Light Faded Minerals–
Can We Restore the Glow?

From Don Kauffman, CPRMC

One day while browsing through Mindat.org a Message Board* user inquired, "I wonder if faded fluorite (or other minerals) can have their color restored." In a matter of a few hours, he started receiving responses and below is a compilation of what I learned about faded mineral specimens.

It is best to note that most fading of delicate minerals can be avoided by keeping them out of direct sunlight*. Even a strong source of any Ultraviolet (UV) light may cause a fading or color change. First response indicated that most color diminished fluorite could be restored BUT only with a strong source of ionizing radiation. It is very important to note that such restoration is considered highly hazardous and not recommended.

One collector stated that virtually tight storage of his **fluorite** in a light-free container kept his prized Weardale fluorite in pristine condition. Available information by a collector who apparently did some experimentation established that indeed irradiation has been known to restore *green* color to sun damaged fluorite. He also stated that "grey ones remained grey." A vast difference was noticed between fluorites observed under natural sunlight and artificial light sources.

Due to crystalline lattice structure of fluorite other mineral defects in the material may *trap* light. Such "color centers" collect electrons by absorbing light which then emit certain ranges of the color spectrum (red, orange, yellow, grey, blue and shades of indigo to purple). When a strong UV light source such as sunlight impacts a mineral for an extended amount of time, electron particles are ejected from the mineral and severe fading of the specimen is noted. A strong dose of ionizing radiation will "recharge" some color damaged minerals such as **hackmanite**.

It was emphasized that to reactivate mineral color a source of radiation may be needed that is just too dangerous for any collector without proper equipment or facilities. In event that a mineral such as blue **topaz** is in need of therapy only emitted by X-rays or gamma rays would suffice. But this procedure is much too dangerous for laymen or many experienced collectors. Because irradiated gem stones or jewelry then become too radioactively ***hot*** to wear. In most instances post irradiation application typically requires them to be sequestered a minimum of five years. After radioactive decay has been dissipated, irradiated material can then be handled safely.

Depending upon the type of radioisotope emitted not all radiation is an equal opportunity hazard. Shielding from a radioactive source can range from a single sheet of paper (Alpha particles) to a minimum of centimeters of shielding (Beta particles) to very heavy shielding more than twelve inches thick (Gamma particles), in order to protect human tissue.

Protection doesn't end there. Certain radioactive sources provide an additional hazard when inhaled as emitted gas or ingested in the form of particles. Time of exposure and distance from radiation source are factors in determining how much of a hazard experimentation may pose. Radiation therapy of mineral specimens is not a safe experiment for amateurs or even most experienced collectors.

What minerals are best not exposed to direct and continued UV sunlight? A Mindat reader had the answer. Fluorite and amethyst lose color. Realgar metamorphoses into pararealgar (yellow orpiment). Silver bearing minerals (silver halogenides) will turn black due to photochemical reaction with sulphur or sulphur dioxide. It is best that minerals prone to react to sunlight be stored in black boxes. Very often you will observe dealers at shows with boxes of specimens marked "**Light sensitive, please do not keep open**."

It was reported that some English fluorites from certain locations were more fade resistant than others. The sturdier fluorites reported were deep purples, yellows and a green specimen from a

particular location.

Two other minerals were reported as victims of sunlight, **kunzite** and **rose quartz**. A despaired collector stated that a brilliant lilac kunzite gradually faded to clear with prolonged exposure to the sun. Pink or rose quartz also will fade as we noted in a piece of quartz from Beauregard Mine, New Hampshire. That material may have been a beautiful pink when first left on a ledge at the mine years ago, but when discovered the summer of 2008 the mineral had turned to almost a clear, transparent quartz with just a hint of pink.

An excellent source on how sunlight and UV affects various minerals is found in a book written by John Sinkankas.** In checking this valuable reference, approximately nine more minerals were found that have adverse reactions when exposed to direct sunlight: In **barite**, some colorless crystals turn blue when exposed to sunlight or UV sources. Some **beryl** crystals change color when exposed to direct sunlight as reported by Sinkankas who had a Brazlian apricot color beryl turn pink after exposure of one week in sunlight. No changes occurred in pale blue beryls. **Cerargyrite (a.k.a chlorargyrite which is a cubic,** changes to brown-violet in daylight and to a brown color when exposed to artificial UV light. **Cinnabar** quickly metamorphoses a purple-black metallic-like coating under UV light. Under UV light exposure ruby **corundum** transforms to a more violet hue and blue-green corundum became slightly bluer. In direct sunlight cuprite surfaces turn to a blacker metallic luster. Lilac to violet **lepidolite** is reported to pale significantly after several months of exposure to sunlight. Under UV light **smoky quartz**, often very abundant in certain pegmatite outcrops, has been observed to pale significantly or turn colorless with long term sunlight. A combination of humidity and direct sunlight will change beautiful pink-red **rhodocrosite** surfaces black in a rapid reaction. Pink **sodalite** reportedly goes colorless and sometimes in a matter of seconds.

Last but not least, **vivianite** beginning as colorless and transparent crystals rapidly changes to various blue shades. Range of color from pale to blue, to green-blue, indigo and blue-black may be exhibited immediately after being exposed to light. An additional response may be disintegration of very large crystals.

Prerequisite knowledge of mineral color characteristics is perhaps the best way to avoid color change in any minerals you may acquire for your collection. Do some additional research or ask some expert collectors in order to know which ones may be affected.

Comments entered in this article just scratch surface knowledge about conditions affecting color change of minerals. Heat and various types of radiant exposure affecting minerals plus restoration of color are covered by consulting Internet resources, other collectors and excellent books such as the Sinkankas reference.

*Article inspired by Mindat.org Message Board inquiry and responses on January 2, 2008 Thanks to Barry M. who made the initial inquiry and responding contributors; Alfredo P., Jenna M., Stephen M., Ray L., Howard M., Scott, Sebastian M., David B., and Thomas H.

Sinkankas, John "Color Changes in Gemstones and Minerals" from **The Gemstone and Mineral Data Book, Winchester Press, c1972 pp 112-120.

***Ceraragyrite a.k.a. chlorargyrite is a silver chloride halide found in oxidized zones of silver deposits from especially arid regions. Specimens may be cubic, massive crusts or waxy druzied crusts coating surfaces; also can appear as columnar or stalactites. It is colorless when first uncovered but changes to a bright chartreuse-green, light yellow, light green, or grey. Type locality for this mineral is Marienburg District, Saxony, Germany.

NOTE: Bob Jones wrote an article, "Light-Sensitive" MINERALS: Why Some Specimens Lose Their Color in **ROCK&GEM** of November 2008. This piece was in no way influenced by Bob's piece since I had not read it until after Mindat stirred my curiosity. ε