

time. The third angle projection (in some cases the seventh octant projection) is used and the methods of descriptive geometry are employed. The plans and elevations with an occasional supplementary projection furnish a convenient basis for the application of graphical methods. Miller indices, axial elements, and interfacial angles may be determined graphically and the student may also gain a good general idea of the symmetry and zonal relations of crystals.

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## PHOSGENITE FROM THE TERRIBLE MINE NEAR ILSE, CUSTER COUNTY, COLORADO

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Recently the Colorado School of Mines received two samples of massive cerussite ore representative of the deposit at the Terrible mine near Ilse, Custer County, Colorado. The general appearance of these samples was that of massive crystalline cerussite, white to yellowish white in color, partially covered with a brownish yellow coating, and containing small vugs lined with druses of cerussite crystals. There were also inclusions in the samples which were darker in color and appeared to have different characteristics than the massive cerussite. Blowpipe tests were made on this dark mineral and the reactions obtained indicated immediately that it was not cerussite. Further tests showed the mineral to be the rare chlor-carbonate of lead, phosgenite, ( $\text{Pb CO}_3 \cdot \text{Pb Cl}_2$ ). A preliminary quantitative analysis for lead, made by Professor W. V. Norris of the Department of Chemistry of the Colorado School of Mines, gave 75.3 per cent lead in the dark mineral, whereas the theoretical per cent of lead in phosgenite is 75.97. The color of the phosgenite from the Terrible mine is smoky transparent; luster, vitreous to adamantine; cleavage, perfect in three directions at 90 degrees; fracture, conchoidal; hardness, 2-3; streak, white; fusibility, 1-2; specific gravity (average of six determinations), 6.08. In addition to these physical properties good tests were obtained for lead, carbon dioxide and chlorine.

In preparing this article, in which is included a list of localities where phosgenite has been reported, it was found that the occurrence of phosgenite at the Terrible mine had already been men-

tioned by C. H. Warren in 1903.<sup>1</sup> Since that time, an article by R. B. Brinsmade,<sup>2</sup> describing the Terrible mine, appeared in the *Engineering and Mining Journal Press*, but the occurrence of phosgenite was not mentioned and apparently its occurrence was not known to the present owners of the mine. C. H. Warren has briefly described the phosgenite from the Terrible mine as follows: "Associated with the cerussite is the chlor-carbonate of lead, phosgenite. This is distinguished in appearance from the cerussite by its clear brown color and by three excellent cleavages, prismatic and basal, at right angles to each other. It was possible to identify the basal cleavage by the positive uniaxial interference figure obtained when sections parallel to this cleavage were examined under the microscope. On such fragments, a much poorer cleavage approximately half way between the prismatic cleavages was also observed, indicating the presence of the cleavage parallel to the face 100. The prismatic and basal cleavages are of about the same degree of perfection. In one specimen a somewhat tabular habit was noticed parallel to the basal cleavage.

"The relative amounts of cerussite and phosgenite vary considerably in different specimens, but the latter has always been observed as a core surrounding the former. In one specimen, weighing nearly two pounds, the cerussite is simply a rim averaging 1 cm. in thickness. This is separated from the phosgenite by a very narrow white band of powdery material. The above facts suggest that the cerussite is an alteration product of the phosgenite. Small cavities, possibly formed by solution, lined with acicular crystallizations of cerussite have been noticed in most of the specimens examined."

It may be of interest to note the peculiar features of the cerussite, observed by C. H. Warren, in which the phosgenite occurs.

CHEMICAL ANALYSIS OF CERUSSITE FROM  
THE TERRIBLE MINE (WARREN)

CO <sub>2</sub>	17.02
FeO	trace
PbO	79.59
Alkali	trace
SrO	3.15
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	99.76

<sup>1</sup> C. H. Warren, *Mineralogical Notes, Am. J. Sci.*, Series 4, 16, 344, 1903.

<sup>2</sup> R. B. Brinsmade, *Eng. and Mining J. Press*, 83, 844, 1907.

The cerussite is crystalline and massive in character, grayish white to light amber in color, and its surface covered with a yellowish brown coating.

From the above analysis and from specific gravities he concludes that this cerussite adds another "undoubted case of isomorphism to those already known among the orthorhombic carbonates."

According to R. B. Brinsmade, the Terrible mine was discovered in 1880 and had, up to that time, 1907, produced about 250,000 tons of ore. Some of the ore was smelted but most of it was oxidized directly to litharge which was exceptionally high grade. The main features of the deposit are: (1) a well marked fault plane on the east side with a dip of 67 degrees, filled with finely divided blue clay six to twelve inches thick; and (2) the confinement of the profitable ore to a block of granulite between walls of gneiss which has apparently been thrown into position by faulting. In the discussion of the genesis of the deposit he concludes that the ore is undoubtedly of secondary origin, states that no galena has ever been detected, but does not mention the occurrence of phosgenite.

Thus far, phosgenite has been reported from Matlock in Derbyshire, England; Cornwall, England; Elgin, Scotland; Gibbs, Monte Poni and Montevecchio in Sardinia; Bobrek in Upper Silesia; Broken Hills, New South Wales; Dundas, Tasmania; Laurium, Greece; and Ilse in Custer County, Colorado. Although phosgenite had already been reported from the Terrible mine, its presence was probably not known to many so that it was thought advisable to call attention again to its occurrence.

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#### A CORRECTION: RECENTLY DESCRIBED CRYSTALS OF GLAUCOCHROITE FROM FRANKLIN, N. J., ARE TEPHROITE

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In a recent article<sup>1</sup> on several Franklin, N. J. minerals, the writer described several interesting crystals as glaucochroite, with a number of new forms. Dr. Schaller has since suggested that the crystals are probably tephroite. The indices of refraction of

<sup>1</sup> Crystallographic notes on glaucochroite, willemite, celestite, and calcite, from Franklin, New Jersey: *Proc. Acad. Nat. Sci. Phila.*, LXXIV, 105-108, 1922.