A rediscovery of epidote pseudomorphs after orthoclase from the Orogrande District, Otero County, New Mexico

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A Rediscovery of Epidote Pseudomorphs after Orthoclase from the Orogrande District, Otero County, New Mexico

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New discoveries, or rediscoveries of old localities, are very often some of the most challenging objectives within the field collecting world. Sparse information along with vague references or landmarks often lead to frustration in locating these areas, and more often than not result in many hours, if not days, of fruitless exploration. In this particular venture, we were fortunate to have at least a distinct starting location from which we could base all of our further exploration. This led to a wonderful find of pseudomorphs that, as far as we can determine, are unique in the mineral collecting world.

The Discovery

This adventure started with research for the New Mexico Pseudomorphs presentation given at the New Mexico Mineral Symposium in 2019. As Phil browsed the Ray Demark collection to find interesting pseudomorphs for the talk, Ray pointed out a couple of specimens that were easily overlooked. They were the typical sharp phenocrysts of orthoclase common from porphyries found at several localities across the state, but in this case they were green! Closer inspection revealed that the orthoclase had been fully replaced

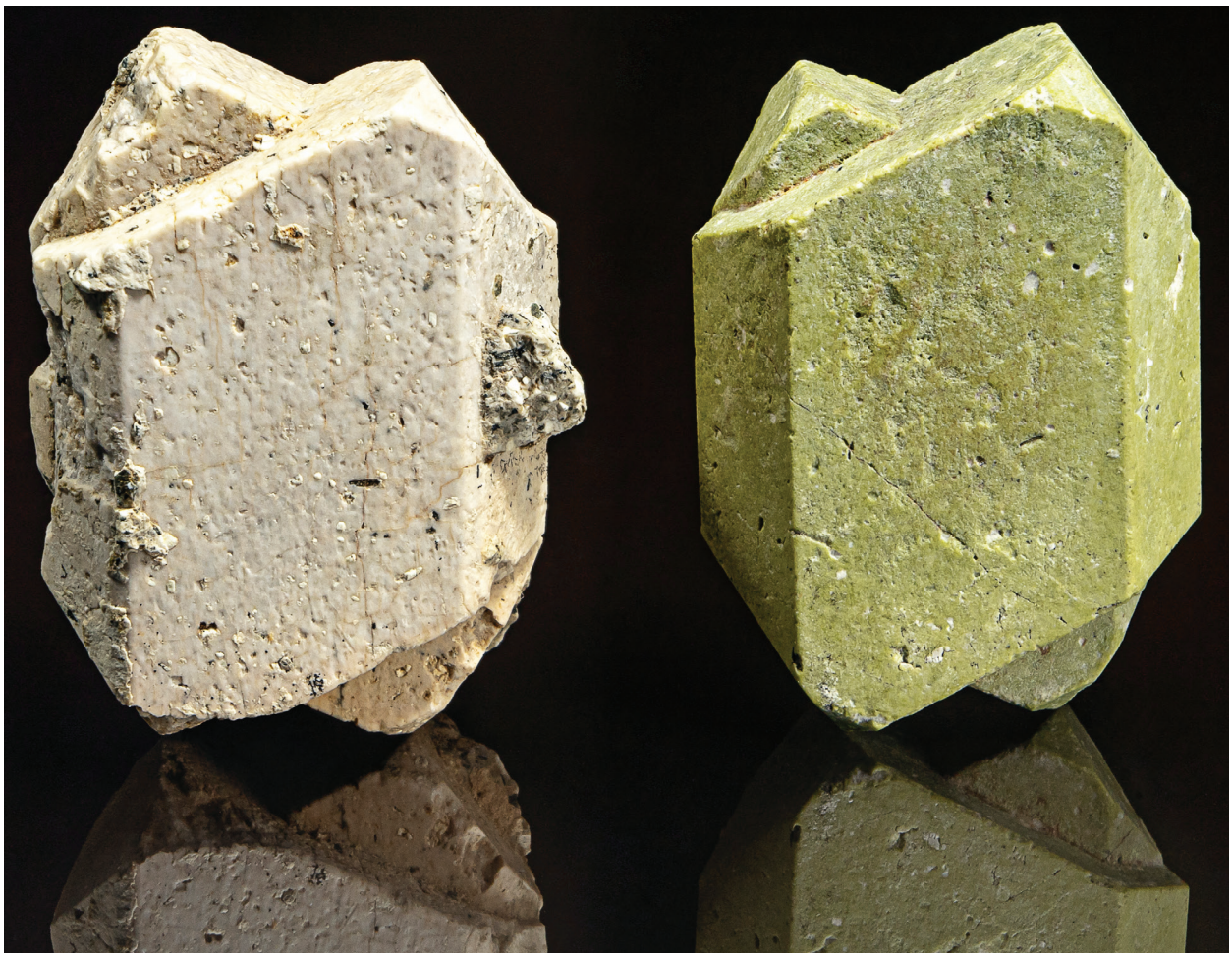

Figure 1. A comparison of an unaltered (4.2 x 3.1 cm) and an altered twin (4.1 x 3.1 cm). Note that the unaltered crystal still shows signs of surficial pitting, demonstrating that many of the defects of the pseudomorphs may have been defects in the original feldspar. The orthoclase twin is also one of the very few relatively complete crystals found on the mountain. Philip Simmons specimens. Photo by Erin Delventhal and Philip Simmons.

by epidote, a pseudomorph Phil had never seen before. An excited phone call to Erin was all that was needed to prompt us to ask Ray if he would be willing to tell us from where he had collected the specimens. Ray graciously agreed. Although the specimens observed in Ray's collection were found by an individual from Alamogordo years back, Ray had gone looking for the locality. The trip only resulted in a few crude crystals that were nowhere near the quality of the ones found previously. However, with the knowledge of where Ray had collected, we were able to pinpoint other promising targets that eventually led to the discovery (or possible rediscovery) of the premier zone that produced the sharp pseudomorphs in November of 2020.

Geology

Although the mineralogy is more complex in the parts of the Orogrande district that contain base and precious metal contact metasomatic deposits and hydrothermal turquoise deposits, the local geology of the pseudomorph locality is relatively simple. The collecting area is composed of a monzonite porphyry stock containing large, sharp phenocrysts of potassium feldspar reaching sizes of 6 cm. Late-stage mineralizing fluids, rich in iron and magnesium (known as propylitic alteration) worked their way through zones of the monzonite with higher permeability, resulting in an alteration mineral assemblage of epidote and albite with minor chlorite and calcite. This alteration targeted the feldspar, resulting in pseudomorphs of epidote/albite after orthoclase. However, the replacement is most often observed in fracture fillings and rounded "pods" up to about 20 cm in diameter. Most feldspar phenocrysts within these zones are replaced, while the effects of the replacement outside of the zone are sporadic.

Minerals and Mineralogy

XRD analysis of the rock and crystalline phases was performed by Virgil Lueth and Kelsey McNamara at the New Mexico Bureau of Geology and Mineral Resources X-ray Lab. Results concerning the feldspar species showed orthoclase, microcline, sanidine, and albite. Questions still exist regarding these results given two factors: 1) XRD has limitations in discerning various types of alkali feldspars; 2) the presence of some of these species raises questions given what is known of the broader geology of the region. Analysis concerning the replacement species resulted in clinozoisite—however since clinozoisite forms a solid solution series with epidote (Fe^{3+} substitutes for Al) and the distinct green color of the specimens in contrast to the typical brownish tinge of clinozoisite, we assume the replacement is epidote. Further analysis is needed for both the precursor feldspar species and the replacement species to determine the identity unequivocally. Small albite crystals form a replacement texture on the outside of the phenocrysts; some replaced by epidote and some unreplaced. Based on the replacement, it appears that the rind of the phenocrysts was less susceptible to epidote alteration. Replacement is variable within the phenocrysts, although the majority of crystals are fully replaced. Surficial replacement often consists of albite, and the crystals can exhibit cracks as a result of the volumetric change during pseudomorphism or later weathering.

A mix of single crystals and Carlsbad-law twinned crystals are found at the locality. The twins are both morphologically left- and right-handed pairs. Only two Baveno twins have been found, making them the rarest type of crystal growth. Coveted groups of intergrown crystals are found occasionally, as well as parallel growth crystals. Matrix specimens are occasionally found, and are some of the more desirable specimens from the locality. Since the crystals are found as phenocrysts, they have no point of attachment, and are fully complete all around when not broken by the weathering process.

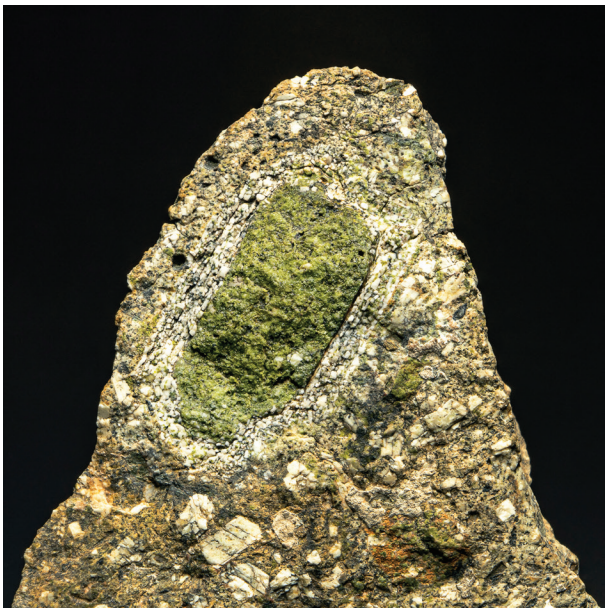

Figure 2. A cross-section of a broken epidote pseudomorph exhibiting a rind of concentric layers of flattened albite crystals, crystal is 3.0 cm long. Also of note are the other feldspar phenocrysts that, even in close proximity, show little sign of epidote alteration. Mike Sanders specimen.
Photo by Erin Delventhal and Philip Simmons.