Perhaps the most interesting feature brought out by the etching is the presence of actual minute octahedral crystals, ranging in diameter from .063 to .095 millimeters, amongst the individual units that go to make up the carbonado. One of these is shown in Fig. 3.

Walter Gerloch[1] has investigated the diffraction pattern of the carbonado obtained by the powder method of X-ray analysis and has compared this with those obtained from the ordinary diamond and graphite. The only difference observed between the pattern obtained from the carbonado and that from an ordinary diamond was an intense darkening of the background of the former. No indication of the presence of crystalline graphite was observed on the carbonado pattern. Gerloch concluded that carbonado consists of a very large number of small interlocking normal diamond grains with perhaps a little intermingled and finely distributed amorphous carbon. The effect produced upon a polished surface of the carbonado by etching with a blow-pipe apparently substantiates these conclusions. It further shows that some of the small individual units have actually assumed the octahedral form which is so characteristic of the diamond proper.

NOTE ON THE ALTERATION OF GALENA TO ANGLESITE, TO CERUSSITE

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Several specimens of galena, with their surfaces covered with alteration products which show clearly the sequence of its alteration, were found by Dr. W. A. Tarr in the southeast Missouri lead belt. These specimens came from the residual clays over the Bonneterre dolomite and show galena altered to anglesite, and the anglesite in turn altered to cerussite. Some veinlets and incrustations of dolomite are also present.

The galena shows all the characteristics commonly associated with that mineral. On a crystal, about one cubic inch in volume, one face shows a deposit of anglesite about 3 millimeters thick. The anglesite is dark gray in color and is soft and earthy. The

[1] Walter Gerloch, Über die Structur des "Schwarzen Diamants." *Zeitschrift für Anorganische und Allgemeine Chemie*, Band **137**, pp. 331–332. 1924.

earthy anglesite is in layers, eight layers being the greatest number found on any specimen. Some of the layers are lighter colored than the others. The lightest colored layers are on top and the darkest layers are nearest the galena. The colors range from light gray to nearly black.

The cerussite occurs as a thin gray to brownish crust on the anglesite. The brownish color is perhaps due to the oxidation of some of the ferrous iron that was isomorphous with the magnesium in the dolomite, and later stained the cerussite. The cerussite layer is variable in thickness but averages about 0.3 millimeter. On some of the galena crystals the cerussite is found directly on the galena and is not separated from it by anglesite.

The facts that suggest the alteration of anglesite to cerussite are:

1. The contact between the two minerals is gradational. The gradational zone is wavy and irregular, and is parallel to the line of contact.

2. Patches of anglesite are entirely surrounded by cerussite. The largest mass was about 1 cubic millimeter in volume, the others were only a fraction of that amount.

The above observations could also apply with equal weight to the alteration of cerussite to anglesite. However, cerussite is more insoluble and the reaction would tend to go to the formation of the carbonate, instead of the carbonate being altered to the sulfate.

3. Minute cavities in the anglesite are lined with cerussite. Several cavities about .5–1 millimeter in diameter were found to be lined with cerussite. One or two crystals were found about .5 mm. in length but the others were less than .1 mm.

4. Cerussite penetrates the anglesite laminae. In several places the outer two or three laminae have been cut by veinlets of cerussite. Enclosed in the vein material and surrounded by it are small fragments of anglesite.

These alteration products were probably formed by ordinary weathering processes. The galena was first oxidized to anglesite, and the anglesite later converted into cerussite. The probable reactions are expressed by the following formulae:

$$PbS + 2O_2 \rightarrow PbSO_4 \qquad PbSO_4 + H_2CO_3 \rightarrow PbCO_3 + H_2SO_4$$