

MINERALIZATION AT GRANITE GAP, HIDALGO COUNTY, NEW MEXICO

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INTRODUCTION

This brief paper is the outcome of study of the interesting oxide ores at Granite Gap. The geology of the area has been described in some detail by Gillerman (1958), and the mines have been mentioned by Lindgren and others (1910), who saw them during their most productive period.

The mineralization considered here is confined to occurrences in the Escabrosa and Horquilla limestones. The workings studied are all located in the prominent hill just south of Granite Gap and U.S. 80.

GRANITE GAP GRANITE

The coarse grained intrusive rock occurring at the pass and to the north is actually a quartz monzonite. It is typically leucocratic, carrying minor biotite and accessory magnetite with nearly granular quartz, orthoclase and plagioclase in approximately equal amounts. The orthoclase shows patchy ordering and is perthitic.

Although assigned a Precambrian age by Gillerman (1958), the intrusion is firmly established as Tertiary. A K/Ar age determination based on fresh biotite yielded a 33.2 ± 1.2 m.y. date. The sample was taken in the old road cut at the pass. Further evidence of this age is the presence of a contact metamorphic aureole surrounding the intrusion. A zone of wollastonite-grossularite-vesuvianite up to 100 m wide is commonly present. Additionally, rafted blocks and roof pendants of calc-sediments within the pluton are similarly metamorphosed (with small amounts of accessory scheelite and chalcopyrite).

Dikes of quartz monzonite porphyry are locally common around the margins of the main intrusion, particularly within the mineralized area at Granite Gap. Their spatial distribution with relation to mineralization is striking and was early noted by Lindgren and others (1910). For want of better or conflicting evidence, the dikes are the presumed source of metallization. Although texturally different, the dikes are chemically nearly identical to the main intrusion. They carry large, usually nearly euhedral phenocrysts of orthoclase, plagioclase and quartz in a ragged, nearly granophyric quartz-feldspar matrix. Biotite occurs as smaller phenocrysts in the matrix. Accessory minerals such as sphene, apatite and monazite are found in the dikes and main intrusion, suggesting a close genetic link.

The dikes show somewhat stronger deuteric alteration than the main intrusion. This is exemplified by biotite altered to iron-rich epidote and pennine and the presence of pyrite that invariably blots out the biotite relics. Diking appears to have been a precursor of the main intrusive event, and most dikes have been blotted out where cut by the pluton.

MINERALIZATION

The introduction of sulfides has occurred in hazily defined volumes of rock surrounding known areas of quartz monzonite porphyry dikes. Although thermal metamorphism in the lime-

stones is generally negligible, even directly against dikes, it is readily observed in mineralized structures. Sulfides are usually confined to pitches and flats in certain limestone beds and, to a lesser extent, to fractures cutting bedding. Sulfides occur as disseminated crystals or massive pods in a gangue of unctuous scaly phlogopite hosting corroded beads of iron-poor epidote. Calcite crystalloblasts may be embedded in the phlogopite, and the calcite adjoining silicated structures is also apt to be recrystallized.

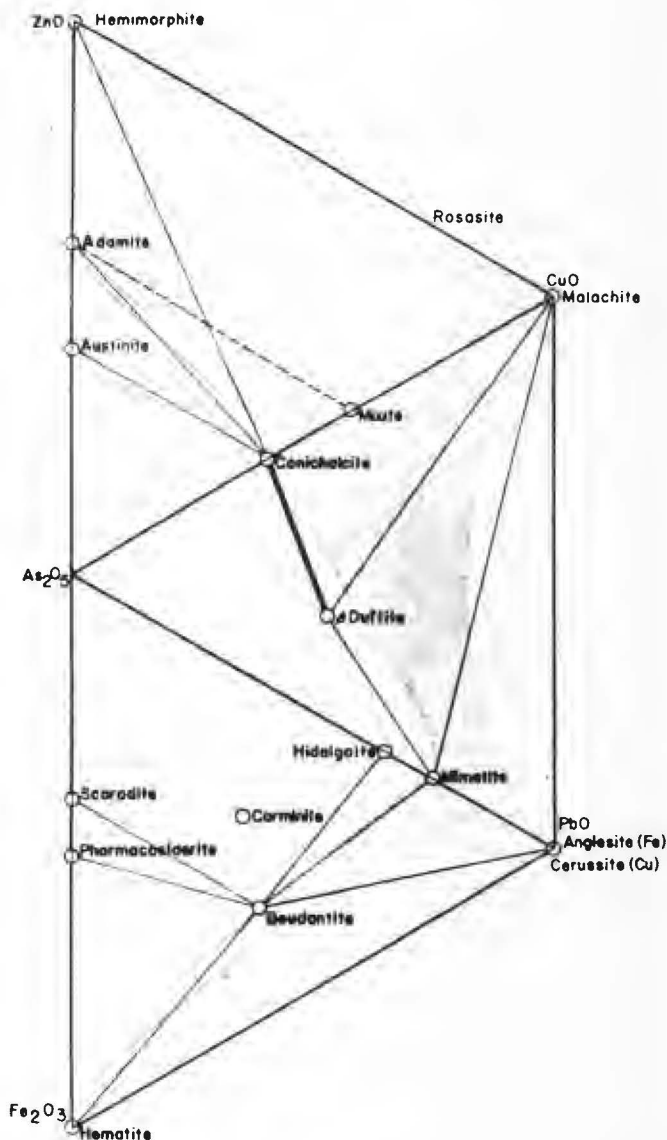


Figure 1. Joined ternary diagrams $ZnO-CuO-As_2O_5-PbO-Fe_2O_3$ showing ore mineralization at Granite Gap. Major mineral assemblages fall within stippled area. See text for explanation.

Small-scale subsidiary fractures leading away from the more intensively mineralized and silicated structures often carry small amounts of lead and zinc with no gangue other than recrystallized calcite.

The sulfide mineralogy of the district is simple. Both pyrite and pyrrhotite occur, usually only in the silicated structures, and arsenopyrite is nearly ubiquitous. This latter mineral was often observed as isolated, highly perfect prisms embedded in phlogopite and in many instances where no other sulfides could be found.

The major ore minerals are galena, sphalerite and chalcopyrite. Seldom does the latter occur in discrete masses; most is present only as exsolution blebs in sphalerite. Both galena and sphalerite are coarse grained, often forming nearly massive nodules of considerable size (0.5-1.5 m). The major metal of interest in the district was silver. So far as known, all silver must have occurred originally as matildite blebs and platelets in the galena, and chemical analysis of several "pure" galena fragments (i.e. with included matildite) showed silver values in the range 100-150 oz/ton. Bismuth occurs not only in matildite but in arsenopyrite in the range 0.1% to 0.2%.

OXIDATION

In most of the workings, oxidation has occurred as deep as mining has pursued the ore. There is little doubt that oxidation enhanced silver values, most silver now appearing as chloargyrite. Selected ore samples taken in well mineralized structures commonly run 100-500 oz/ton silver.

The scheme of oxidation is shown in the joined ternary diagrams in Figure 1. Major assemblages generally fall in the lightly stippled areas beginning with beudantite-mimetite-anglesite followed by mimetite-cerussite-duftite-malachite,

then duftite-malachite-conichalcite, then conichalcite-adamite-hemimorphite with or without malachite or rosasite.

Iron sulfides eventually appear *in situ* as powdery hematite, while arsenopyrite is apt to be leached, leaving cavities filled with beudantite and occasional tiny prisms of mixite. Galena typically occurs as corroded remnants embedded in nuggets of granular cerussite. As is so often the case, supergene covellite precipitates on the galena, the copper ultimately appearing in rosasite or malachite intergrown with cerussite.

Copper and zinc usually migrate extensively, often appearing on the walls of solution caverns in the limestone. Commonly these caverns have an outer rind of iron oxides implanted with hemimorphite and rosasite, all overgrown with coarsely crystalline calcite. Where arsenic was available, such caverns may be lined with adamite-austinite-conichalcite.

CONCLUSIONS

Metallization at Granite Gap, including ores of copper-lead-zinc-silver, is related to quartz monzonite porphyry dikes that can be genetically linked to the Granite Gap Granite (of Gillerman). The metallization occurs in various silicated structures in the Horquilla and Escabrosa limestones. Although the volume of metallization was evidently small, ores were enriched during oxidation, and well suited to small-scale underground mining.

REFERENCES

- Gillerman, E., 1958, Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico, and Cochise County, Arizona: New Mex. Bur. Mines and Min. Resources, Bull. 57, 152 p.
- Lindgren, W., Graton, L. C., and Gordon, C. H., 1919, The ore deposits of New Mexico; U.S. Geol. Survey Prof. Paper 68, 361 p.