

Mineral Showcase

Allanite



Discovered in 1810 at Aluk Island, Greenland by Karl Ludwig Giesecke, and named for Scottish mineralogist Thomas Allan, *allanite* is not a distinct mineral in itself, but the general name of several closely related sorosilicate minerals in the epidote group. However, they differ from epidote in one significant manner: whereas small amounts of REE are present in most epidote-group minerals, in allanite the REEs are *essential* structural constituents.

Its general chemical formula may be stated as $\text{A}_2\text{M}_3\text{Si}_3\text{O}_{12}(\text{OH})$, where large cations such as bivalent calcium and strontium reside in the “A” site, while trivalent iron, aluminum, and manganese (with minor amounts of zinc, phosphorus, barium, chromium, and others) are sequestered in the “M” site. The rare earths (predominantly cerium, lanthanum, and yttrium, but also with trace amounts of uranium and thorium) replace some of the calcium in the molecular structure.

Though found widely disseminated in numerous rock types, allanite (also known as orthite) is nonetheless still rare in general occurrence, but the most common of the REE-rich epidote-group minerals. Minute grains occur primarily as an accessory in felsic plutonic rocks (granite, syenite, etc.), but can also be found in schists, contact metamorphic calcareous deposits, and metamorphosed clay-rich sediments. Its best presentation from the mineral collector’s perspective is as potentially large pods in granitic pegmatites. These will be found with distinct orange-brown halos of radiation damage caused by the uranium and thorium that almost ubiquitously accompany their rare earth relatives. The mineral contains up to 20% rare earth elements and is a valuable source of them.

Allanite is generally brown-black in color, crystallizes in the monoclinic system, and forms prismatic crystals, though rarely found in this habit. It has a Mohs hardness of 5.5–6 and a specific gravity of 3.5–4.2. It is also *pyrognomic*, meaning that it becomes incandescent at a relatively low temperature of about 95°C.

In lieu of crystals, allanite can be difficult to identify visually from other similar-looking minerals that often occur with it in massive aggregates, particularly aeschynite, euxenite, uraninite, magnetite, ilmenite, and black gadolinite, as at the Kingman Feldspar Quarry. Here, the allanites I have encountered feature a luster dulled by weathering, but generally greasy to waxy, rather than the usual sub-metallic to resinous. Under a microscope, reddish internal flashes reminiscent of hematite can sometimes be discerned.

Additionally, simple tests can be performed to distinguish allanite from its associates. When heated, specimens expand and fuse readily, yielding a black magnetic glass. Often, this is all the testing required. Ilmenite and magnetite are infusible, plus magnetite is naturally magnetic without having to resort to heating, both thus being eliminated.

A chemical test that can be performed at home will also differentiate allanite from the other suspects. Euxenite, aeschynite, and uraninite are all oxides, lending themselves to a silica test, which of course, will be negative. (A small sample of a silicate such as allanite, fused with sodium carbonate, then dissolved in nitric or hydrochloric acids and left to evaporate, will form a thick colorless gel, proving the presence of silica in the test specimen). Gadolinite is also a silicate, and will thus yield a positive result with the silica test. However, gadolinite, when heated, flakes and turns into a brown mass without fusing.

The International Mineralogical Association currently lists three minerals in the allanite group, each recognized as a unique mineral: allanite-(Ce), allanite-(La) and allanite-(Y), depending on the dominant rare earth present, cerium, lanthanum or yttrium. However, some specimens from the Kingman location show a distinct dominance of neodymium over the other lanthanides, thus warranting a consideration for including allanite-Nd as the newest member of the family.



Telltale Signs

These small blackish pods in a boulder of feldspar betray their radioactive nature by the conspicuous radiation halos they produce, typical of allanite which usually hosts trace amounts of uranium and thorium.



Allanite-Ce

XVIII 47 D

Mountain Pass Mine

Clark Mountains; San Bernardino Co., CA

2.5 x 2 inches

Allanite-Ce

XVIII 34 D

Tie Gulch Pegmatite; Trout Creek Pass

Chaffee Co., CO

1.25 x .75 inches



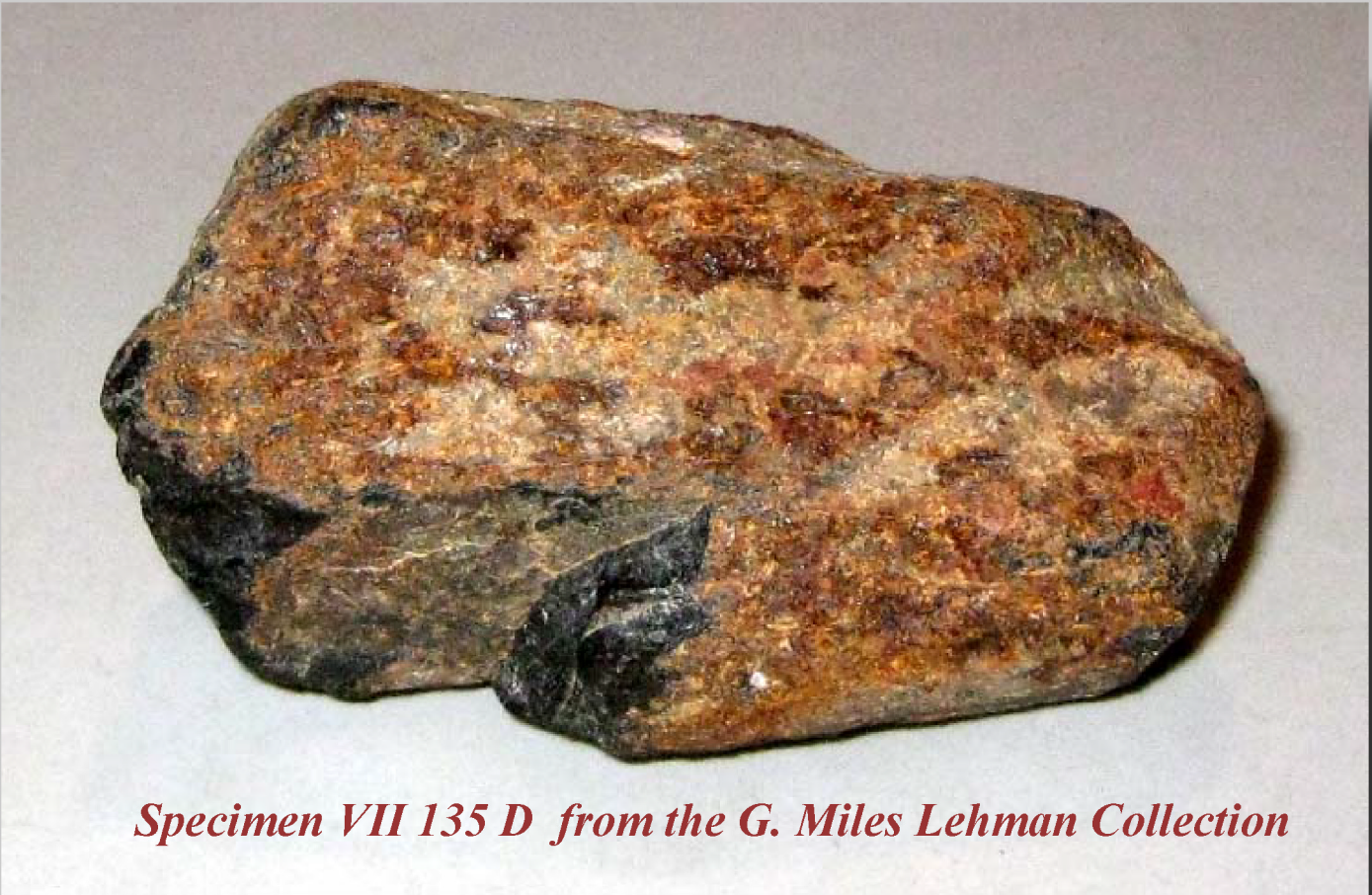
Ferriallanite-Ce

XVII 32 D

Bastnas Mine; Vastmanland, Sweden

1.25 x 1.25 inches

Classic Relationship Specimen



Specimen VII 135 D from the G. Miles Lehman Collection

This specimen from the Kingman Feldspar Quarry in the Wallapai District, Kingman, AZ, displays a classic relationship of minerals commonly found in REE pegmatites. The dark brown-black core is allanite-Ce surrounded by a thin rind of red-brown bastnaesite-Ce. This particular specimen also boasts a veneer of the new species allanite-Nd first recognized from this mine. Such specimens can also be found with an alteration crust of tanish white hydroxlbastnaesite. Specimen dimensions: 2.75 x 1.6 inches.