Table 1. *Observed and calculated spacings of* B_7O

Philips powder camera ($r = 5.74$ cm.) Cu $K\alpha$ radiation

Line	Intensity*	$d_{obs.}$	$d_{calc.}$		hkl
1	m	4.343	4.349		101
2	s	4.114	4.102		200
3	m	3.715	3.704		011
4	w	2.679	2.677		020
5	vs	2.571	2.565		002
6	vs	2.284	2.280		121
7	w	2.251	2.242		220
8	w	2.178	2.175		202
9	vw	2.049	2.051		400
10	w	1.855	1.852		022
11	vw	1.737	1.744		130
12	w	1.691	1.688		222
13	w	1.649	1.651		131
14	vw	1.640	1.637		230
15	s	1.464	1.465		032
16	m	1.448	1.450		303
17	s	1.430	1.435		331
18	vw	1.403	1.400	1.399	313, 520
19	m	1.340	1.339		040
20	m	1.282	1.282		004
21	vw	1.274	1.272		240
22	w	1.261	1.267		104
23	w	1.244	1.247		014
26	vw	1.189	1.187		042
27	w	1.158	1.157		024
28	w	1.142	1.142	1.140	701, 242
29	vw	1.121	1.121		440
30	vw	1.090	1.087		404
31	m	1.026	1.025	1.027	800, 442
32	m	1.007	1.007	1.007	424, 810
33	vvw	0.9916	0.9903	0.9929	722, 514
34	vvw	0.9277	0.9259		044
35	vw	0.9098	0.9092		723
36	w	0.8917	0.8923		060
37	m	0.8776	0.8791	0.8794	061, 803
38	w	0.8691	0.8699		505
39	vw	0.8558	0.8550		006
40	w	0.8450	0.8440		444
41	vvw	0.8350	0.8368		206
42	vw	0.8253	0.8255		262
43	vw	0.8153	0.8160	0.8143	306, 026
44	vw	0.8068	0.8067		316

* s = strong, m = medium, w = weak, v = very.

which were back reflections, an indication of high degree of order in the structure. The observed reflections could be indexed on the basis of an orthorhombic unit cell. The dimensions, obtained by trial and error, are (λ(Cu $K\alpha$) = 1.5418 Å)

$$a = 8.20(4), \quad b = 5.35(4), \quad c = 5.13(0) \text{ Å}.$$

The density of the material, determined experimentally by flotation, is $d = 2.64(4)$ g.cm.$^{-3}$. The observed and the calculated spacings, given in Table 1 agree to better than 0.5%. The differences are within the limit of accuracy of the measurements. Thus, the X-ray pattern arises from one homogeneous phase only.

From the unit-cell dimensions and the density, the mass of one mole of unit-cells is calculated to be 358.8. Assuming 4 equivalent units per unit cell, which is reasonable for an orthorhombic cell, the equivalent weight for the structural unit is 89.7. This agrees satisfactorily with the theoretical formula weight of B_7O, 91.7, especially if one considers possible experimental errors. The experimental density is likely to be lower than the true density of a material, because of air inclusion in the grains of the samples, and thus the observed formula weight tends to be low also. Compound $B_{6.5}O$ (or $\frac{1}{2} B_{13}O_2$) would have the formula weight of 86.3, about 4% *smaller* than the observed value; therefore, the material studied is less likely to be this oxide. Thus, the existence of the boron suboxide B_7O appears to be established.

The structure of B_7O is probably closely related to that of elemental boron, in particular its tetragonal modification (Hoard *et al.*, 1958). This is indicated by the close similarity of the c-axes of the two structures (for tetragonal boron $c_0 = 5.06$ Å). The relative densities of B_7O and B also suggest this. Their ratio (2.64/2.31) is nearly equal to the mass ratio B_7O/B_7; the oxygen atoms are accommodated in the boron lattice without expanding it significantly. To establish the structure of B_7O unequivocally, single crystal data will be needed. Such work is not planned in this laboratory.

The author is indebted to the American Potash & Chemical Corporation, Los Angeles, for the sample of B_7O. Credit is due to Dr Dale Coulson and Dr Harold Eding for the analytical and the preliminary X-ray studies, and to Mrs H. Johnson for the experimental measurements.

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Book Reviews

Works intended for notice in this column should be sent direct to the Editor (P. P. Ewald, Polytechnic Institute of Brooklyn, 333, Jay Street, Brooklyn 1, N.Y., U.S.A.). As far as practicable books will be reviewed in a country different from that of publication.

Kompendium der Kristallkunde. By W. F. DE JONG. Pp. viii + 258, with 227 figs. and 41 tables. Vienna: Springer. 1959. Price S. 264, DM. 44, $ 10·50. 75s.

This work is a translation into German of the author's *Compendium der Kristalkunde* already reviewed in this journal (*Acta Cryst.* (1952), **5**, 858). A few diagrams have been added, a few have been redrawn, and some material

has been rearranged and slightly expanded, but in the main the translation follows the original very closely and therefore shares its merits and shortcomings. Among the merits is to be reckoned the ambitious coverage, ranging over morphological crystallography, structure analysis, crystal chemistry, and solid-state physics; among the inevitable shortcomings is the extremely superficial treatment which most of these topics receive. Thus piezoelectricity, the classical tensor theory of elasticity,

thermal conductivity, transistors and many other topics are each treated in no more than a page or two of text, while the section on crystal chemistry (less than 50 pages) is almost exclusively descriptive. The work is, indeed, a 'compendium', but it is doubtful whether the student would be able to follow much of the material without the assistance of many supplementary works. Fortunately, references to such works are numerous.

The German translation is better printed and better bound than the Dutch original, but not so much better as to justify a price nearly two and a half times as great. In fact, the price is outrageous, and at 29s. per 100 pages compares very unfavourably with other well known crystallographic works such as Nye's *Physical Properties of Crystals* (16s.), Megaw's *Ferroelectricity in Crystals* (13s.), Born & Huang's *Dynamical Theory of Crystal Lattices* (12s.), and (biggest bargain of all) Wells's *Structural Inorganic Chemistry* (7s.). In any case, however, this translation is likely to be of very limited interest outside of German-speaking countries in view of the fact that an English version is understood to be in an advanced stage of production.

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Growth and Perfection of Crystals: Proceedings of an International Conference on Crystal Growth, Cooperstown, New York, Aug. 1958. Edited by R. H. DOREMUS, B. W. ROBERTS and D. TURNBULL. Pp. 609. London: Chapman and Hall; New York: Wiley. 1958. Price £5·0·0, $12·50.

To this formidable report 51 authors have contributed and it is only possible to indicate but briefly the content. The report is richly illustrated. The growth of crystal whiskers occupies a relatively large section, for no less than 275 pages are devoted to this aspect with 17 separate contributions from 24 authors. The range covered extends from graphite to non-metal and to metal whiskers, even to the study of ferromagnetic domains in iron whiskers. Effects of irradiation, etching, straining, electrochemical behaviour, plastic deformation and indeed a whole host of aspects are reported on. Some admirable electron-microscope pictures are reproduced. An outstanding contribution covering 84 pages is that on growth of crystal whiskers by Nabarro and Jackson, which is brilliantly illustrated and is a masterly summary with no less than 246 references. A most impressive contribution indeed.

A hundred pages (9 contributions) are concerned with crystal growth from the solvent phase. Methods are described for growing large silicon crystals largely free from dislocations. Growth of crystals of the solute phase occupies 74 pages (7 contributions) and the growth of synthetic quartz crystals is included here. Section VI which deals with crystallization of polymers ends the report with 125 pages (8 contributions). An attractive paper here is the review on Morphology of Crystalline Polymers by A. Keller, another beautifully illustrated article, also with a comprehensive bibliography. This last section also includes a valuable paper by F. P. Price on A Light Scattering Investigation of Crystal Growth in Polyethylene (a material which incidentally attracted contributions in no less than five papers).

Your reviewer marvelled at the very large numbers of beautiful photographs of the microtopographies of crystals but was forcibly struck by the *complete absence* of any interferometric examinations of surface microtopographies. This seems a remarkable failing in a research field of this character. Why use *two*-dimensional microscopy only, when *three*-dimensional microscopy is available ? Is it that experimenters have not yet realized that multiple-beam interferometry offers three-dimensional microscopy ? Or is a more plausible explanation that as yet crystal morphology specialists, as such, have not yet learnt the necessary optical techniques of multiple-beam interferometry ?

Any one engaged on any branch of crystal growth is well advised to dip into this volume. Somewhere in the mass of information presented he will find something of personal interest. There is very little on X-ray structure; the reports are more concerned with morphology.

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Gleichgewichts- und Wachstumsformen von Kristallen. By Dr B. HONIGMANN. Pp. 154. Darmstadt: Dr Dietrich Steinkopff Verlag, 1958. Price DM. 26·00.

This short work is presented strictly from the point of view of I. N. Stranski and his students, of whom the author is one. Such a work is valuable in that it enables one to study the point of view of this school by reading a single source, but it also suffers from the limitations of this point of view.

The strong points of this book are the tables and figures presenting experimental data concerning the habit of many simple crystals, and the brief section on experimental determinations of crystal growth rates. Even in these sections the data have been carefully selected. Much important work by English and American authors on growth forms and rates has been omitted. In fact, the great impact dislocation theory has had on the crystal growth theory and the interpretation of experimental results has been drastically minimized. Furthermore, in the opinion of this reviewer, no modern discussion of growth forms of crystals, no matter how brief, should exclude all references to 'whisker' growth.

The last section of the book is devoted to the theory of crystal growth and the development of equilibrium forms as presented by I. N. Stranski and his students over the past thirty years. This theory is correct insofar as the assumptions on which it is based are correct. However, if there is a large body of experimental data demonstrating that it applies to the growth of real crystals, the author does not present it. This is especially the case in the discussion of the effect of impurities on growth habit. In this case, the many publications concerned with this problem were, for the most part, ignored, and no comparison of theory with the few data presented is attempted.

There is a fairly complete bibliography at the end of the work which includes many references only mentioned in the text.

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