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two segments must have been sealed after the outer zones had crystallized, and thus the concentration of potassium in the south segment and sodium in the north segment must have taken place at a very early stage, probably by a physical mechanism. Potassium may have been carried upward through the liquid in a volatile phase before crystallization began.

The most marked feature of the course of crystallization as indicated in figure 32.2 is progressive enrichment in silica. The difference between points 1 to 5 (fig. 32.2) and the field boundary determined by Tuttle and Bowen (1958, fig. 38) suggests that excess of alumina and the minor constituents (such as lithium) in the natural system, at the high pressures that presumably prevailed when this pegmatite formed, caused the crystallizing fluid to become progressively richer in silica. The excess alumina surely affected the course of crystallization, because it gave rise to a significant amount of muscovite, but an extended discussion of its influence on the position of the field boundary will not be possible until more laboratory work has been done on systems containing mica, feldspar, and quartz.

The increase in silica content ended in zone 6, and the small amount of material that crystallized later, forming zone 7 and the replacement bodies, was low in silica and high in alumina, alkalies, water, and fluorine. The contrast in composition between this material and the rest of the pegmatite, coupled with the evidence for replacement of some previously solidified rock, suggests that a hydrothermal or pneumatolytic fluid separated from the silicate liquid. During the time that the outer zones were crystallizing, the content of water in the remaining liquid must have increased progressively until it had become as high as possible. Subsequently, a fluid phase rich in H_2O would have to separate, and dissolved materials would then be distributed between this and the remaining silicate liquid. This process could account for the concentration of alumina, alkalies, and volatiles in some places and of silica in others. At a very late stage the pressure of the fluid rich in H_2O must have increased until it exceeded the confining pressure, and this fluid then escaped outward and replaced previously crystallized rock.

REFERENCE

Tuttle, O. F., and Bowen, N. L., 1958, Origin of granite in the light of experimental studies in the system $NaAlSi_3O_8$—$KAlSi_3O_8$—SiO_2–H_2O: Geol. Soc. America Mem. 74.

33. A NEW BERYLLIUM DEPOSIT AT THE MOUNT WHEELER MINE, WHITE PINE COUNTY, NEVADA

By H. K. Stager, Menlo Park, Calif.

The recent discovery by Mt. Wheeler Mines, Inc. of a large beryllium deposit at the Mount Wheeler tungsten mine in Pole Canyon, on the west side of the Snake Range, White Pine County, Nev., has caused widespread interest among geologists and mining people. Because the principal beryllium minerals in this deposit—phenacite and bertrandite—are easily mistaken in hand specimens for ordinary quartz, this deposit had escaped the notice of the many geologists and engineers that had mapped the geology and explored the tungsten and other mineral deposits in the district. The geology of the deposit is described here to provide information on the mode of occurrence of this unusual ore that may be useful in searching for similar deposits elsewhere.

The rocks exposed in the Pole Canyon area are, from oldest to youngest, the Prospect Mountain quartzite, the Pioche shale, and the Pole Canyon limestone, all of Cambrian age (Drewes and Palmer, 1957). The beds strike northwest and dip 5° to 20° south.

About 400 feet of the Prospect Mountain quartzite is exposed in the mine area. The Pioche shale, which overlies the quartzite, is about 450 feet thick. It consists mainly of micaceous, siliceous, highly indurated shale, but includes several beds and lenses of limestone. The thickest of the limestone beds, known locally as the "Wheeler limestone", is about 50 feet above the quartzite contact and may be equivalent to the CM (Combined Metals) limestone at Pioche, Nev. Its average thickness is about 20 feet, but in places it is as much as 50 feet thick. At the outcrop in Pole Canyon it is pure white to gray, but in the mine workings, about 2,500 feet east of the outcrop, it is a black, carbonaceous limestone. In an area beginning about 3,800 feet east of the outcrop it is almost completely silicified, probably because of a nearby concealed granitic body. The limestone is the host rock for the tungsten and beryllium deposit.

The sedimentary rocks are cut by three sets of faults. One set strikes north and dips steeply east or west, the second strikes east or northeast and dips steeply north, and the third strikes east and dips gently south nearly parallel with the bedding. These faults are commonly occupied by quartz veinlets from a few inches to as much as five feet wide.

Granitic rocks, ranging from quartz monzonite to granodiorite, are exposed about three miles north of the mine and crop out over an area of about 20 square miles (Drewes, 1958). The granitic body is believed to underlie the area at a shallow depth, perhaps less than 1,000 feet, and was possibly the source of the beryllium-bearing solutions that formed the deposit.

The Mount Wheeler tungsten deposit was discovered in 1950 and was explored by Mount Wheeler Mines, Inc., in cooperation with the Defense Minerals Exploration Administration, between 1952 and 1954. Beryl was first found to be present in the ore in 1951, but no significance was attached to the fact until 1959, when Mr. J. D. Williams, president of Mount Wheeler Mines, had the tungsten concentrates analyzed for beryllium. The analyses revealed more beryllium than could be accounted for by the small quantities of beryl that had been observed at the mine. Beryllium Resources, Inc., of Salt Lake City, Utah, then explored part of the beryllium deposit, and between September 1959 and March 1960 this company drove about 600 feet of new underground workings and did 10,000 feet of underground diamond-drilling.

The ore shoots are localized in the lower 15 feet of the "Wheeler limestone", along quartz veinlets in steeply dipping fault fissures that strike east or northeast. Exploration has shown that the beryllium minerals occur in a zone that extends for about 2,500 feet along the dip of the outcrop of the "Wheeler limestone" in Pole Canyon and extends eastward into the range along the strike for about 4,000 feet. The size and limits of the deposit have not yet been determined. The ore shoots within the explored area range from a few feet to more than 10 feet in width and from 15 to 20 feet in vertical extent, and one shoot has been traced for a strike length of about 1,500 feet. The average BeO content of the ore is about 1.0 percent.

Mineralogical studies by R. G. Coleman and others, U.S. Geological Survey, indicate that more than half the beryllium in the ores is contained in the mineral phenacite (Be_2SiO_4). The phenacite occurs in colorless, translucent, euhedral to subhedral crystals resembling quartz. It is found throughout the deposit but is most abundant in the western part, where it is associated with scheelite and pyrite. Bertrandite ($Be_4Si_2O_7(OH)_2$) is also an important ore mineral and in places accounts for nearly half the beryllium in the ore. It occurs in thin, bladed, translucent crystals and rosettes. It is most abundant in the eastern part of the deposit, where it is accompanied by fluorite and phenacite; it was probably derived from phenacite. The beryllium minerals are intimately associated with scheelite, fluorite, pyrite, sericite, and manganoan siderite. In places the ore contains a little galena and sphalerite. The beryl, which is pale blue, forms veinlets and small isolated euhedral crystals. It is most common in and near the thin quartz veinlets cutting the Pioche shale below the ore bodies, where it is associated with phyrite, calcite, sericite, fluorite, and rarely scheelite.

REFERENCES

Drewes, Harald, 1958, Structural geology of the southern Snake Range, Nevada: Geol. Soc. America Bull., v. 69, no. 2, p. 221–240.

Drewes, Harald, and Palmer, A. R., 1957, Cambrian rocks of the southern Snake Range, Nevada: Am. Assoc. Petroleum Geologists Bull., v. 41, p. 104–120.

See U.S.G.S. Prof. Paper 424C, p C120.

34. PRE-MINERALIZATION FAULTING IN THE LAKE GEORGE AREA, PARK COUNTY, COLORADO

By C. C. Hawley, W. N. Sharp and W. R. Griffitts, Denver, Colo.

The Lake George beryllium area in Park County, Colo., is underlain mainly by Precambrian rocks. The area is traversed by large-scale lineaments trending north-northwest, which coincide at least in part with faults that are older than the mineralization. The rocks in the southwestern part of the area are mainly schists and gneisses, cut by many granite pegmatites of simple composition and by small granitic bodies. The