Strontianite and Witherite Associated with Southern Illinois Fluorite

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Strontianite and witherite have been identified in specimens of fluorspar from the Minerva Oil Company Mine No. 1, NW¼ SE¼ sec. 24, T. 11 S., R. 9 E., about 5 miles north of Cave-in-Rock, Hardin County, Illinois. The original specimens were collected on October 25, 1948, by Charles E. Tothill, on a senior student trip through the mine. These specimens consisted of barrel-shaped mosaic aggregates which had been identified as barite. The student, impressed by the unusual habit of the "barite," brought the specimens to the senior author, who recognized the crystals as witherite twins. Upon request, the superintendent of the mine, Mr. Gill Montgomery, furnished additional specimens of the same material. At the suggestion of the senior author, the junior author visited the mine during the Christmas vacation to study the occurrence of the minerals. The complete results of his study will be published later.

The fluorite in the Minerva Oil Company Mine No. 1 replaces the Downey's Bluff (Renault) limestone of Upper Mississippian, Chester age. The deposit is capped by the Bethel sandstone of the same age. Similar replacements in other Chester and Ste. Genevieve limestones are found at Cave-in-Rock at Crystal, Davis No. 2, Lead Hill, Victory, and other mines east of the Peters Creek fault zone in southern Illinois. In answer to a query concerning the occurrence of witherite in the Cave-in-Rock district, E. A. Brecke stated that early in 1943 he had noted the pseudohexagonal twins in the West Green Mine of the Ozark-Mahoning Company and had identified them as witherite. In this mine, according to Brecke, the fluorite replaces the Fredonia limestone and the deposit is capped by the overlying Rosiclare sandstone.

The principal commercial mineral in the Cave-in-Rock district is fluorite, but it is accompanied by barite, calcite, chalcopyrite, galena, greenockite, quartz, sphalerite, strontianite, and witherite. Although galena is recovered at the Ozark-Mahoning mill, only the cadmium-bearing sphalerite and the fluorite are recovered at the Minerva Oil Company Mine No. 1. According to Mr. Montgomery, a sudden increase in the barium content of the fluorspar concentrate was noted as soon as fluorspar from a new stope began to be milled. In this stope the so-called "hexagonal barite crystals" were found. The flotation reagents that previously had been successful in depressing the barite were not effective on this unusual form of "barite," which floated and was concentrated with the fluorite. After the barium mineral was correctly identified as witherite, the high barium content of the fluorspar concentrate from the new stope was explained. Examination of the mine showed that witherite is present in minor amount throughout the mine, but in the new stope it ocurs in larger crystal aggregates and it is more abundant than elsewhere. Since the discovery of the witherite, adjustment of the mill feed has made possible the maintenance of a flotation product that is acceptable to the glass industry.

The witherite occurs in pseudohexagonal twinned mosaic crystals with dense, creamy-white, waxy-lustered cores which are surrounded by nearly colorless, twinned, glassy crystals. The twins have a maximum length of 3 in. and a width of 1½ in. The dominant forms are the unit prism and several dipyramids. The crystals appear to be terminated by basal pinacoid faces but closer examination reveals that the terminal faces belong to a poorly developed, nearly flat dipyramid. The pseudohexagonal form of the twins is usual for witherite twinned on the unit prism, but the twins from the Minerva mine are unusual in exhibiting not only the usual cyclic twinning but also polysynthetic twinning, as well as mosaic structure. These features are revealed in thin sections examined in polarized light. The twins are not as simple as they appear. Under an ultraviolet lamp the witherite exhibits a strong whitish fluorescence and a weak phosphorescence. Identification of the mineral was verified by qualitative chemical tests, accurate density determinations, and by an X-ray diffraction pattern. Vugs in the deposit are lined with witherite, which appears to be an alteration product of barite, although not always is it directly associated with barite. The barite does show the effects of solution and much of it occurs in dull white pulverulent masses. In the Ozarks-Mahoning Mine the witherite is corroded. Here it is closer to the surface than at the Minerva Oil Company's mine and it has been partially dissolved by circulating ground water.

The strontianite occurs in slightly pinkish bladed grains and in brown fibrous aggregates. The brown coloration is due to a slight amount of oil associated with the mineral. Both forms of strontianite are distinctly radial. Crystals of this mineral have not been observed. Identification was based on chemical tests and upon X-ray diffraction patterns. Strontium has not hitherto been reported as occurring in this deposit. Strontianite was deposited prior to the barium-bearing minerals and after the sphalerite and the bulk of the fluorite.

A preliminary study indicates that the order of crystallization of the minerals at the Minerva Oil Company Mine No. 1 is: fluorite, sphalerite, calcite, barite, strontianite, witherite, fluoride, quartz, and calcite, with chalcopyrite being deposited contemporaneously with witherite and with both the early and the late fluorite. Although a little galena does occur at this property its exact mineral relationships could not be determined from the specimens collected by the writers. Additional studies are being made to work out the paragenesis in greater detail. The search for witherite and strontianite has been extended to other mines in the Cave-in-Rock district and to the vein deposits at Rosiclare, but to date additional occurrences have not been found.