

**NEVADA MINING ASSOCIATION
LAS VEGAS, NEVADA
TEACHER WORKSHOP
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INTRODUCTION: Why do you suppose we mine rocks and minerals? It costs a lot of money to dig and haul all that rock material. Does anybody know where all of this rock goes after its dug out of the ground? Does anyone know what the rocks and minerals we have studied today are used for, other than making a nice mineral kit? Minerals are the basic ingredient of many every day products. Listed below are just a few to get your started. Do not forget the human body's requirements for minerals on a daily basis and that our food production requires minerals as soil additives to maintain the level consumed by the world's population. Their importance in our nation's economic well being is neither well known nor understood by many people. Rocks have a wide variety of uses besides construction materials and are made up of different minerals.

MINERALS

BARITE: (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. Barite is used to make optical glass; white pigments, ink, linoleum and oilcloth as well as the green color in fireworks.

CALCITE: (CaCO_3 Calcium carbonate it is 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, ceramics and plastic pipe.

ORES OF COPPER: 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, and similar places in hospitals to inhibit germs. Due to its biostatic properties, germs do not grow on copper, so many new hospitals, hotels and such facilities are using a layer of copper on door strike plates, heating and air-condition vents and piping to reduce the risk of infection spreading.

- **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 and a specific gravity of 3.7 to 3.8). It has good cleavage in two directions. It is usually associated with malachite and is a secondary copper mineral.
- **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.

FELDSPAR: (KAlSi_3O_8 a variety of Orthoclase, potassium aluminum silicate, a non-metallic mineral. Colors can go from white, pink, brown, gray, green, yellowish or colorless. Luster is vitreous, streaks white, hardness is 6 to 6 ½ and a specific gravity of 2.5 to 2.6) Used in the

manufacture of glass, porcelain (high tension electrical insulators, ceramic glazes and dental products), enamel, mild abrasive in scouring powder.

FLUORITE: (A non-metallic mineral (CaF_2), calcium fluoride, with small amounts of yttrium and cerium. Color can be white, gray, pink, purple, blue, yellow or pale green with a white streak, hardness of 4.0, a specific gravity from 3.1 to 3.3). 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: (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 with a specific gravity of 15.3 to 19.3). 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 sinkers. 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: ($\text{Ca}_3\text{Al}_2\text{Si}_3\text{O}_{12}$ A complex family of silicates containing combinations of iron, aluminum, magnesium, manganese, calcium and chromium, non-metallic. It can be colorless, white, yellow, pink, green, or brown. Luster is vitreous, streaks colorless, hardness from 6 ½ to 7 ½ and a specific gravity of 3.56 to 4.32). These samples are grossularite, calcium aluminum silicate, a non-metallic mineral. It has various uses including jewelry, gemstones, collector specimens, and as an abrasive such as sandpaper.

GYPNUM: (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 3 to 4 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.

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.

- **MAGNETITE:** (Fe_3O_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.

QUARTZ: (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. It can also be found in insulation, roof shingles, and other construction material. Many people feel quartz crystals have special powers, probably due to its piezo-electronic components. This relates to the way quartz's structure can convey electrons. This property was the reason quartz was initially used in transistors and is now used as a source of pure silicon for microprocessors.

PYRITE: (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.

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). It will burn 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.

ROCKS

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 as ballast for railroad track beds.

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 especially for making concrete.

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. Recently, a company has been offering diorite as an alternative to granite countertops. They say hold up better than granite.

GNEISS: A metamorphic rock that is uneven, granular, medium to coarse grained crystalline with 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, floors 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, for the 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 antacids.

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. Light, cellular, frothy rock 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 metamorphic rock that was originally deposited as sand in streams in Southern Minnesota. It consists mainly of quartz and is formed by the recrystallization of sandstone or chert. This is a very hard rock, known as the Sioux Quartzite and contains layers of softer claystone called Catlinite or Pipestone. Indians in the area prize it for carving. Quartzite is also used in construction and construction materials like roofing shingles and in place of sandstone in many instances.

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. It has many uses in sandblasting and as abrasives.

SCHIST: A metamorphic uneven granular, medium to coarse grained, crystalline with prominent parallel mineral orientation rock. It 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.

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