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MINERALOGY

A NEW MINERAL FROM THE REGION OF LAKE INDER *

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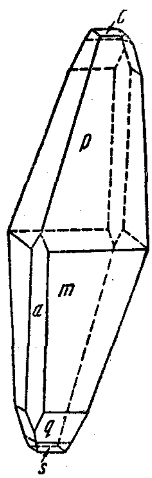
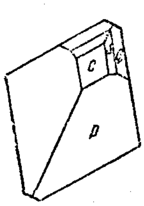
In 1934 among Lower Permian gypsum beds in the Inder mountains, northwards from lake Inder (Guriev region of the Kazakh Socialist Soviet Republic) there was found a large deposit of aqueous borates.





As a result of the work carried out by the expedition of the geologist Volkov the following minerals have been found there (3): hydroboracite, inyoite, colemanite, ascharite, ulexite, and somewhat later, pandermite. In 1936 Boldyreva discovered a new Mg-borate named by her (2) inderite. In 1938 Godlevsky described kaliborite from lake Inder (5) and, finally, in 1940 the same author described one new borate more (5)—kurnakovite. Thus, towards 1941 nine minerals on the whole were known from the Inder deposit, hydroboracite, regarded previously as a mineralogical rarity, being here of economic importance.

In the summer of 1940 E. E. Vashman and V. I. Semenova, of the Mineralogical Museum of the Academy of Sciences, collected an abundance of minerals at lake Inder. While examining the material collected, their attention was attracted by a mineral whose habit seemed widely different from that of the known borates. The investigations made by the present author showed this to be a new mineral species.

C h e m i c a l   P r o p e r t i e s. The new mineral is a hydrous borate of calcium and magnesium. Table 1 contains analytical data and theoretical amounts of oxides of the elements derived from the formula.

Spectral analysis showed moreover the presence of traces of Fe and Mn. The formula: $CaO \cdot MgO \cdot 3B_2O_3 \cdot 11H_2O$ or $CaMg \cdot B_6O_{11} \cdot 11H_2O$.

* Our periodical received the article by G. S. Gorshkov May 27, 1941, and later on, i. e. July 26, the article by N. J. Ikornikova and M. N. Godlevsky under th· title «The new borate—metahydroboracite» (see p. 257). Comparison of both thes articles revealed the necessity of checking Gorshkov's analytical data; as a resul of this, arose the necessity of correcting his calculations.

In both articles is concerned the same new mineral species; naturally enough, the priority must therefore be assigned to the name «inderborite». *Ed.*

Table 1

	Analysis in %	Molecular ratio	Theor. composition in %
CaO	11.27	1.02	11.13
MgO	8.00	1.00	8.01
B_2O_3 . . .	41.70	3.01	41.50
Losses on ignition .	39.48	11.02	39.36
Total.	100.45	—	100.0

The new mineral is an analogon of hydroboracite and has been named inderborite after the place of finding. A small piece of the mineral cracks in the flame of the blowtorch and melts, forming colourless glass and imparting a light-green colour to the flame. When heated in a closed pipe, splits and evolves water. Inderborite is very poorly soluble in water and cold acids. In hot HCl solves quickly.

Physical Properties. Forms coarsely crystalline aggregates and well developed crystals up to 2 cm in size. The crystals are colourless and transparent, en masse the mineral is white and semitransparent. In one direction (100) the cleavage is clearly manifest. Lustre on faces and along cleavage planes intensely vitreous. Conchoidal fracture with a somewhat fatty lustre. Mohs' hardness 2.5. Specific gravity 1.928—1.930.

Optical Properties. Optically negative. Optical axes plane (100). N_g=1.538—1.544; N_m=1.521; N_p=1.496; N_g—N_p=0.048—0.042; $2V$ determined on the Fedorov stage. N_m and N_p determined by immersion. N_g derived from $2V$. N_g—N_p determined by the Bereck compensator. Optically inderborite is widely different from hydroboracite. In Table 2 a comparison is given of the optical constants of hydroboracite and inderborite.

Table 2

	N_g	N_m	N_p	$2V$	$N_p \wedge c$
Hydroboracite	1.570	1.534	1.523	+61°	31°
Inderborite	1.538—1.544	1.521	1.496	—80—86°	0—1°

Crystallography. Goniometric measurements were carried out on Flient's bicircular reflecting goniometer. On the whole 12 crystals were measured, but most of them possessed a bad zone of adjustment, and in consequence of this only four crystals with the best adjustment were chosen. The principal zone [001] was measured to $\pm 0°10'$. The co-ordinate ρ of the face c (001) was measured with the same precision. The face p (221), along which the crystal was measured, showed a precision to $\pm 0°10'$ along ρ and φ. The precision of measurement of the co-ordinates of the face q ($\bar{2}21$) was $\pm 0°15'$ along ρ and $\pm 0°10'$ along φ. The precision of measurement of face s ($\bar{1}\bar{1}1$) along $\rho = \pm 1°$ and along $\varphi = \pm 0°20'$. The face t ($\bar{1}12$) was measured by reflection. The results of measurements are given in Table 3.

Table 3

Symbols	Designations	Measured		Calculated	
		φ	ρ	φ	ρ
100	*a*	90°00′	90°00′	90°00′	90°00′
001	*c*	90°00′	0°48′	—	—
110	*m*	31°28′	90°00′	31°28′	90°00′
221	*p*	31°41′	72°06′	—	—
$\bar{2}21$	*q*	—31°16′	71°47′	—31°15′	72°01′
$\bar{1}11$	*s*	—31°20′	57°00′	—31°01′	56°57′
$\bar{1}12$	*t*	—34°00′	35 ½°	—30°34′	37°25′

The crystals belong to the prismatic type of monoclinic syngony. The elements of crystals were found to be as follows: $a : b : c = 1.6346 : 1 : 1.3173$; $\beta = 90°48'$; $1\bar{1}0 \wedge 110 = 62°56'$; $2\bar{2}1 \wedge 221 = 76°48'$.

Fig. 1 shows the external appearance of the crystal, the face *t* ($\bar{1}12$) not having been traced, since it was present only on one of the crystals and no signal of this could be obtained. The forms determining the habit were two prisms in *m* (110) and *p* (221) forming a pseudodipyramid and the pinacoid *c* (001). On the whole the face *c* (001) was absent and the crystal showed a lanceolate habit. The faces *a* (110) and *q* ($\bar{2}21$) are rarely present, and still more rarely (and this of a low quality) is present the face *s* ($\bar{1}11$).

A comparison of the crystallographic constants of hydroboracite ([1]) and inderborite given in Table 4 points to a certain similarity.

Table 4

	$a : b : c$	β	Cleavage 11
Hydroboracite	1.762 : 1 : 1.241	102°39′	(100) and (010)
Inderborite	1.6346 : 1 : 1.3173	90°48′	(100)

P a r a g e n e s i s. In paragenesis with inderborite are found inyoite, colemanite and ulexite, which are secondary in relation to inderborite.

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