

## MINERALS AND ROCKS THEIR PROPERTIES AND USES

### ROCKS

**ANDESITE:** An igneous, volcanic rock, brown, greenish to dark gray that forms when magma of dioritic composition is erupted as lava flows or injected into fractures of volcanic vents and cones in the form of dikes and domes. The darker colored andesite can be mistaken for basalt in many cases. Its uses are similar to basalt for aggregates, roadbeds and other construction.

**BASALT:** An igneous, extrusive fine-grained and dark gray to black rock. It is the volcanic equivalent of plutonic gabbro and is rich in ferromagnesian minerals. Basalt can be used in aggregate and roadbeds. It is widely used for railroad track beds.

**COAL:** A sedimentary rock, there are four types of coal, anthracite, bituminous, subbituminous and lignite. Coal provides about 60% of our nation's electricity. Used in making cement, in the food, paper, automobile, textile and plastic industries. By-products are used for paint, nylon and aspirin. The fly ash left from the burning of coal is now being processed into building blocks and other construction products. The fines left from coal preparation are sometimes mixed with a binding agent, pressed into cylindrical pellets and used as a synthetic fuel in electrical generation.

**CONGLOMERATE:** A sedimentary rock with a variable hardness, consisting of rounded or angular rock or mineral fragments cemented by silica, lime, iron oxide, etc. It is usually found in mostly thick, crudely stratified layers and used widely in the construction industry.

**DIORITE:** An igneous plutonic rock, medium to coarse-grained gray to dark gray in color. Often forms in marginal portions of large granite-granodiorite masses. It is similar to those of granite but topographically less prominent. Its origin is slow, deep-seated cooling and crystallization of magma richer in ferromagnesian constituents than those that produce the plutonic rocks of the granite family. Since it has good strength and durability, can take a high polish, it can be used as an architectural or ornamental stone but normally has the same uses as basalt.

**DOLOMITE:** A sedimentary rock that is made up of marine deposited calcium and magnesium. It may contain tiny fossilized remains of plants and animals. It has a pearly luster, is soft enough to scratch with a knife, and reacts very slowly with acid. It is used in road and bridge construction, buildings and as a dimension stone. Good quality Dolomite is a source for magnesium used as anti-acids.

**GABBRO:** A fine to coarse grain, dark-colored, igneous rock composed mainly of labradorite and anorthite, clinopyroxene, and sometimes olivine. It is widely used as crushed stone for concrete aggregate, road metal, railroad ballast, etc. Smaller quantities are cut and polished for dimension stone and called black granite.

**GNEISS:** A metamorphic rock that is uneven, granular, medium to coarse grained crystalline with more or less parallel mineral orientation. Colors are too variable to be of diagnostic value. Due to physical and chemical similarity between many gneiss's and plutonic igneous rocks some are used as building stones and others for structural purposes, all part of the construction



industry.

**GRANITE:** An igneous-plutonic rock, medium to coarse-grained that is formed mainly of feldspars, quartz and mica and is extremely hard and light colored. It makes a high grade aggregate for construction and is a favorite dimension stone for statues, buildings and counter tops and is widely used in many building products like asphalt shingles.

**LIMESTONE:** A sedimentary rock that is used mainly in the manufacture of Portland cement. It is usually fine-grained and may contain fossils. Limestone has numerous uses including, the production of lime, manufacture of paper, petrochemicals, insecticides, linoleum, fiberglass, glass, carpet backing and as the coating on many types of chewing gum.

**MARBLE:** A metamorphic rock that has even-granular grain to medium grained and may be uneven granular and coarse grained in calc-silicate rock. The normal color is white but accessory minerals act as coloring agents and may produce a variety of colors. Depending upon its purity, texture, color and marbled pattern, it is quarried for use as dimension stone for statuary, architectural and ornamental purposes. Dolomite rich marble may be a source for magnesium and is used in the manufacture of refracting materials or simple things like Tums.

**OBSIDIAN:** An igneous-volcanic rock that is glassy with a brilliant vitreous luster. It is generally black but more or less smoky along translucent to transparent edges and may be found in gray, reddish brown, mahogany, or dark green. Black is sometimes mixed with the other colors to form thin bands or produce a marbled effect. Obsidian scratches window glass and is so silica-rich that when slowly crystallized a very light-colored granite is formed. It occurs as volcanic lava flows are thick and of limited areas. In olden times it was used as knives, spearheads and other sharp implements that are a result of conchoidal fractures. Native Americans formed arrows out of obsidian.

**PEGMATITE:** (A plutonic igneous rock, very coarse-grained.) Normally associated with granites and syenitic plutons it forms large crystals as the result of the magma's high volatile content and slow rate of cooling. The various minerals found in pegmatites are separated and used for various purposes. Feldspars are used as abrasives and in the manufacture of porcelain, electrical insulators, ceramic glazes and dental products. The micas are used for electrical and heat insulation, paper, rubber and plastic manufacturing porcelain products and make-up.

**PHOSPHATE ORE:** (A sedimentary rock). Once it is separated from limestone and silica sand by milling, the phosphate is made into fertilizers, industrial chemical compounds and additives to foods and toothpaste. Florida and North Carolina are major sources of this mineral. It is mainly used as a fertilizer but is also used to give your soda pop its fizz.

**PUMICE:** An igneous-volcanic rock that is usually found after a violent explosion of a volcano. It is produced by the violent expansion of dissolved gases in viscous silica lava such as rhyolite or dacite. It is light, cellular, frothy rock that normally floats in water. It has a low bulk density, good heat and sound insulating properties and an excellent abrasive, which makes it useful in industrial applications. It can be found in hand soap, emery boards, and sandpaper and for use in sandblasting.

**QUARTZITE:** (A sedimentary rock). It is even-granular, medium grained; particles are generally rounded of sand size. Held together by compaction in clay or cementation by silica,



carbonates, clay or iron oxides. Its color is extremely varied and quartz is the dominant mineral but feldspar, garnet, magnetite, tourmaline, hornblende, mica and zircon may also be found. Has a gritty feel like sandstone. Like sandstone it is used primarily in construction. It is easy to work and thick-bedded that permit quarrying of uniform, large-size blocks.

**RHYOLITE:** An igneous-volcanic rock that is the volcanic equivalent of plutonic granite, having excess silica. It is very fine-grained and occurs when magma of granitic composition erupts at the earth's surface or intrudes the crust at shallow depths. It cools rapidly so only small crystals are able to develop. It is mainly a construction rock.

**SANDSTONE:** A sedimentary rock, generally thick-bedded, varicolored, rough to feel due to uneven surfaces produced by breaking around the grains. Used principally for construction, it is easy to work, the red-brown sandstone of Triassic age, better known as "brownstone", has been used in many eastern cities for buildings.

**SCHIST:** A metamorphic uneven granular, medium to coarse grained, crystalline with prominent parallel mineral orientation rock. Goes from silvery white to all shades of gray with yellow to brown tones depending on the mineral concentration. Many schists are a source for graphite and others are used in the building trades and construction industry.

**SERPENTINITE:** A metamorphic rock that is dense and has many slick, polished-looking and often striated surfaces. It is generally green or yellow-green but may show dark green to black and is dull or waxy. It has many associated minerals including a source of platinum, and iron ore with some nickel and chromium in many localities. It is the principal source of asbestos and is also used as a decorative stone.

**SHALE:** A sedimentary rock that is well-stratified in thin beds. It splits unevenly more or less parallel to bedding plane and may contain fossils. Oil shale can be a source of petroleum but shale is used in the manufacture of bricks.

**SLATE:** A metamorphic rock that is thin-layered that causes it to split readily into thin, smooth, slightly lustrous slabs. It is usually dark gray to black but may have green or red, purple, brown or yellow streaks depending upon other mineral components. It can easily be scratched and normally occurs as steeply tilted outcrops with jagged or irregular outlines due to weathering. Its parent rock is either mudstone or shale. It is used for roofing slate, flagstone, blackboards, floors, etc.

**WOLLASTONITE:** A metamorphic rock commonly found in metamorphic rocks. It has a unique particle shape (acicular or fibrous) and has a white color when pure. It is used in ceramics, and as filler in paint and plastics.

## MINERALS

**BARITE:** ( $\text{BaSO}_4$ , usually colorless or white but may be yellow, red green or black. It has a hardness of 2.5 to 3.5, a white streak, specific gravity of 4.48, a vitreous luster and perfect prismatic cleavage). It is the basis for drilling mud in the exploration of oil, gas, water and minerals. It is also used in bowling balls, televisions, computers, paint and the “ever-popular” barium cocktail. Also used to make optical glass; white pigments, ink, linoleum and oilcloth as well as the green color in fireworks.

**BAUXITE:** (Not a specific mineral but a term applied to a mixture of hydrated aluminum oxides, can be white, gray, yellow, red, brown has a dull luster and streaks white. Hardness goes from 1 to 3 with a specific gravity of 2.4 to 2.6, it has no cleavage. It is a secondary material formed at the surface by the alteration of minerals and rocks rich in aluminum. Domestic ore accounts for less than 2% of our bauxite requirements. Most bauxite used in this country is converted to alumina. Used in the production of abrasives, chemicals, propellants and refractories.

**CALCITE:** ( $\text{CaCO}_2$  Calcium carbonate it usually white, colorless or pale gray with a white streak, hardness of 3 and specific gravity of 2.7) It is the most common of the calcium carbonate minerals. It is the major component of the rock limestone. Calcium is produced from calcite and is used to reduce metal oxides to the metallic state. Its uses are similar to limestone, which includes, carpet backing, linoleum, fiberglass, paper production, insecticides, glass manufacturing and plastic pipe.

### ORES OF COPPER:

- **AZURITE:**  $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$  A basic copper carbonate. It is usually azure-blue to dark blue, vitreous, dull and streaks blue with a hardness of 3.5 to 4. It has good cleavage in two directions. It is usually associated with malachite and is a secondary copper mineral. Copper is used extensively for electrical wiring, plumbing, as an alloy for bronze and brass, coinage, jewelry and a more recent usage has been in the medical field as a coating on doorknobs, plates, etc in hospitals to inhibit germs. Due to its biostatic properties, germs do not grow on it.
- **BORNITE:** (A copper iron sulfide  $\text{Cu}_5\text{FeS}_4$ , it is copper-red to bronze-brown, metallic and streaks grayish black. It has a hardness of 3, no cleavage, specific gravity of 4.9 to 5.1, fractures uneven, is conchoidal and brittle. It is a common and widespread copper-sulfide mineral and occurs in several environments. Uses are as for Azurite or other copper ores.
- **CHALCOCITE:** (An ore of copper ( $\text{Cu}_2\text{S}$  copper sulfide, is dull gray but on the surface can be altered to black or green. Has a hardness of 2.5 to 3.0, specific gravity of 5.5 to 5.8, streaks shiny dark gray, a metallic luster and indistinct cleavage. It dissolves easily in nitric acid. Like all other copper ores, it is used extensively in electronics and telecommunications, the manufacture of brass, for coinage, cooking utensils, pipe and tubing and as a blue pigment.
- **CHRYSOCOLLA:**  $\text{Cu}_2\text{H}_2\text{Si}_2\text{O}_5(\text{OH})_4$ , hydrous copper silicate is bright green or bluish, a

hardness of 2.4, specific gravity of 2.0 to 2.4, a vitreous, greasy to waxy luster with a white streak and no cleavage. It decomposes in hydrochloric acid, producing silica gel. See azurite or chalcocite for uses.

- **CUPRITE:** (An ore of copper,  $\text{Cu}_2\text{O}$ , a copper oxide, ruby-red, reddish black, could have brownish red streaks, a hardness of 3.5 to 4, specific gravity of 6.1, fractures uneven, is translucent and brittle.) This is a secondary copper mineral and forms in the zone of alteration in disseminated hydrothermal replacement deposits, where it occurs with native copper, malachite and calcite. Uses are same as for other ores of copper.
- **MALACHITE:** ( $\text{Cu}_2(\text{CO}_3)(\text{OH})_2$ , A copper ore, hydrous copper carbonate is deep emerald green, with a hardness of 3.5 to 4.0, a specific gravity of 4.0, streaks green, has a vitreous to silky luster and perfect cleavage. It will fizz in dilute hydrochloric acid. See azurite or chalcocite for uses.

**DIATOMITE:** (Actually a sedimentary rock that is a fossil accumulation of diatoms that forms a amorphous, hydrated silica. The U. S. Government classifies it as an industrial mineral  $\text{SiO}_2\text{-H}_2\text{O}$  for the periodic statistical and economic reports published). A major component in filtering systems for water, swimming pools, juices, wines, beers, cooking oils and syrups as a mild abrasive in cleansers and polishing agents. Used to make "Kitty Litter", the flat finish in paints and as an anti-caking agent in fertilizers and insecticides. It gives crayons their "bite" and is used in pastel chalk for the matte finish and bite.

**FELDSPAR:** (A potassium aluminum silicate, sometimes with considerable sodium  $\text{KAlSi}_3\text{O}_8$ ). Formed in many colors from white to brown, is vitreous and streaks white. Has a hardness of 6 to 6.5, cleavage is good in two directions with a specific gravity of 2.5 to 2.6. The most abundant mineral on earth and is very common in igneous rocks. It is used for the manufacture of porcelain, glass and as a glaze.

**FLUORITE:** ( $\text{CaF}_2$ , calcium fluoride). Color can be white, gray, tan, pink, dark purple or pale green with a white streak, hardness of 1.0 to 1.5 and a specific gravity from 2.4 to 2.8). It is used in the manufacture of aluminum, plastic and Freon. It is the basis for hydrofluorocarbons, in cleaning solvents for electronic components and is added to drinking water and toothpaste to prevent cavities.

**GALENA:** ( $\text{PbS}$ , lead sulfide, a dark gray metallic ore of lead, with a dark streak, hardness of 2.5 and is the heaviest of the common metals). Most lead today is used in transportation, in the form of batteries, fuel tanks, solder, seals and radiation shielding. Other uses include paint pigments, cable coverings, ammunition, TV screen glass, x-ray protection, plumbing pieces and weights. Much of the lead is recycled and broken down into other components for use in the chemical industry as a basis for many products such as detergents.

**GARNET:** (A group of very closely related aluminum silicates: pyrope, almandine and spessartine and calcium silicates: grossular, andradite and uvarovite. |Color is from deep red to reddish black, a vitreous luster, a colorless streak and a hardness between 6 1/2 and 7 1/2. Almandine is the most common garnet mineral and most of those mined are used as abrasives for grinding and polishing. Some are beautiful enough for gemstones and have been found as large as three feet across. Most garnets are found in metamorphic rocks such as schist and gneiss.



**GOLD ORE:** (Au, a native element, is bright yellow, whiter when alloyed with silver and orange-red with alloyed with copper. It has a hardness of 2.5 to 3, specific gravity of 15.3 to 19.3, a brilliant metallic luster, gold smear as a streak and very little cleavage. It is extremely malleable and ductile and is insoluble in most acids. Gold is an excellent electrical conductor, never tarnishes or corrodes, therefore, it is important in microelectronics. It has excellent reflective properties. It is found in computers, satellites, and communication equipment, aircraft and automobile air bags. In micro-thin coatings it is used on windows, visors and face shields for astronauts. In medicine it is used to treat arthritis and as an anti-nausea drug for chemotherapy. It is also used in dentistry, jewelry and is the basis for our monetary standard.

**GRAPHITE:** (C, carbon, often impure due to a mix of clay and iron oxide. It is steel-gray to iron-black, metallic with a grayish to black streak, hardness of 1 to 2 and a specific gravity of 1.9 to 2.3). It is usually found with quartz and muscovite in schists and is principally used in lubricants and pencils.

**GYP SUM:** (a non-metallic mineral,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  can be clear (selenite) white, yellow, pink or blue but streaks white with a 1.5 to 2 hardness and a specific gravity of 2.7). A versatile mineral used mainly for wallboard and plaster in the construction industry but is also used as filler in flour, for manufacturing paper goods and is an important soil additive.

**HALITE:** (NaCl, Sodium chloride, normally colorless with tints of gray, yellow, red, or blue and streaks white. Hardness is 2 to 2.5, with a specific gravity of 2.16). It is readily soluble in water and has a salty taste and is commonly associated with gypsum, borax and thenardite. In ancient times it was used as a form of money (bartering). Used in tanning leathers, the manufacture of poly-vinyl-chlorine for fabrics and plumbing pipes, in soaps and detergents, ceramics, feed supplements, printing inks and for textile dyeing.

**IRON ORES:** Most iron ores are used as raw material to produce iron and steel which modern societies is based. Iron is valued because of its great strength and its ability to be alloyed with carbon and other minerals to make steels. The steel is used in construction, automobiles, ships, machinery, tools, cooking utensils, appliances and building necessities such as staples, nails, etc.

- **HEMATITE:** ( $\text{Fe}_2\text{O}_3$  Iron Oxide, a metallic mineral that is steel-gray, red, reddish brown or black, streaks red, with a hardness of 5 to 6 and specific gravity of 4.9 to 5.3) The red streak is used to distinguish it from limonite and ilmenite and the lack of magnetism distinguishes it from magnetite. It is a principal ore of iron and the crystals are used in jewelry.
- **LIMONITE:** ( $\text{FeO}(\text{OH}) \cdot n\text{H}_2\text{O}$  a mixture of hydrous iron oxides of indefinite composition, usually yellow or brown, glassy with a streak of yellowish brown, hardness of 4 to 5.5 and a specific gravity of 2.7 to 4.3). Limonite is widespread and gives the characteristic rusty brown color to the weathered surfaces of rocks. It is another ore of iron and is used as a pigment in the manufacture of paint.
- **MAGNETITE:** ( $\text{Fe}_3\text{O}_4$ , ferrous and ferric iron oxide, a metallic mineral with a black color, black streak and a hardness of 5.5 to 6.5, it is also magnetic). It is one of the most abundant and widespread of all oxide minerals and occurs in a wide variety of environments.

- **TACONITE:** (Iron ore,  $\text{Fe}_2\text{O}_4$  or magnetite being the principal mineral of taconite). It contains silica in the form of chert or jasper with bands of hematite or magnetite or a combination of the two that occurs in the Mesabi area of Minnesota.

**KAOLIN:** (Kaolinite, hydrous aluminum silicate  $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2 \cdot \text{H}_2\text{O}$ , is the major component of kaolin, or China clay. it has a hardness of 2 to 2.5, can be white, gray, and yellowish, has a dull pearly luster and streaks white, with perfect cleavage in one direction.) Pure deposits of kaolin are used for coating and filling paper, as a component in ceramics, and as filler in paint, plastics and rubber.

**LITHIUM ORE:** (Spodumene,  $\text{LiAlSi}_2\text{O}_6$ , lithium aluminum silicate. It can be white, yellow, gray, pink or emerald green, transparent to translucent. Has a hardness of 6.5 to 7, specific gravity of 3.1 to 3.2, and a vitreous luster with a white streak. Cleavage is perfect parallel to vertical prism. It is used in glass, ceramics and pharmaceuticals and some varieties are treated as gemstones.

**MAGNESITE:** (Magnesium Carbonate,  $\text{MgCO}_3$  color can be white, yellowish, grayish, brown; it has fine-grained porcelaneous masses, dull luster, streaks white, a hardness of 3.5 to 4.5 and the cleavage is perfect in three directions). Among its uses are as a dietary supplement, as an acid neutralizer, for sewage treatment. It is a source of magnesium metal and magnesia.

#### **MINERAL SANDS:**

- **ILMENITE:** ( $\text{FeO} \cdot \text{TiO}_2$ , a black, heavy titanium-iron bearing mineral that resembles magnetite, but readily distinguished by its weak magnetic character. Has a black to browning-red streak. A metal that can be produced synthetically, it is used mainly in jet engines, airframes and space and missile application. As titanium dioxide it gives the white color to paper, paints, frostings and is the white on the M of M&M's.
- **LEUCOXENE:** (A variety of spene or titanite,  $\text{CaTiSiO}_5$ ). It is found as an alternation product consisting primarily of rutile.
- **MONAZITE:** A phosphate of the cerium and lanthanum ( $\text{Ce,LaY,Th} \text{PO}_4$ , yellow, yellowish brown or reddish brown with a white streak, hardness of 5 to 5.5 and a specific gravity of 4.6 to 5.4). It is used as an ore of thorium and the rare-earth elements cerium, lanthanum and yttrium.
- **RUTILE:** (A mineral of titanium dioxide,  $\text{TiO}_2$  it is red, reddish brown or black with a white to gray streak, hardness of 6 to 6.5 and a specific gravity of 4.2 to 4.3). It is the principal ore of titanium and is also used as a gemstone and in ceramic glazes.
- **STAUROLITE:** (A silicate of aluminum and iron,  $\text{Fe}_2\text{Al}_9\text{Si}_4\text{O}_{22}(\text{OH})_2$ , yellowish brown, reddish to brownish black, streaks white with a hardness of 7 to 7.5 and a specific gravity of 3.7 to 3.8). Transparent single crystals are occasionally cut into gems but its principal uses are as an abrasive or sandblasting agent.
- **ZIRCON:** ( $\text{ZrSiO}_4$ , zirconium silicate, can be many colors including gray, brown, yellow, green, red colorless or smoky and has a colorless streak, hardness of 7.5 and a specific

gravity of 4.6 to 4.7). It is a source for gem and industrial zircon. Commercially it is used primarily as a refractory material or for zirconium metal.

**MOLYBDENUM:** ( $\text{MoS}_2$  molybdenum sulfide. A bluish lead-gray, metallic mineral with a hardness of 1 to 1.5, streaks grayish black, an unglazed porcelain type luster, specific gravity of 4.6 to 5.1, with perfect cleavage in one direction.) 47% of this mineral is used in steel alloy. In pure form it is used because of its high melting temperature for hardened steels. Uses include, automobiles, pipes, stainless steels, chemical processing equipment, dies, paint pigments, corrosion inhibitors, smoke and flame-retardants. The filament supports in light bulbs is made from molybdenum.

**MUSCOVITE:** ( $\text{KAl}_3\text{Si}_3\text{O}_{10}(\text{OH})_2$ , a basic potassium aluminum silicate; of the mica group. Usually colorless or white, streak is colorless, hardness of 2 to 2.5 and a specific gravity of 2.7 to 3.0). Muscovite is still used as windows in iron stoves, as a filler in various industrial products and as an insulator in electrical equipment. It can be used as the frost type glitter in many applications including make-up, nail polish and wallpaper.

**NICKEL:** ( $(\text{Ni},\text{Mg})_3\text{Si}_5(\text{OH})_4$ , the mineral garnierite, apple green in color occurs in deep weathered lateritic soils). The nickel is a vital element used to alloy with other metals, particularly iron to form stainless steel and specialty steels. It is also used in the chemical and aerospace industries.

**OLIVINE:** ( $(\text{Mg},\text{Fe})_2\text{SiO}_4$  a mineral group of magnesium iron silicate. It is olive-green to yellowish, transparent to translucent with a hardness of 6.5 to 7, specific gravity of 3.27 to 4.20, has a luster that is vitreous, streaks white or gray and an indistinct cleavage). A highly refractory mineral, which means it, does not change or melt at high temperatures. It is used in applications requiring high temperatures such as the firebricks, which line furnaces. Transparent olivine of good color can be cut into gemstones (peridot).

**POTASH:** (Potash is a term used to identify common compounds of the element potassium (K), an essential chemical element for plants and animal life. Most potash products contain the equivalent of 60% potassium oxide ( $\text{K}_2\text{O}$  and is refined into many sizes and grades. Over 90% produced in the U.S. is for agriculture. It is a necessary ingredient for production of most fine glassware, chinaware, crystal and optical glasses. Soaps, matches, dyes, television tubes, photographic film, detergents and pharmaceuticals are other uses.

**PYRITE:** ( $\text{FeS}_2$ , iron disulfide, pale yellow to brass yellow, often tarnished with brown film of iron oxide, a metallic that streaks greenish black, has a hardness of 6 to 6.5 with a specific gravity of 4.9 to 5.2. The most widespread and abundant of the sulfide minerals and occurs in rocks of many types and in all types of hydrothermal veins. It is well known as “fool’s gold”, so called because it can be mistaken for native gold. It can be associated with gold. It has commercial importance as a source of sulfur in the preparation of sulfuric acid for the manufacture of paper, synthetic fabrics, medicines, rubber vulcanization, matches, pigments and paints.

**QUARTZ:** ( $\text{SiO}_2$ , silicon dioxide, normally white or colorless but it’s crystals are in many colors such as purple, rose, yellow, and others colors as gemstones like amethyst, rose quartz, citrine, smoky quartz, etc. It streaks white has a hardness of 7 and a specific gravity of 2.65). It is an important rock-forming mineral and is in many environments. Primary uses are in the manufacture of optical glass, oscillators, filters in radio and telephone services and silicon chips



for most electronic components. Many people feel quartz crystals have special powers, probably due to its piezo-electronic components. This has something to do with how quartz's structure can convey electrons. This property was why it was initially used in transistors and now as pure silicon for microprocessors.

**REALGAR:** (AsS, Arsenic sulfide, usually deep red to orange but becomes yellow upon exposure to light, has a resinous luster, streak is orange/yellow, a hardness of 1.5 to 2, specific gravity of 3.5 to 3.6, and has good cleavage in one direction.). Realgar is used as an ore of arsenic and should be handled carefully. Arsenic acid is used in the production of chromated copper arsenate, a wood preservative.

**SILVER ORE:** (Ag, native element. Is normally silvery to gray-white, hardness of 2.5 to 3, specific gravity of 10.0 to 12.0 with a brilliant metallic luster, opaque, usually dulled by black film caused by chemical alteration. It streaks silver-white to gray-black (tarnish), with little cleavage. It is malleable and ductile, soluble in nitric acid. The best known conductor of electricity and heat. Tarnishes when exposed to air. The most important uses include photography, dentistry and jewelry. Over half of all silver mined is used in the manufacture of photographic and x-ray film. It is important in the electronic field due to its high electrical conductivity and other uses include plating for mirrors, coinage and in chemical applications.

**SPHALERITE:** (ZnS, zinc sulfide, yellow to reddish brown, blackish with increasing iron content. Can also be pink, green or colorless, has a hardness of 3.5 to 4, specific gravity of 3.9 to 4.2, its luster is adamantine to resinous, transparent or translucent with a pale yellow or red streak. Has perfect cleavage parallel to the twelve faces of the dodecahedron.) It is the main ore of zinc, used in metal plating to inhibit rust, combined with copper to form brass, as a dietary supplement, in other medical applications as zinc oxide in ointments and creams for healing.

**SULFUR:** (S. normally bright lemon yellow, has a hardness of 1.5 to 2.5, specific gravity of 2 to 2.1, its luster is resinous to greasy, with a white streak and no cleavage. Burns at 275° F, giving off sulfur dioxide fumes. Poor conductor of heat and has a distinctive “rotten egg” odor). About 90% of the sulfur consumed in this country goes into making sulfuric acid, the “king of chemicals”. Sulfur is used in the manufacturing process for rubber, matches, paper production, fabric, drugs as well as in photography. It is also a very important chemical in the production of fertilizer.

**TALC:** ( $Mg_3Si_4O_{10}(OH)_2$ , a basic magnesium silicate) it is noted for its softness, has a hardness of 1, streaks white and has a specific gravity of 2.7 to 2.8). Talc is a major component of the rock soapstone (so named because of its slippery feel) and may be used in ceramics, PVC pipe, talcum powder, as a lubricant and as insulation in electrical equipment. It is widely used for carvings.

**TRONA:** ( $Na_3(CO_3)HCO_3 \cdot 2H_2O$ , hydrated sodium carbonate, is white or yellowish, transparent to translucent with a hardness of 2.5 to 3.0, specific gravity of 2.17, dull, earthy luster, white streak and perfect cleavage. It is soluble in hydrochloric acid, light and fragile and is called “natural soda ash”.) Trona is refined into soda ash that is used in glass manufacturing and detergents. A by-product is baking soda used in baking, toothpaste, antacids and pharmaceuticals. Ceramic tiles, porcelain fixtures, and upset stomach remedies all are from trona. Wyoming is the largest producer of trona in this country.



**ULEXITE:** ( $\text{NaCaB}_5\text{O}_9 \cdot 8\text{H}_2\text{O}$ , a hydrous sodium calcium borate, it is commonly called the TV rock. It is white in color, with a vitreous, satiny luster, streaks white and has a hardness of 2.5 with perfect cleavage in one direction). It usually develops in evaporite deposits of chemical sedimentary rocks and is associated with colemanite, kernite and calcite. Refined borates are used in fiberglass, glass, ceramic glazes, detergents, fertilizers, wood preservatives and other products.

**ZEOLITES:** A group of related hydrous tectosilicate minerals, popular among collectors that occur in cavities in basic igneous rocks, especially vesicular basalt. They contain water in microscopic channels that can be driven off by heat or replaced without altering the structure of the zeolite minerals. List includes Heulandite, Stilbite, Laumontite, Chabazite, Analcime, Natrolite and Mesolite to name a few. Zeolites are used in "kitty litter", filters for odor control, to remove chemicals and other toxins from a wide range of applications. As an ion exchanges such as water softeners

***For further or more detailed information a good reference book like The Audubon Society Guide to Rocks and Minerals is a wonderful source.***

