pyromorphite, mimetite and anglesite. In each of these cases there is ample evidence to show that volatile constituents were liberated, for bubble holes can be observed in every case. It is of interest that chalcocite suffered decomposition while bornite and chalcopyrite did not. Gypsum was dehydrated but the temperature was not sufficient to free the carbon dioxide of calcite.

NOTE ON COBALTIFEROUS GAHNITE FROM MARYLAND[1]

EARL V. SHANNON, *U. S. National Museum*

The old copper mines of Carroll County, Maryland, are known to mineralogists as the type localities for two rare cobalt minerals, remingtonite and carrollite. The ores have, however, received little critical mineralogical examination in recent years. While on a visit to several of the mines in company with Drs. Schaller and Foshag the writer found a specimen of a deep blue mineral at the Mineral Hill mine and the same mineral was found at the Patapsco and Springfield mines by Dr. Foshag. This mineral had much the appearance of lazulite but upon optical examination it was found to be isotropic and analysis proves it to be the zinc spinel, gahnite, notable as owing its beautiful blue color to cobalt which is present in definite amount. This analysis is interesting as confirming the work of Wherry who, by microspectroscopic examination, found that distinctly blue spinels gave the absorption spectrum of cobalt.[2] Trial of a thick section of this Mineral Hill occurrence showed only a faint, hazy band, but it occupied the characteristic position in the spectrum, wave length 550.

The mineral is deep indigo blue in color and occurs as octahedral crystals up to 5 millimeters in diameter and as granular masses of smaller crystals several centimeters in diameter. The spinel, in specimens from all three mines, occurs in veins of glassy quartz up to 10 cm. in width enclosed in fine micaceous schist. In the specimen analyzed the spinel forms streaks parallel to the walls of the veins. In the specimens from both the Patapsco and

[1] Published by permission of the Secretary of the Smithsonian Institution. A preliminary paper on the Minerals of Maryland, being compiled under the auspices of the Maryland State Geological Survey.

[2] Edgar T. Wherry. The microspectroscope in mineralogy. *Smithsonian Miscellaneous Collections*, **65**, No. 5, 1915.

Mineral Hill mines the spinel is intergrown with minor amounts of magnetite and chalcopyrite.

Under the microscope the mineral analyzed is fine clear blue with a refractive index of 1.790 ±.002. The material from the Patapsco mine is about the same in color with a slightly higher index, 1.792 ±.002. Its cobalt content is probably about the same. The spinel from the Springfield mine is slightly greener in the hand specimen and under the microscope is more greenish and less deeply colored, the index being slightly lower, 1.788 ±.002. It probably contains less cobalt than the others.

The specimen from the Mineral Hill mine was analyzed. The sample was selected to contain as much spinel as possible, crushed and screened to 100 to 200 mesh and separated from quartz with methylene iodide. Magnetite was removed with a horseshoe magnet and a small amount of chalcopyrite dissolved out with nitric acid. The resulting sample was found by microscopic examination to be pure and to have a uniform refractive index. It was insoluble in hydrofluoric acid and very slowly soluble in sodium carbonate fusion. The fusion was made with potassium pyrosulphate and only 1.5% of the mineral remained undecomposed. This is tabulated as insoluble in the statement of the analysis, which gave the following results:

ANALYSIS AND RATIOS OF GAHNITE.

	PER CENT		RATIOS	
Insoluble	1.50			
SiO_2	1.50			
Al_2O_3	54.50	.533	.533×1	1.00×1
FeO	4.86	.068		
MgO	.42	.010		
ZnO	34.48	.424	.528×1	.99×1
CoO	1.48	.020		
CuO	.14	.002		
MnO	.26	.004		
Total	99.14			

Owing to the insoluble character of the mineral it was not possible to determine the state of oxidation of the iron. The ratios indicate, however, that it must be entirely ferrous.

The fact that this mineral was found at all three of the mines visited would seem to indicate that it is a fairly common mineral in the ores of this zone.