

Identify Your Mineral Treasures

Learning how to establish or verify the identification of minerals can provide an added dimension of enjoyment to what, for many, turns into a lifelong pursuit, while at the same time can help the collector avoid the pitfalls of collecting.

It is a paradoxical cruelty that collecting minerals can be simultaneously the most rewarding enterprise *and* the most frustrating. Anyone who collects minerals long enough will inevitably acquire specimens of questionable identity, either from finding a poorly crystalized or massive specimen in the field, or through a misrepresented/misidentified purchase, which happens more often than one might expected. *This, by the way, can be used to one's advantage!*

Rare specimens are available and can be procured via buying and trading, which is especially easier to accomplish today than just a mere thirty years ago before the advent of the internet. Now, with the proliferation of trade shows dedicated to mineral collectors, and through such online markets as Ebay, there is little reason why any collection cannot exhibit at least a few examples of the rarest of mineral species.

However, rockhounds and serious collectors with access to even the most mundane of collecting environments—pay attention you Jayhawks and Sooners—will quest to personally collect their own specimens. While they will reasonably expect to find most, if not all, of the common species, inexorably specimens unidentifiable by ordinary means will be found. This is where one can find the most pleasure—and frustration—in being, not simply a mineral collector, but a knowledgeable enthusiast...a curator, if you will, of your own mineralogical museum.

Fortunately, there are methods available to help in this regard. Certainly, a background in chemistry or any lab-oriented science class will make the job at hand easier, but it is not a prerequisite. All that is really needed is a willingness to make the attempt, learn as you go, and ultimately gain invaluable experience through years of practice and accomplishment.

The process includes *determinative mineralogy* requiring the use of such research resources as books, maps (geologic and topographic),

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View NE from the Dawn Mine
Goodsprings District, NV



identification tables (physical, chemical), and knowledgeable individuals; *crystallography*, the recognition and understanding of the six crystal forms; *physical mineralogy*, observation of physical characteristics such as hardness, color, luster, cleavage, luminosity, streak, etc; *chemical mineralogy*; methodology and analysis of solubility and reactivity with reagents; and perhaps the most important, *descriptive mineralogy*, which necessitates at least a basic understanding of geologic processes, mineralizing environments, and fundamental characteristics of the various mineral classes.

Together, these fields collaborate to provide the tools necessary to either identify unknown specimens outright, or eliminate compelling suspects. Which leads us to the point of this dissertation. In this multi-part series, we will explore the various means available to identify your own specimens without resorting to more elaborate and expensive testing procedures (e.g. XRD, SEM, IR, CG, and so forth). Many of these testing techniques can be found in various books and internet resources, but few, if any, will include experienced advice for confronting the innumerable problems one can expect to encounter, nor aid in interpreting confusing results. This is particularly relevant to chemical testing applications.

First and foremost, having an understanding of how and where specific minerals form will suggest or eliminate contending possibilities. Knowing this, one will not expect to find hydrothermal minerals in evaporate environments, nor evaporate minerals in a plutonic environment, and so forth, except perhaps under special extenuating circumstances.

Galena should not be expected to be found mixed with halite on the floor of Death Valley. If it *is* there, someone or something put, dragged, dropped, rolled, or propelled it there! Likewise, diamond will not be found in a coal mine. If it *is*, you can be sure one of the miners will want his girlfriend's engagement ring back! Furthermore, if a serpentine body is being explored, and a heavy black mineral is encountered, it is reasonable to presume the mineral is chromite, not the similar looking and closely related magnetite.

These are obvious examples, but serve the point well. Knowing what minerals form under what conditions and environments can help you identify the specimen without having to resort to elaborate tests, and save you much valuable time and effort that can be better spent in other areas of your collecting avocation.

Typical Environment Associations

Metamorphic

Rock Types

Slate Phyllite Schist Gneiss
Quartzite Marble Serpentinite

General

feldspars, micas, pyroxenes, amphiboles, quartz,
calcite, serpentine, platinum, chromite, etc.

Regional

garnets, micas, andalucite, staurolite, sillimanite,
kyanite, cordierite, anthophyllite, talc, etc.

Contact

sulfides, wollastonite, grossularite, epidote,
diopside, vesuvianite, scheelite, corundum, etc.

Igneous and Plutonic

Rock Types

Granite Syenite Diorite Gabbro
Rhyolite Trachyte Andesite Basalt

Hydrothermal

sulfides, malachite, azurite, anglesite, cerussite,
smithsonite, copper, gold, silver, etc.

Pegmatitic

feldspars, quartz, topaz, beryl, tourmaline,
garnets, apatites, etc.

Fumerolitic

opal, geyserite, sal amoniac, sulfates, hematite,
sulfur, cinnabar, metastibnite, etc.

Sedimentary

Rock Types

Siltstone Shale Arkose Sandstone
Conglomerate Limestone Dolomite

Alluvial

clays, garnets, zircon, magnetite, cassiterite,
chromite, gold, platinum, diamond, etc.

Limestone Quarry

Calcite, dolomite, gypsum, fluorite, galena,
sphalerite, celestite, etc.

Evaporate

halite, gypsum, glauberite, borax, ulexite,
colemanite, strobtilanite, trona, dolomite, etc.

General Group Characteristics

Native Elements

Metals: metallic, malleable, ductile
e.g. **Gold, Silver, Copper, Platinum**

Semimetals: metallic
non malleable or ductile
e.g. **Arsenic, Antimony, Bismuth**

Non Metals: non metallic
non malleable or ductile
e.g. **Sulfur, Diamond, Graphite**

Sulfides Sulfosalts

opaque, brittle, heavy, most are soft

Metallic: crush to dark powder.
e.g. **Pyrite, Galena, Chalcopyrite**

Non Metallic: crush to light powder
e.g. **Sphalerite, Realgar, Orpiment**

Oxides

compounds of metallic elements with oxygen; simple crystal structures; most are primary; virtually all are relatively hard; anhydrous; resistant to weathering

e.g. **corundum, hematite, ilmenite, rutile, cassiterite, uraninite, spinel**

Hydroxides

usually secondary, resulting from weathering; softer than their primary counterparts; hydrous; typically red, brown or black

e.g. **goethite, brucite, manganite, bauxite, limonite**

Halides

compounds of metallic elements with halogens; many are water soluble; light in color when fresh; transparent to translucent

e.g. **halite, fluorite, chlorargyrite, sylvite, atacamite, cryolite**

Carbonates

large group containing carbon dioxide; transparent to translucent; all are soft; many have pronounced rhombohedral cleavage; all are soluble in acids with effervescence

e.g. **calcite, aragonite, smithsonite, malachite, azurite, rhodochrosite,**

General Group Characteristics

Nitrates

small group of nitrogen minerals; most are very soluble in water, thus found mainly in arid regions of Chile and US; soft, colorless to white or light tints; burn when heated

e.g. niter, soda niter

Borates

compounds of metallic elements with boron oxyanions; *hydrous group* is water soluble, light in color, transparent to translucent, soft; *anhydrous group* is very rare, hard

e.g. borax, ulexite, colemanite

Sulfates

large group of compounds of metallic elements with sulfur dioxide; light in color; transparent to translucent; all are soft

e.g. gypsum, barite, celestite, alunite, anglesite, chalcantite, epsomite

Phosphates, Vanadates, Arsenates

most are secondary in oxidation zones; soft, highly colored; arsenates yield garlic odor when roasted

e.g. vivianite, erythrite, varisite, adamite, mimetite, vanadinite

Tungstates and Molybdates

soft, heavy, many are highly colored; more-familiar minerals have easily recognizable characteristics without need of testing; many are fluorescent

e.g. wulfenite, scheelite, powellite, ferberite, huebnerite

Silicates

largest group; most are insoluble in acids before fusion in flux; light streak, usually hard, infusible; transparent to translucent; yield silica gel in acid

e.g. quartz, feldspars, micas, zeolites, pyroxenes, amphiboles, olivines