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References

1. Sutton, J. R., Inclusions in diamond from South Africa: *Mineral. Mag.*, **19**, 208–210 (1921).
———, *Diamond*, London, pp. 42 (1928).
2. Williams, A. F., *The Genesis of the Diamond*, London, **2**, 423 (1932).

NOTES ON SOME MINERAL OCCURRENCES IN THE GUFFEY REGION, COLORADO*

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Introduction

Most of these mineral occurrences have not been described previously in detail, although a few of them have been reported briefly. The mineral localities here described were studied during the summers of 1950 and 1951 as a part of field investigations leading to the preparation of a doctoral dissertation in mineralogy for the University of Michigan.

The Guffey region is an area of about 125 square miles in north-central Fremont County and southeast Park County in the Front Range of central Colorado. Its center is 34 miles by road northwest of Canon City. The area is underlain chiefly by pre-Cambrian igneous and metamorphic rocks, which have been covered to the north, east and west by post-Laramide extrusive rocks.

On the basis of their geological environments it is possible to classify the mineral occurrences under three headings: pegmatite minerals, minerals of the metamorphic rocks and minerals of metallic ore deposits.

Pegmatite Mineral Occurrences

The pegmatites in the area are pre-Cambrian in age, and probably are associated genetically with the intrusion of the Pikes Peak granite batholith (Bever, 1952).

Euxenite: An unusual concentration of this rare radioactive mineral was found in the core margin unit of a small zoned pegmatite about 200 feet west of the Mac Gulch drainage, approximately 3 miles southeast of Guffey. The euxenite occurs in bladed crystals as much as 2 centimeters in length, whose freshly broken surfaces are glassy and brownish-black in color. Associated are abundant coarse biotite and magnetite as well as the other common granitic pegmatite minerals. Tantalite also is

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present in relative abundance. A few grains of altered euxenite also were found at the East-West pegmatite which is described below.

Monazite: A number of small crystals and crystal fragments of monazite were found at the East-West feldspar pegmatite, which is about 1 mile west-northwest of the Meyers Ranch pegmatite described by Hanley *et al.* (1950, pp. 105–107). Associated with the monazite in addition to the common pegmatite minerals are beryl, schorl, tantalite, and smoky quartz.

Magnetite-quartz-sillimanite selvage: The Whopper pegmatite, which is in the Micanite group, has been described by Hanley *et al.* (1950, pp. 48–50) who report "granular magnetite masses as much as 3 inches in size and a mineral tentatively identified as sillimanite." Pods of coarse-grained magnetite-quartz-sillimanite rock, as much as 25 centimeters in diameter, occur as a discontinuous selvage along the pegmatite margins. Individual magnetite octahedra are as large as 3 centimeters in diameter. In some pods the magnetite and quartz are intergrown simplectically to graphically. Similar pods of magnetite-quartz-sillimanite rock were observed along or near the margins of a number of other pegmatites in the Guffey area.

Mineral Occurrences in Metamorphic Rocks

The pre-Cambrian country rocks include those which have been correlated with the Idaho Springs formation and closely associated migmatite.

Cordierite: Sterrett (1923) recognized cordierite in the Climax pegmatite, which is one of the main deposits of the Micanite group. Hanley *et al.* described this deposit (1950, pp. 43–45) and Heinrich (1950) discussed the cordierite occurrence in detail, including its extensive alteration to pinite and summarized and evaluated the various theories concerning the origin of pegmatitic cordierite. Large boulders and several outcrops of cordierite-sillmanite gneiss were found 300 feet west of the Climax pegmatite. This rock contains metacrysts of glassy gray-violet cordierite as much as 3 millimeters in diameter. This occurrence, previously unknown, undoubtedly must be considered in re-evaluating theories on origin of the nearby pegmatitic cordierite.

Eckel in 1932 (Lovering and Goddard, 1950) found "a little cordierite (?)" in the ore-bearing zone at the Lone Chimney mine, now known as the Betty mine. This occurrence was confirmed by the author, but more noteworthy is the occurrence near the margin of the same mineralized zone about two-thirds of a mile south of the mine on the north bank of Thirty-one Mile Creek. The outcrop is about 500 feet east of the Copper King prospect described by Hanley *et al.* (1950, p. 105). Cordierite and quartz in granular aggregates as much as 4 centimeters across are interstitial to radiating fibers of anthophyllite which may reach a length of 3 centimeters. This cordierite is the rarer optically positive variety.

Kyanite: Blades of kyanite, 5×2 centimeters, partly or completely altered to fibrous sillimanite occur randomly oriented in injection gneiss on the north bank of Dicks Gulch about 2 miles west of Currant Creek. The other minerals of the gneiss are quartz, muscovite, biotite, sillimanite, microcline and plagioclase. Kyanite has previously not been reported from this part of Colorado. Aggregates of sillimanite needles in gneisses in other parts of the area also appear, because of their shape, to be pseudomorphous after single kyanite crystals.

Sillimanite: Previous reports on the Guffey area mention the presence of sillimanite, but do not indicate that it is unusually abundant. Sillimanite is almost invariably present in large quantities in transitional zones of injection gneiss that lie between schists of the Idaho Springs formation and the Pikes Peak granite pluton. At the junction of Currant Creek and Lues Gulch just a few feet north of Colorado State Highway 9 is a lens of relatively pure sillimanite-quartz rock with accessory biotite, feldspars and sericite. This deposit is approximately 175 feet long and as much as 30 feet wide, concordant with the foliation of the flanking injection gneiss and localized along the gneiss-Pikes Peak granite contact. This sillimanite is white to greenish white in color, although at the surface much of it is heavily stained by iron oxides.

An erosion surface of several square miles, $\frac{1}{2}$ to 2 miles east of Micanite Ridge, is underlain chiefly by sillimanite schist containing a high percentage of magnetite. Outcrops of this rock generally weather dark reddish-brown to black.

Minerals of Metallic Ore Deposits

Scheelite: Tungsten mineralization has heretofore not been reported from this area, but scheelite occurs as disseminated grains and crystals in possible commercial concentrations along the ridge about one-quarter mile northeast of the West ranch, which is at the junction of Colorado State Highway 9 and the Guffey road. The scheelite occurs in a coarse-grained crystalloblastic aggregate of epidote, hornblende, quartz, calcite, and garnet probably formed by the metamorphism and metasomatism of an impure calcareous sediment. The scheelite is milky white, and some of the crystals are unusual in showing a pronounced zonal variation in fluorescent colors. The centers of the crystals fluoresce blue-white, whereas the narrow margins exhibit a yellow fluorescent color. In view of the studies by Cannon *et al.* (1942) and by Greenwood (1943) this indicates a core of tungsten-rich material and a molybdenum-rich margin. Grains of scheelite occur rarely in other similar rocks throughout the area.

Minerals at the Betty mine: The Betty mine was examined by E. B.

Eckels in 1932 and his description is included in the report of Lovering and Goddard (1950). The mine is about one mile west of Currant Creek, one-third mile south of Black Mountain road. A 300-foot shaft has been sunk near the junction of a rhyolite breccia dike and a diabase dike, both of which have been intruded into injection gneiss.

In addition to malachite, azurite, galena, and chalcopyrite reported by Eckels the writer found significant amounts of pyrite, bornite, and sphalerite and minor amounts of covellite, either in hand specimens or in polished sections. Some of the chalcopyrite has formed as plates along the cleavages of amphibole crystals.

Although vesuvianite reported by Eckels was not confirmed, abundant green spinel is present as small disseminated grains that impart a greenish cast to the quartz-calcite-garnet-amphibole rock in which it occurs. Some octahedra of spinel attain a size of approximately 2 centimeters on edge.

References

1. Bever, J. E. (1952), Unpubl. Ph.D. Thesis, Univ. of Michigan.
2. Cannon, R. S., Murata, K. J., and Grimaldi, F. S. (1942), *Eng. Min. Jour.*, **65,** 65.
3. Greenwood, R. (1943), *Econ. Geol.*, **38,** 56–64.
4. Hanley, J. B., Heinrich, E. Wm., and Page, L. R. (1950), *U. S. Geol. Surv., Prof. Paper* **227.**
5. Heinrich, E. Wm. (1950), *Am. Mineral.*, **35,** 173–184.
6. Lovering, T. S., and Goddard, E. N. (1950), *U. S. Geol. Surv., Prof. Paper* **223.**
7. Sterrett, D. B. (1923), *U. S. Geol. Surv., Bull.* **740.**

NOTE ON SPHALERITE AND WURTZITE*

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Interest in the crystal forms of zinc sulfide was aroused by its similarity to SiC, whose various structures have been investigated by members of the Mineralogy Department of the University of Michigan. Commonly natural wurtzite occurs in the form referred to as $2H$ by the Ramsdell (1947) nomenclature. In addition natural wurtzite was found by Frondel and Palache (1950) to occur in the forms $4H$, $6H$, and $15R$[1]. An investigation was undertaken to see if synthetic wurtzite could be crystallized from aqueous solution in these and in the other forms that have been identified for SiC.

Allen and Crenshaw (1914) reported the conditions under which the various forms of ZnS were precipitated. They identified sphalerite,

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[1] Müller (1952) has recently succeeded in producing these same modifications by tempering synthetic ZnS crystals up to 10 hours at 870–905° C.