacture of many chemicals, for water treatment, papermaking, soaps & detergents and in petroleum refining.

1,000,000 pounds of STONE, SAND, GRAVEL, and CEMENT

- Use in streets, highways and sidewalks; in the foundation for your house and school; as decorative materials for yards and gardens; in water purification plants to protect your health and in the construction of buildings from the most modest of homes to the world's tallest skyscrapers.

Here are just a few of the rocks, minerals and metals that affect our lives every day:

Aluminum

Aluminum is the most abundant metal element in Earth's crust. Used in making cans and other containers, in the manufacture of lightweight parts for automobiles and airplanes, in building construction and in almost every modern appliance found in the home. It is also the active ingredient in many underarm deodorants.

Antimony

Antimony is a native element and the metal is extracted from stibnite and other minerals. It is used as a hardening alloy for lead, especially in the manufacture of storage batteries. It is also used in bearing metal, type metal, solder, collapsible tubes and foil, sheet and pipes, in semiconductor technology and in 4th of July fireworks. Antimony salts are used in the rubber and textile industries, in medicines and glassmaking.

Bauxite

Bauxite is the mineral ore of aluminum which is used in the manufacture of cans, airplanes, sporting and electronic equipment and home appliances. Discovered in the late 1800's, aluminum has changed the way we live. Most of the bauxite we use is imported from Australia and Jamaica.

Barium

Barium is used as a heavy additive in oil well drilling mud; 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, in sparkplug alloys and in making an expensive white pigment.

Beryllium

Beryllium is used in the nuclear industry and in the manufacture of light, very strong alloys used in the aircraft industry. Beryllium salts are used in fluorescent lamps, in X-ray tubes and as a deoxidizer in bronze metallurgy. Emerald and aquamarine are "beryl" gemstones.

Chromite

A mineral ore of chromium which is used in making steel, "chromed" parts for automobiles and appliances and in the manufacture of chromic acid which is used to tan much of the leather used in making shoes, belts, purses, jackets, gloves etc.

Coal

Coal is primarily used in the generation of electricity. About 56% of all the electricity used in the United States is produced from coal-fired facilities. The rest of our electricity is produced from nuclear power plants (24%), natural gas power plants (10%), hydroelectric resources (8%) and alternative sources (wind, solar etc.) - about 2%. Coal is also a source of raw material for making heating oils, chemicals and medicines. At current rates of use and under current environmental regulation, about a 300-400 year supply of coal remains. To put that in perspective, the first English settlement in the New World was at Jamestown, VA in 1607 - just about 400 years ago.

Cobalt

Cobalt is used in making superalloys for jet engines, chemicals (paint dryers, catalysts, magnetic coatings), permanent magnets, and cemented carbides for cutting tools. The United States uses about one-third of the world production of cobalt.

Columbite-Tantalite Group

These are the principal ores of niobium and tantalum, used primarily as an additive in steel making and in superalloys; used in metallurgy for heat-resistant alloys, rust-proofing (stainless steel) and electromagnetic superconductors.

Copper

Azurite, chalcopyrite and malachite are ores of copper which are used in the manufacture of brass, bronze, coins, jewelry, cooking utensils and pigments. Most of the wiring in electrical appliances, TV's, stereos, computers, telephones, aircraft, satellites, automobiles, residential wiring, plumbing... etc is also made from copper. Malachite also provides shades of green used in making cosmetics and was used by primitive peoples for making paint used on their clothing, faces and cave walls.

Feldspar

Feldspar is a rock-forming mineral. It is important industrially in making glass, ceramics, enamelware and soaps. It is also used in making bonding material for abrasive wheels, cements, fertilizer, tarred roofing materials and as a sizing or filler in textiles and paper.

Flint

Flint was very important to civilization from its early use in the stone age until the mid 1800's. It was used extensively by primitive peoples in making arrowheads,

spearpoints, knives, and other scraping and cutting tools. It was also used - with steel - as a primary way to start a fire until the invention of matches in the early 1800's, and it was widely used as the ignition system for flintlock rifles until the mid 1800's.

Fluorite

Fluorite is used in the production of hydrofluoric acid and the source of the "fluoride" in your favorite toothpaste. It is used in the pottery, ceramics, optical, electroplating and plastics industries; in the metallurgical treatment of bauxite to make aluminum; as a flux to remove impurities in open hearth steel furnaces and in metal smelting; in carbon electrodes; emery wheels; electric arc welders; and as paint pigment.

Galena

This ore - lead sulfide (PbS) - is the primary source of lead used in the manufacture of batteries. Lead is very heavy - weighing about 400 pounds per cubic foot! It is used as an effective sound barrier and to shield us from harmful, natural radiation while we are flying in an airplane or when we are getting our teeth or other body parts x-rayed in medical or dental offices. A coating of lead on the inside of your television picture tube protects you from radiation while you watch TV. It is also used in making tire and fishing weights.

Gilsonite

Gilsonite is used in the manufacture of wire insulation, paints and varnishes, construction materials, asphalt, printing ink, oilwell drilling and in foundry casting.

Gold

Gold is used in dentistry and medicine; in jewelry and art; in medallions and coins; and in ingots as a store of value by banks throughout the world. Because of its malleability (gold wire can be made that is thinner than a human hair) it is used in intricate circuitry for scientific and electronic instruments such as computers. It is also used in the electroplating industry.

Gypsum

One of gypsum's primary uses is in the manufacture of "sheetrock" or wallboard. Chances are that the walls in your home, office or school are at least partly constructed using a gypsum board.

Halite (Salt)

Commonly recognized as salt, halite is used in human and animal diet, food seasoning and food preservation. It

is used to make sodium hydroxide, soda ash, caustic soda, hydrochloric acid, chlorine, and metallic sodium, in ceramic glazes, metallurgy, the curing of hides, in mineral waters, soap, home water softeners, as a highway de-icer, in photography and in optical parts of scientific equipment. Single crystals can be used for spectroscopy, ultraviolet and infrared transmission.

Hematite

A primary ore of iron. Hematite is processed to produce iron which is used to make steel which, in turn, is used in everything from automobiles to flatware to the machinery used to make almost everything else we use. Many different minerals can be combined with iron in producing steel. Each provides a different set of valuable properties to the finished product. A familiar example is stainless steel. Steel is used in the manufacture of such things as kitchen appliances, furniture, tools, bridges, buildings, automobiles, construction equipment, manufacturing machinery, highway construction, shipbuilding, trains, railroads etc. Picture what life would be like without steel! Powdered iron is used in magnets, high-frequency cores, auto parts, and as a catalyst. Radioactive iron (iron 59) is used in medicine and as a tracer element in biochemical and metallurgical research. Iron blue is used in paints, printing inks, plastics, cosmetics, paper dyeing. Black iron oxide is used as a pigment and in polishing compounds, medicines and magnetic inks. The other primary ore of iron is magnetite.

Kaolinite

Kaolinite is a very fine, white clay used as a filler in many products, for coating pages in magazines and newspapers to prevent ink from running, and as a whitener and abrasive in toothpaste.

Limestone

Limestone is used as dimension stone in buildings and as a component of cement which is used in the construction of everything from homes and sidewalks to bridges and skyscrapers. It is composed primarily of calcium carbonate which is the primary ingredient in such things as anti-acid tablets and liquids we all require from time to time for an upset stomach.

Lithium

Lithium compounds are used in ceramics and glass; in primary aluminum production; in the manufacture of lubricants and greases; rocket propellants; vitamin A synthesis; silver solder; batteries; medicine.

Magnetite

An ore of iron which is used in making steel, nails, kitchen appliances, furniture, tools, bridges, buildings, automobiles, construction equipment, manufacturing machinery, highway construction, shipbuilding, trains, railroads etc. Picture what life would be like without steel! Powdered iron is used in magnets; high-frequency cores; auto parts; and as a catalyst. Radioactive iron (iron 59) is used in medicine and as a tracer element in biochemical and metallurgical research. Iron blue is used in paints, printing inks, plastics, cosmetics and paper dyeing. Black iron oxide is used as a pigment and in polishing compounds, medicines and magnetic inks. Also see hematite.

Malachite

USES: Copper is used in making most of the wiring used to carry electricity in our homes, automobiles, electronic equipment, and appliances. It is also used to provide shades of green in cosmetics and was used by primitive peoples for making paint.

Marble

Used as dimension stone in building construction and for making decorative items such as pillars, floor and bath tiles, table tops etc.

Mica

Micas commonly occur as flakes, scales or shreds. Sheet muscovite (white) mica is used in the manufacture of electronic insulators. Ground mica is added to paints and cosmetics to add "sparkle", in joint cement, as a dusting agent, in well-drilling muds as well as in plastics, composition roofing, rubber and welding rods.

Molybdenite

An ore of molybdenum which is alloyed with steel and other metals to improve hardness, strength and resistance to abrasion and corrosion. It is used in the manufacture of jet engines, in oil refining, in lubricants and as pigmentation in dyes, inks and paint. As a pure metal, molybdenum is used as filament supports in light bulbs because of its high melting point - 4,730 degrees F - in metalworking dies and furnace parts.

Perlite

Perlite is used in roof insulation boards, as a filler, in filter aids and for horticulture applications.

Platinum Group Metals

The Platinum Group Metals (PGM) Includes platinum,

palladium, rhodium, iridium, osmium and ruthenium. They commonly occur together in nature. Platinum is used principally in catalytic converters for the control of automobile and industrial plant emissions but is also used in making jewelry. PGM metals are also used in catalysts to produce acids, organic chemicals and pharmaceuticals as well as in bushings for making glass fibers used in fiber-reinforced plastic, in electrical contacts, in capacitors and in resistive films used in electronic circuits. They are also used in dental alloys for making crowns and bridge.

Phosphate

Phosphate rock is 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 consumers. Phosphoric acid also helps provide the "tingly" taste you experience when drinking many soft drinks.

Potash

Potash is a carbonate of potassium used as a fertilizer, in medicines, in the chemical industry and to produce decorative color effects on brass, bronze and nickel.

Pyrite

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

Pyrolusite

An ore of manganese, a metal used in the steel making process to help provide different characteristics (such as hardness, heat resistance etc.) which are preferred and often required for some specific applications of steel.

Rare Earths

Rare Earth Elements (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium) are primarily used as catalysts in petroleum fluid cracking processes. They are also used as metallurgical additives, and in ceramics and polishing compounds, permanent magnets and phosphors.

Silica

Your daily contact with silica is most often in the form of an anti-caking agent when you use a powdered form of foods such as milk, chocolate, sweeteners etc. For example, those little packets of sweetener you use for

your coffee instead of sugar are as much as 95% silica sand - ground so finely that it will dissolve. Silica is also used in the manufacture of computer chips, glass and refractory materials, ceramics, abrasives, water filtration processes, as a component of hydraulic cements, as a flattening agent in paints and as a thermal insulator. It is also used as a filler in the making of paper.

Silver

Without silver, you could not take a single picture with your camera. Besides its use in photography, silver is also used in chemistry, jewelry, in electronics because of its very high conductivity and as currency in the form of coins - usually as an alloy. Other uses included the lining of vats and other equipment for use as chemical reaction vessels and in water distillation processes. It is also used as a catalyst in the manufacture of ethylene, in making mirrors, as plating for flatware, dishes and tea sets, and in dental, medical and scientific equipment.

Soda Ash

Soda ash and trona (see "trona" below) are both sodium carbonate. Soda ash is used in the manufacturing of glass containers, fiberglass, specialty glass and flat glass. It is also used in the paper making process, in liquid detergents, in medicine, as a food additive, and in cleaning compounds.

Sulfur

Used in the manufacture of fertilizer (necessary to grow our food), chemicals, in the manufacture of sulfuric acid, in papermaking, film, tires, paint, detergents, explosives, matches, drugs and dyes.

Titanium

As a metal - because of its light weight, strength and heat resistance, titanium is primarily used in the manufacture of such items as jet engines, aircraft frames and space and missile components. You most often come in contact with titanium in its form as titanium dioxide - the whitest substance known. Titanium dioxide has thousands of applications as a "whitener" in items such as paint, in food items such as sugar and candy and in toothpaste.

Trona

Trona is a primary source of sodium carbonate. It is used in the making of toothpaste, in glass and paper making, in soaps and detergents, in the treatment of water for domestic use and in the manufacture of a number of chemicals. One of its most important applications is its

use in baking soda and baking powder, a necessary ingredient in making bread, cookies, cakes and most other baked goods. You "eat" this rock every time you have a sandwich, a cookie or piece of cake.

Tungsten

Tungsten is used in steel making and thus in all the items constructed of steel that require the hardness and other characteristics provided by tungsten-steel alloys. It is applied on metalworking, construction and electrical equipment; in transportation equipment, as filaments in light bulbs, and as components of dyes, enamels and paints and for coloring glass.

Vanadium

Vanadium is used in metal alloys for aerospace applications.

Zeolites

Zeolites have some unique absorption and neutralizing characteristics. They are used in kitty litter for odor control and in fish hatcheries for removing ammonia from the water to protect the fish.

Zinc

"Copper" pennies are actually mostly zinc. One of the primary uses of zinc is as a protective coating on steel used to manufacture things such as automobile frames and bumpers to prevent corrosion and oxidation (rusting). It is also used as an alloy metal with copper to make brass, and for "galvanizing" iron used in making nails and roofing material that will not corrode when exposed to the weather.

FIREWORKS date back to about the same time as the discovery of gunpowder in ancient China. Americans use nearly 30,000 short tons per year - much of that in celebration of Independence Day on the 4th of July. Individuals purchase and use about two-thirds of the total. The remainder is used in public fireworks displays. About 85 percent of consumer fireworks and half of the display variety are imported from China, Japan, Korea and such European countries as France and Italy.

Despite our use and exposure to fireworks, few people stop to consider the minerals that make them such a spectacular part of the festivities. Did you know that each basic color in a fireworks display is produced by a specific mineral or mineral compound?

Bright GREENS are made with barium.

Deep REDS are a product of strontium.

BLUES come from copper.

YELLOWWS require sodium.

More colors can be created by mixing compounds:

ORANGE is produced by a mixture of strontium and sodium.

SILVERY WHITE by a mixture of titanium, zirconium and magnesium alloys.

LAVENDER is obtained using a copper and strontium mix.

Special effects are created by yet other mineral products:

Iron filings (from the ore mineral hematite) and small particles of charcoal produce GOLD sparks.

Bright flashes are created by using fine ground aluminum powder. The use of larger particles, such as small flakes or granules, give a longer, shower-like effect.

Magnalium, a magnesium-aluminum alloy, produces a tiny series of silvery-white flashes.

Aluminum, antimony sulfide and perchlorate are other flash mixtures that are used.

Fireworks are just one more example of how we use minerals for the manufacture of everything from automobiles to toothpaste.

RECYCLING

Many minerals have unique properties. Fortunately, we have discovered ways to put them to use in improving our standard of living. Without rocks and minerals, many of the gadgets and gizmos you depend on every day - including the computer you are using to visit our website - could not exist. Recent information from Handy and Harman Electronic Materials Corp. states that a typical desktop computer system - primarily the CPU and monitor - weighs about 70 pounds.

The figures below illustrate the percentage and weight of each of the components used in constructing the average computer. Most components could be recycled. However, the economics of doing so is often prohibitive with the exception of precious metals and components such as lead that must, by law, be disposed of properly and safely.

Plastics	24.99%	17.5 lbs
Silica	22.99%	14.3 lbs
Lead	6.29%	4.4 lbs
Aluminum	14.17%	9.9 lbs
Iron	20.47%	16.1 lbs
Copper	6.92%	4.8 lbs
Zinc	2.20%	1.5 lbs
Other	1.97%	1.4 lbs

Recycling is an important environmental tool and although technology to recycle most components used in the construction of a computer exists, only a few have much monetary value. The few that do are generally precious metals. An article in the June, 1999 issue of Wired Magazine examined the salvage value of a few of the metals used in the high tech world in which we live.

According to the article, a company from Rhode Island recently melted down 2,500 tons of obsolete equipment. Although more than 35 minerals and metals are used in the construction of telephones and computers, only precious metals such as gold, silver and palladium are currently valuable enough to make recycling efforts profitable.