Acta Cryst. (1955). **8**, 847

The crystal structure of indium (I) iodide.

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(*Received* 23 *August* 1955)

Crystals of InI were grown by heating indium with a slight excess of iodine in an evacuated tube at 300° C. The vapor condensed on a cooler surface outside the furnace as brownish-red plates of the {010} form. From Weissenberg and powder photographs taken with Cu $K\alpha$ and Cr $K\alpha$ radiation an orthorhombic unit cell was found with dimensions:

$$a = 4{\cdot}75,\ b = 12{\cdot}76,\ c = 4{\cdot}91\ \text{Å}\ (\text{each}\ \pm 0{\cdot}2\%)\ .$$

For $Z = 4$, the density is calculated as 5·39 g.cm.$^{-3}$ compared with 5·32 g.cm.$^{-3}$ measured by Klemm & Dierks (1934). The absences correspond to space groups *Cmcm*, *Cmc*2 and *C*2*cm*. Agreement with the intensities is found with the TlI-type structure (Helmholz, 1936), space group *Cmcm*–D_{2h}^{17} with the atoms in positions 4(*c*) (*International Tables*, 1952):

$$\pm(0,\ y,\ \tfrac{1}{4}) + (0,\ 0,\ 0;\ \tfrac{1}{2},\ \tfrac{1}{2},\ 0)\ .$$

The atomic parameters were determined by sharpened $(F_o - F_c)$ syntheses for the projection along [001], computed only along the y axis. The $hk0$ intensities were estimated visually and corrected for Lorentz and polarization factors and for absorption. For allowed reflections the intensity is independent of h for constant k and l, except for the factors dependent on θ. Sets of corrected intensities with $l = 0$ and with the same value of k were plotted versus $\sin^2\theta$, and sharpened F^2 values, corresponding to point atoms at rest, were read from these curves at an arbitrary $\sin^2\theta$. This procedure was adopted to improve the accuracy of the absorption corrections. The best fit was obtained with $y = 0{\cdot}398 \pm 0{\cdot}001$ for indium and $y = 0{\cdot}145 \pm 0{\cdot}001$ for iodine. The standard deviations are according to the method of Cox & Cruickshank (1948).

Each atom has one neighbor of the opposite kind at 3·23 Å and four more at 3·46 Å. Two additional neighbors at 3·95 Å can hardly be considered nearest neighbors. The shortest In–In and I–I distances are 3·58 and 4·44 Å, respectively. The ionic radius of In^+, if this compound can be considered a salt, may be estimated as 1·32 Å if one uses the polymorphism of TlI (Helmholz, 1936; Barth, 1927) to calculate the distance In and I would have in the CsCl-type structure if it existed. One obtains essentially the same result using either Pauling's (1942) or Zachariasen's (1950) scheme for correcting for coordination if one uses the corresponding course for the radius of I^-.

The compound InBr has this same structure (Stephenson & Mellor, 1950). From the distances in this compound one can calculate in the same way essentially the same value for the radius by either scheme.

This research was supported by the U.S. Atomic Energy Commission.

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Acta Cryst. (1955). **8**, 847

The length of the uranyl ion in uranyl carbonate.*

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(*Received* 25 *July* 1955)

Christ, Clark & Evans (1955) have recently published the structure of rutherfordine, the naturally occurring mineral UO_2CO_3. We had simultaneously been investigating some synthetic UO_2CO_3. These synthetic crystals were made by Dr B. Thamer of this laboratory by the method of Miller, Pray & Munger (1949).

The synthetic crystals occur as small, very thin laths elongated along [001] with the (010) face dominant. Weissenberg photographs with Cu radiation gave the following cell dimensions:

$$a = 4{\cdot}85 \pm 0{\cdot}01,\ b = 9{\cdot}22 \pm 0{\cdot}02,\ c = 4{\cdot}30 \pm 0{\cdot}01\ \text{Å}\ .$$

These values are in good agreement with those reported by Christ *et al.* (1955).

The $hk0$ projection is particularly well suited for a determination of the length of the U–O bond. A crystal $52 \times 2{\cdot}3 \times 18{\cdot}4$ microns was selected for measurement of the $hk0$ intensities. Using Cu radiation all $hk0$ reflections were measured with a Geiger counter, and the average value of symmetry-related reflections was obtained. Thirty crystallographically different reflections were measured. Absorption corrections were computed by the graphical method of Howells (1950).

* This work was performed under the auspices of the Atomic Energy Commission.