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HYDROTHERMAL WURTZITE AT THOMASTON DAM, CONNECTICUT

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In 1957 and 1958, during the construction of a flood control dam on the Naugatuck river about $1\frac{1}{2}$ miles north of Thomaston, a railroad cut was made along the west side of the dam. This cut exposes pockets and veins of hydrothermal mineralization in the Hartland formation (Rodgers, *et al.* 1959, p. 33–34). Within the fracture zone there is a vein about five feet wide, which is entirely fluorite. Minerals in adjacent cavities include quartz, fluorite, calcite, wurtzite, sphalerite, galena and calcic zeolites. Where an offshoot veinlet of fluorite traverses a nearby simple pegmatite, about 35 feet away, a pod of pink montmorillonite occurs.

Hydrothermal mineralization appears to be in four separate stages. Deposition of quartz, sphalerite, and wurtzite are the first stage. Quartz cemented the shattered country rock and is the most abundant mineral, and wurtzite and sphalerite are rooted against the quartz. Next, fluorite and calcite, along with galena, wurtzite, and chalcopyrite, crystallized in a second set of fractures as well as within the quartz-lined cavities. Calcic zeolites, stilbite, heulandite and laumontite, crystallized with calcite in the third stage. They are intergrown and perched on quartz and fluorite druze. The less siliceous zeolites, phillipsite and chabazite, are rare and usually found alone on fluorite. The final stage is pyrite in minute crystals that are sprinkled randomly on other minerals. One of the more interesting properties of this locality is that nearly all the minerals are represented by well-developed crystals.

Wurtzite in euhedral crystals is identified as the 6H polytype, and the cell constants are $a=3.812$ and $c=18.690$ Å. The space group is $P6_3mc$. The crystals are abundant and many are suitable in size for single crystal *x*-ray diffraction studies. They are blunt, hexagonal-hemimorphic, pagoda-like pyramids covered with finely spaced horizontal striations. Under a 40-power binocular microscope, striations are seen to result from oscillatory combination of pyramidal faces. Goniometric signals observed with monochromatic light (Na_D) are of very poor quality. Nearly all crystals have pedion terminations. The crystals are lustrous and deep brown and range in size from $\frac{1}{2}$ to 5 mm long, averaging about $2\frac{1}{2}$ mm. In the cross section perpendicular to their long axis they range from $\frac{1}{4}$ to 2 mm. Perfect prismatic cleavage on $\{11\bar{2}0\}$ and some evidence of imperfect basal cleavage, (0001), is present. A few of the crystals are terminated by combination positive and negative tetrahedrons of sphalerite, and a three fold axis of sphalerite is in common with the wurtzite c-axis. The specific gravity is measured at 4.06, and the value calculated from measured cell constants is 4.09. Presence of iron substituting for zinc is confirmed by an emission spectrographic analysis on one 12 mg single crystal.

Zn	major constituent
Fe	8.5%±0.5% (wt. per cent)
Mn	0.7%
Ti	0.05%
Cu, Ag, Pb	100 p.p.m. each
Cd	none

The *x*-ray data were established by Weissenberg rotation photographs and Debye-Scherrer powder diagrams. Fe Kα radiation with Mn filter was used for photographs of the 0, 1, 2, and 3 levels about *c* and the 0 level about the *a* axis. Cu Kα radiation with Ni filter produced diffraction spectra from powdered samples, and the spectra agree with peaks corresponding to the d-spacings published by Smith (1955, p. 665–666), for the 6H polytype. The constants of wurtzite described here are similar to those given by Frondel and Palache (1950, p. 39), except in morphological development. Also, there is a larger amount of iron substituting in the structure than in the 6H polytype described by them. One, single, $\frac{1}{4}$ mm crystal of limonite pseudomorphous after wurtzite was noted and examined in a Weissenberg camera using Fe Kα radiation with a Mn filter. The resulting *x*-ray diffraction line pattern indicates a composite mixture of hematite and goethite without preferred orientation.

Calcite occurs as snow-white plates intergrown with fluorite and zeolites. Each plate is dominated by the basal pinacoid (0001) and modified by a rhombohedron, and many plates form a striking pagoda-like stack with the c-axis in optical continuity within the succession. As many as 20 consecutive plates can be in a stack.

Ca-Al zeolites are mostly of typical varieties, although light green heulandite was found in quartz cavities with stilbite, platy calcite, pyrite and fluorite. Cause of the green color is unknown; $\alpha = 1.500$, $\beta = 1.497$, $\gamma = 1.504$, all ± 0.002, $2V_\alpha = 35°$, $r > v$ moderate, $X \wedge a = 34°$ and specific gravity is 2.20.

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THE DETERMINATION OF DIOCTAHEDRAL MICA AND POTASSIUM FELDSPAR IN SUBMICROSCOPIC GRAIN SIZES

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INTRODUCTION

The method reported here has been used successfully as a means of quantitatively determining illite and potassium feldspars in the size range $<10\ \mu$ and $<2\ \mu$ESD.[1] The method was developed using ground muscovite standards. Because of the structural and chemical similarity between muscovite and illite, it was assumed that the technique was applicable to illite-potassium feldspar separations. The term "dioctahedral mica" will be used here to describe micas of either illitic or muscovitic composition.

The method is based upon the differential solubility of potassium feldspar and dioctahedral mica in HCl after heating to 825° C. Heating muscovite to 800° C. for several hours causes a loss of hydroxyl water[2] (Roy, 1949). This change in composition renders the muscovite susceptible to attack by hot, concentrated HCl. Muscovite so treated yields an insoluble residue that (1) shows a weight loss of about 50%, (2) gives no characteristic 10-angstrom *x*-ray diffraction maximum, and (3) contains less than 10% of the potassium present in the untreated sample. Potassium feldspars are chemically unaffected by this treatment.

The procedure is useful in the following applications:

(1) Separating potassium feldspar from dioctahedral mica.

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[1] Equivalent spherical diameter.

[2] There is some evidence that dehydroxylation of muscovite is incomplete at 800° C. Higher temperatures were not used, however, because of the possible formation of other potassium-bearing phases.