Table 2. *Part of the powder photograph of* HgO

Cu $K\alpha_1$ radiation

Indices referred to the unit cell found at the present investigation

	$10^4 \times \sin^2 \theta$		Present investigation		Roth	
hkl	Obs.	Calc.	I_o	$(pF^2)_c \times 10^{-3}$	I_o	I_c
200	544	543	*vw*	2·2	—	—
101	615	614	*vw*	1·8	—	—
011	673	673	*vst*	280	424	425
210	737	737	*vst*	240	353	346
020	778	779	*vst*	170	236	221
111	807	809	*vvw*	0·7	—	—
201	1021	1021	*vst*	290	275	272
211	1215	1216	*w*	9·5	—	—
220	1320	1322	*vw*	3·7	—	—
121	1393	1393	*vw*	2·2	—	—
301	1704	1700	*vvw*	1·0	—	—
221	1798	1800	*vst*	480	206	209
311	—	1895	—	0·03	—	—
002	1914	1914	*st*	110	39	40
102	2047	2050	*vvw*	1·5	—	—
400	2170	2171	*st*	110	39	39
031	2231	2231	*st*	200	56	56
112	—	2244	—	0·03	—	—
230	2295	2295	*st*	180	54	54
410 131	2363	2366 2366	*w*	15 0·2	—	—

der photographs taken in a Guinier focusing camera (Table 2).

The following structure, derived from powder and single-crystal data obtained by X-ray and neutron diffraction methods, is in reasonable agreement with the experimental results.

Cell content: 4 HgO.
Cell dimensions: $a = 6{\cdot}612_1$, $b = 5{\cdot}520_1$, $c = 3{\cdot}521_3$ Å.
Space group: *Pnma* (No. 62).
4 Hg in (c): $x, \frac{1}{4}, z;\ \bar{x}, \frac{3}{4}, \bar{z};\ \frac{1}{2}-x, \frac{3}{4}, \frac{1}{2}+z;\ \frac{1}{2}+x, \frac{1}{4}, \frac{1}{2}-z$
with $x = 0{\cdot}115$, $z = 0{\cdot}245$.
4 O in (c): with $x = 0{\cdot}36_5$, $z = 0{\cdot}58_5$.

This structure is built up of infinite planar zigzag chains running parallel to the *a* axis and lying in the *ac* plane. Within the chains the distance Hg–O is 2·03±0·10 Å and the angles O–Hg–O and Hg–O–Hg are 179±3° and 109±1° respectively. This chain arrangement is essentially different from that found by Roth, the principal divergence being the bonding of the oxygen atoms to the mercury atoms, the angle O–Hg–O given by Roth being 110°.

A full report will appear in *Acta Chemica Scandinavica.*

References

AURIVILLIUS, K. (1954). *Acta chem. scand.* **8**, 523.
ROTH, W. L. (1956). *Acta Cryst.* **9**, 277.
ZACHARIASEN, W. (1927). *Z. phys. Chem.* **128**, 421.

Acta Cryst. (1956). **9**, 686

The structural crystallography of indium bismuthide.*

By W. P. BINNIE, *Physics Department, Purdue University, West Lafayette, Indiana, U.S.A.*

(*Received* 6 *April* 1956)

From X-ray crystallographic analysis the unit cell of the intermetallic compound InBi is found to be tetragonal with dimensions $a = b = 5{\cdot}000$, and $c = 4{\cdot}773$ Å. Absent X-ray spectra and the presence of a center of symmetry are consistent with the space group *P*4/*nmm*. Density measurements show that there are two molecules of InBi in the unit cell so that the atoms are at special positions, the coordinates of which are (0, 0, 0), ($\frac{1}{2}$, $\frac{1}{2}$, 0) and (0, $\frac{1}{2}$, z), ($\frac{1}{2}$, 0, $\bar{z}$). By employing the observed intensities of (0*kl*) reflections in summations of the Patterson and Fourier types, the In atoms are located at the origin and the end-centered position, while the unknown coordinate, z, is found to be 0·393. The reliability index of this analysis, expressed in the usual manner, is 0·17.

Fig. 1 shows four unit cells of InBi and also the tetrahedral array of four Bi atoms around each In atom with the dimensions and angles listed. Each Bi atom has four In atoms as nearest neighbours, forming a square to one side of it. The structure consists of layers of like atoms normal to the *c* axis with adjacent In layers separated by two Bi layers. Each In layer is bonded to the Bi layer on either side of it and the closest approach of the Bi

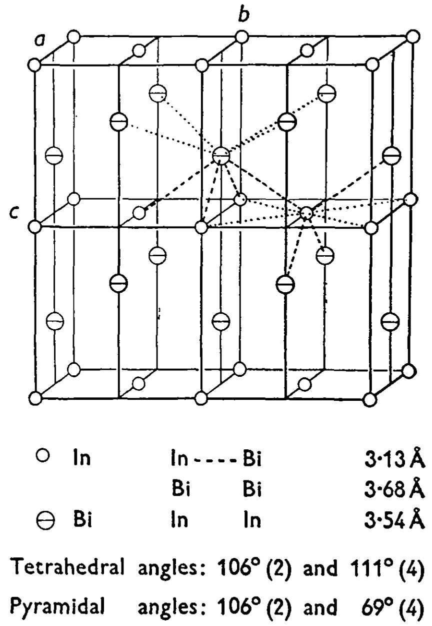

Fig. 1. Atomic arrangement in four unit cells of InBi.

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* Work supported by Signal Corps contract. Crystals prepared by Miss L. M. Roth of this department.

atoms in neighboring Bi layers is 3·68 Å, which is somewhat larger than the interatomic separation of Bi atoms in adjacent layers of metallic Bi (3·47 Å) and gives rise to a marked cleavage plane normal to the *c* axis.

The significance of the structure of InBi is its contrast to that generally found in 1:1 compounds formed by elements in which the average number of valence electrons per atom is four. In the case of the *B* sub-group elements of groups 3 and 5 of the periodic table, to which In and Bi belong, such compounds crystallize with the zinc-blende structure with tetrahedrally coordinated atoms and interatomic distances corresponding to the sum of the tetrahedral covalent radii of the atoms involved. The only exceptions in this series are the compounds involving the heavier and more metallic elements, namely TlSb and TlBi, in which the atoms are in the CsCl arrangement and the interatomic separations are equivalent to the sum of the metallic radii for eightfold coordination (Wyckoff, 1948). InBi appears to be intermediate between these two structural types as it possesses fourfold coordination and its interatomic distance, 3·13 Å, corresponds to the sum of the metallic radii of In and Bi with four nearest neighbours (1·47 and 1·60 Å respectively). This observed separation is appreciably greater than the value expected (2·92 Å) for a covalent bond; or for an ionic structure of the type $In^{3+}Bi^{3-}$ in which the radii would be 0·88 and 1·98 Å for the cation and anion respectively (Wyckoff, 1948). InBi belongs to the B-10 structural type (*Strukturbericht*), which is characterised by a bimolecular tetragonal unit cell developed from the space group *P*4/*nmm* and with atoms at the positions already quoted. A compound of this type can be described as a distorted CsCl arrangement when the axial ratio c/a approaches $1/\sqrt{2}$, (0·707), and the unknown coordinate, *z*, approximates 0·5 (*Strukturbericht*). However, the distortion in the case of InBi, due to an axial ratio of 0·955, is so great that fourfold coordination results and only a formal resemblance exists between InBi and the distorted CsCl arrangement which is possible in *B*–10 structural types.

References

Strukturbericht, **1**, 89.

Wyckoff, R. W. G. (1948). *Crystal Structures*, vol. 1, chap. 3. New York: Interscience Publishers.

Notes and News

Announcements and other items of crystallographic interest will be published under this heading at the discretion of the Editorial Board. Copy should be sent direct to the British Co-editor (R. C. Evans, Crystallographic Laboratory, Cavendish Laboratory, Cambridge, England).

International Union of Crystallography

With the approval of the Executive Committee, the Commission on Crystallographic Data has co-opted Dr Olga Kennard (U.K.) and the Commission on Crystallographic Apparatus has co-opted Dr M. M. Umanskij (U.S.S.R.).

Symposium on Crystallography in Santiago, Chile

A Symposium on Crystallography, organized by the Chilean Committee of Crystallography, was held at Santiago, Chile, from 7 to 9 June 1956. It was attended by members of three Chilean Universities who are working in this field.

Dr Sven Furberg, who is at present at Montevideo organizing a Crystallographic Laboratory on a UNESCO Technical Assistance Mission, attended this Symposium as the guest of honour.

A report on the Symposium of the International Union of Crystallography held in Madrid last April, submitted by Mr Enrique Grünbaum, was read during the sessions.

Papers by Jorge Muñoz-Cristi, George Mueller, Sven Furberg, Arnold Keller, Carlos Rivera, Nahum Joel and Isabel Garaycochea on subjects including mineralogy, crystal structure, X-ray diffraction, optical crystallography and crystallization problems were presented to this Symposium.

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (P. P. Ewald, Polytechnic Institute of Brooklyn, 99 Livingston Street, Brooklyn 2, N.Y., U.S.A.). As far as practicable books will be reviewed in a country different from that of publication.

Microscopic Petrography. By E. W. Heinrich. Pp. xiv+296 with 131 photomicrographs, 21 other figures and 9 tables. New York, Toronto, London: McGraw-Hill. 1956. Price $6·50; 49*s*.

This book is designed to serve as a text for the systematic study of rocks under the microscope. It is intended for 'initial to intermediate students' (author's preface) but ranges over a wider field than many teachers would attempt at this level. The knowledge of mineralogy assumed in the reader is greater than would usually be possessed by second-year university students.

The opening chapter, 'Methods of Microscopic Study', is an up-to-date account of techniques for the preparation