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Synthesis and X-Ray Diffraction Analysis of $InBO_3$

X-ray powder diffraction pattern for $InBO_3$

hKL (rhomb)	d obs.	d calc.	I obs.
110	3.72	3.67	75
121	2.84	2.83	100
222	2.59	2.57	4
$\bar{1}10$	2.42	2.41	37
120	2.19	2.18	9
020	2.02	2.01	21
220	1.831	1.835	20
231	1.759	1.758	47
$12\bar{1}$	1.542	1.545	21
130	1.455	1.460	18
343	1.444	1.448	6
242	1.412	1.417	7
$11\bar{2}$	1.388	1.391	11
444	1.284	1.287	2
442	1.238	1.241	3
341	1.217	1.221	10
$02\bar{2}$	1.201	1.204	2
$03\bar{1}$	1.141	1.144	3
453	1.135	1.135	4
$23\bar{1}$	1.108	1.108	5
352	1.103	1.103	5
240	1.090	1.091	5
554	1.065	1.066	1
$\bar{2}22$	1.033	1.034	<1
040	1.006	1.007	2
251	0.9919	0.9923	3
464	0.9750	0.9749	1
$13\bar{2}$	0.9495	0.9498	2
$14\bar{1}$	0.9285	0.9289	2
440	0.9179	0.9175	2
$\bar{3}21$	0.9102	0.9103	2
563	0.9033	0.9037	2
664	0.8791	0.8758	2
262	0.8641	0.8642	<1
150	0.8583	0.8582	4
$\bar{4}11$	0.8297	0.8295	<1
574	0.8228	0.8230	2
361	0.8137	0.8134	3
675	0.8082	0.8080	2
$\bar{3}30$	0.8032	0.8028	1
$\bar{3}47$	0.7985	0.7983	1
$\bar{2}40$	0.7848	0.7843	1

The synthesis of $InBO_3$ has been reported by several workers (AVELLA[1]; AVELLA et al.[2]; LEVIN et al.[3]), but a single-phase material apparently was not produced in these endeavors. This paper presents the results of work where a homogeneous, single-phase material was synthesized.

Spectrographic grade reagents (In_2O_3 and H_3BO_3) were fired together, using an excess of H_3BO_3, at 1250 °C for 24 h. The product was washed in hot water, dried, then mixed with more H_3BO_3 and fired at 1250 °C for another 24 h. The material was again washed in hot water. The hot water wash removes any B_2O_3 which may have formed during the reaction. The X-ray diffraction pattern shows that a single-phase $InBO_3$ was formed.

The X-ray diffraction analysis was made using the Debye-Scherrer method for d-spacing measurements, and by measuring peak heights on a powder diffraction chart tracing for observed intensity measurements. CuKα radiation ($\lambda = 1.5405$ Å) was used. LEVIN et al.[3] determined that $InBO_3$ has the calcite structure, the space group being $R\bar{3}c$ (No. 167). They did this by comparing their powder diffraction pattern with that of calcite, and found that they could index their material according to the calcite symmetry. The lattice constant of our material was determined by least squares analysis to be $a_o = 5.850 \pm 0.001$ Å, $\alpha = 48.63°$. LEVIN et al.[3] found the lattice parameters to be $a_o = 51{,}856$ Å, $\alpha = 48.64°$.

The Table gives the indexed powder pattern[4].

Zusammenfassung. Die Reindarstellung von $InBO_3$ wird beschrieben und die Reinheit des Präparates durch ein Debye-Scherrer-Röntgendiagramm belegt.

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[1] F. J. AVELLA, J. electrochem. Soc. *113*, 1225 (1966).

[2] F. J. AVELLA, O. J. SOVERS and C. S. WIGGINS, J. electrochem. Soc. *114*, 613 (1967).

[3] E. M. LEVIN, R. S. ROTH and J. B. MARTIN, Am. Mineral. *46*, 1030 (1961).

[4] The author wishes to express appreciation to GRETA HARKNESS for her help in synthesizing this compound. The U.S. Geological Survey gave us the computer program used for the determination of cell size. L. TAYLOR helped with the computer work.