

Assuming this structure to be the correct one for  $\text{Ag}_2\text{S}$ , there would be four atoms with a face-centered cubic arrangement, but they would be too light to materially affect the pattern. The eight Ag atoms would be located at the centers of the eight small cubes made by dividing the unit cell by the three principal planes of symmetry. These heavier Ag atoms by themselves possess a simple cubic arrangement, with the side of the cube one-half that of the true unit cell. The four lines of the diffraction pattern fit this simple cubic structure equally as well as they do the body-centered cube, with a value of 3.40 A. U. for the side of the small cube, or 6.80 A. U. for the side of the true unit cell.

However, a cube of this size, containing four molecules, gives a calculated density of about 5.2, as compared with 7.2 for  $\text{Ag}_2\text{S}$  at room temperatures. There is no justification for using the value of 7.2 as the density of the cubic form, for not only would there be some decrease in density with the increased temperature, but there would probably be a greater change due to the structural inversion. However, this change from 7.2 to 5.2 does seem abnormally large. The writer made several attempts to determine the density of  $\text{Ag}_2\text{S}$  above  $180^\circ\text{C}$  by a modified pycnometer method. The results did not check very closely, but all indicated a considerable decrease in density, with an average of about 6. Until a better determination of the density at  $180^\circ\text{C}$  can be made, there can be no direct proof of any structure.

The relative intensities of the four lines of the pattern are estimated to be 3, 10, 6, and 2, while the calculated intensities for this  $\text{CaF}_2$  type of structure are 5.5, 10, 2, and 2. With the exception of the third line, this is an excellent agreement. Intensities have been calculated for the  $\text{Cu}_2\text{O}$  and  $\text{FeS}_2$  types of structure (both of which have the same number of atoms in the molecule as  $\text{Ag}_2\text{S}$ ) and for a cube-centered arrangement of Ag atoms, and none are in agreement. For example, the  $\text{Cu}_2\text{O}$  type would have two intense lines from planes 111 and 311, in addition to the four actually present, while with a body-centered type the first line would be four times, and the third line two times as intense as the second line. Accordingly, if the  $\text{CaF}_2$  type is not correct, then  $\text{Ag}_2\text{S}$  must possess a structural arrangement different from anything yet found for a compound of the type  $\text{R}_2\text{X}$ .

Since  $\text{Ag}_2\text{S}$  does exist in a cubic form, it has been suggested<sup>4</sup> that argentite and acanthite represent distinct mineral species. Both names are so well established that it may be desirable to retain them, but it should be pointed out that although it is possible to consider  $\text{Ag}_2\text{S}$  above  $180^\circ\text{C}$  as a separate mineral to which the name argentite is to be applied, this is of theoretical interest only. The practical conclusion to be drawn is that all specimens which are labelled "argentite" are in reality acanthite, paramorphs after argentite.

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#### ARTIFICIAL FLUORITE

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The value of fluorite having high transparency to ultraviolet radiation of short wave lengths is great enough to warrant an attempt to produce it in the laboratory. To this end the writer and his students have made several trials by fusing chemically pure calcium fluoride in an electric furnace.

<sup>4</sup>Emmons, Stockwell, and Jones: *Am. Mineral.*, 11, 326 (1926).

The first experiments, performed in 1922 by G. E. Dean and R. D. Stuart showed that whereas clear melts were readily obtained, the solidified mass was opaque. The problem was attacked anew last year by C. S. Draper, who succeeded in proving that the opacity was due in part to numerous small crystals. These crystals could be made to grow by slow cooling through the freezing point and below, until they were of the order of magnitude of one sixteenth of an inch across. No tests with ultra-violet radiation have been made, but in visible light they appeared to be perfectly transparent. They adhered strongly and the entire mass possessed the cleavage planes characteristic of natural fluorite.

The work is being carried on by M. W. Fort, a graduate student, and the successful growth of large, clear crystals is predicted.

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## REVIEWS

### DIE METALLOGENETISCHEN EPOCHEN UND GEBIETEN

VON SIBIRIEN. W. A. OBRUTSCHEW, *Abhandlungen zur Praktischen Geologie und Bergwirtschaftslehre*, vol. 6. *Berlin*, 1926. Published by Wilhelm Knapp, Halle (Saale). 63 pages. Price R. M. 5.50

It is a rather difficult task to present an adequate review of this interesting article as the author lists one hundred and thirty-six references from which he has drawn his material and then attempted to condense it into fifty-five pages.

After a short introduction an historical sketch is given covering the main points on the geology of Siberia. A rather detailed discussion follows dealing with the metallogenetic periods and metallogenetic epochs of Siberia. This portion comprises the major part of the article. The classification used is that based on the author's own classification of ore deposits, which was reviewed in *Am. Mineral.*, Vol. 11, p. 190, 1926. The discussion closes with a short review of the older literature and a general summary of results.

This contribution should prove interesting to readers who wish to acquaint themselves with the mineral wealth of Siberia, but the vast accumulation of data and confusing geographic names make the reading somewhat difficult. A map of Siberia indicating the principal ore deposits accompanies the article. This map together with the comprehensive list of references contribute much to the value of the paper.

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### ENTWICKLUNGSGESCHICHTE DER MINERALOGISCHEN

WISSENSCHAFTEN. P. Groth. VI+266 pages. Julius Springer. *Berlin*, 1926.

It is indeed fitting that the eminent teacher and investigator, Professor P. Groth, for many years Director of the Mineralogical Laboratory of the University of Munich and also the founder and first editor of the *Zeitschrift fuer Krystallographie und Mineralogie*, should bring together the salient facts concerning the development of the mineralogical sciences from the very beginning down to the end of the nineteenth century.

The evolution of our knowledge of the geometrical, physical, and chemical properties of crystals is discussed in Part I. This survey is very timely, especially in view of the recent important developments in these fields which were made