

THE AMERICAN MINERALOGIST, VOL. 45, MAY-JUNE, 1960

THE NAMING OF THE HYDROUS MAGNESIUM BORATE MINERALS
FROM BORON, CALIFORNIA—A PRELIMINARY NOTE*

WALDEMAR T. SCHALLER AND MARY E. MROSE, U. S.
Geological Survey, Washington, D. C.

Considerable confusion exists in the naming of the two hydrous magnesium borate minerals from the Open Pit at Boron, California. These minerals have only recently been discovered in the sediments overlying the borax and kernite and were described by Frondel and Morgan (1956) and by Frondel, Morgan, and Waugh (1956). The latter group considered one of these minerals to be new and named it lesserite. However, both of these minerals had been described previously as the new minerals inderite (Boldyreva, 1937) and kurnakovite (Godlevsky, 1940); both occur at the Inder borate deposit in western Kazakhstan, U.S.S.R.

The uncertainty as to the identity of the minerals from Boron has been augmented by partly inaccurate optical determinations originally given for inderite, the incorrect formula derived for kurnakovite, and the incorrect interpretation by Heinrich (1946) of the original x -ray powder diffraction data for inderite. No x -ray powder diffraction data for type kurnakovite have been published. The information available to us indicated strongly the identity of both of the California minerals with the two Russian minerals, inderite and kurnakovite. All doubt of this identity is now removed by the receipt from Prof. Dr. M. A. Valyashko of x -ray powder diffraction data we requested of an authenticated specimen of kurnakovite from Inder. These data are in agreement with those published by Heinrich for his "American material" and with those obtained by us on numerous samples from Boron, California.

Comparison of x -ray, optical, and chemical properties obtained during our detailed study of these minerals with those given for type inderite (Boldyreva, 1937; Boldyreva and Egorova, 1937), synthetic inderite (Feigelson *et al.*, 1939; Nikolaev and Chelishcheva, 1940), type kurnakovite (Godlevsky, 1940), and synthetic kurnakovite (Spiryagina, 1949) now makes it possible to define inderite and kurnakovite as dimorphs of $Mg_2B_6O_{11} \cdot 15H_2O$. The so-called "lesserite" is identical with type inderite. Some of our conclusions previously had been suggested by D'Ans and Behrendt (1957), by Dr. Robert Kühn (1959) of Hannover, Germany (also, written communication, 1958), and by Richard C. Erd of the U. S. Geological Survey (written communication, 1958).

This preliminary note is presented to prevent further confusion in the

* Publication authorized by the Director, U. S. Geological Survey.

TABLE 1. CLASSIFICATION OF THE HYDROUS MAGNESIUM BORATE MINERALS

Inderite, $Mg_2B_6O_{11} \cdot 15H_2O$ Monoclinic		Kurnakovite, $Mg_2B_6O_{11} \cdot 15H_2O$ Triclinic	
Natural*	Synthetic*	Natural*	Synthetic*
"lessерite" of Frondel, Morgan, and Waugh (1956)	inderite of Feigelson <i>et al.</i> (1939)	"inderite" of Heinrich (1946)	"inderite" of Heinrich (1946)
"lessерite" of Muessig (1959)	inderite of D'Ans and Behrendt (1957)	"inderite" of Frondel and Morgan (1956)	kurnakovite of Spiraygina (1949)
		"inderite" of Muessig and Allen (1957)	
		"inderite" of Muessig (1959)	

* The incorrect names assigned by the designated investigators are given in quotes.

designation of these two hydrous magnesium borates. Table 1 summarizes the results of our investigations. The detailed evidence on which the above conclusions are based will be presented in a later paper.

REFERENCES

- BOLDYREVA, A. M. (1937), Investigations of inderite and the including rock: *Mem. Soc. Russe Min.*, ser. 2, **66**, 651-671 (in Russian), 672 (English summary).
- BOLDYREVA, A. M., AND EGOROVA, E. N. (1937), Inderite—a new hydrous borate of magnesium: *Mat. Centr. Sc. Geol. Prosp. Inst. U.S.S.R., Gen Ser.*, no. 2 (in Russian).
- D'ANS, JEAN, AND BEHRENDT, KARL-HEINZ (1957), Über die Existenzbedingungen einiger Magnesiumborate: *Kali und Steinsalz*, **2**, 121-137.
- FEIGELSON, I. B., GRUSHVITSKY, V. E., AND KOROBOCHKINA, T. V. (1939), Synthesis of inderite: *Compt. Rend. (Doklady) Acad. Sci. U.R.S.S.*, **22**, 242-243.
- FRONDEL, CLIFFORD, AND MORGAN, VINCENT (1956), Inderite and gerstleyite from the Kramer borate district, Kern County, California: *Am. Mineral.*, **41**, 839-843.
- FRONDEL, CLIFFORD, MORGAN, VINCENT, AND WAUGH, J. L. T. (1956), Lesserite, a new borate mineral: *Am. Mineral.*, **41**, 927-928.
- GODLEVSKY, M. N. (1940), Kurnakovite, a new borate: *Compt. Rend. (Doklady) Acad. Sci. U.R.S.S.*, **28**, 638-640.
- HEINRICH, E. W. (1946), A second discovery of inderite: *Am. Mineral.*, **31**, 71-76.
- KÜHN, ROBERT (1959), Die Mineralnamen der Kalisalze: *Kali und Steinsalz*, **4**, 331-345.
- MUESSIG, SIEGFRIED (1959), Primary borates in playa deposits: minerals of high hydration: *Econ. Geol.*, **54**, 495-501.
- MUESSIG, SIEGFRIED, AND ALLEN, R. D. (1957), Ezcurrite ($2Na_2O \cdot 5B_2O_3 \cdot 7H_2O$), a new sodium borate from Argentina: occurrence, mineralogy, and associated minerals: *Econ. Geol.*, **52**, 426-437.

- NIKOLAIEV, A. V., AND CHELISHCHEVA, A. G. (1940), The 25° isotherm of the systems: $\text{CaO} + \text{B}_2\text{O}_3 + \text{H}_2\text{O}$ and $\text{MgO} + \text{B}_2\text{O}_3 + \text{H}_2\text{O}$: *Compt. Rend. (Doklady) Acad. Sci. U.R.S.S.*, **28**, 127-130.
- SPIRYAGINA, A. I. (1949), Conditions of formation of kurnakovite: *Doklady Akad. Nauk S.S.S.R.*, **68**, 909-911.

THE AMERICAN MINERALOGIST, VOL. 45, MAY-JUNE, 1960

JACOBSITE FROM THE NEGEV, ISRAEL

GERALD KATZ, *Israel Atomic Energy Commission, Rehovoth, Israel.*

The specimen of jacobsite investigated is the first reported occurrence from Israel and the middle east. The sample was not found in situ but obtained from a large boulder (approximately 1 cubic meter) which was mined from the vicinity of "manganese hill," 26 miles North of Eilat, in the Southern Negev (Sturm 1953 and Bentor 1956). All subsequent analyses were performed on a "fist-sized" sample removed from this boulder.

PHYSICAL PROPERTIES AND COMPOSITION

In appearance, the specimen was predominantly of a deep black color, exhibiting a brownish-black streak test. It was very magnetic, being able to support a 3 inch alnico horse-shoe magnet with 1 cm² pole pieces. The hardness on the Mohs scale was just below 6 of feldspar. It was quite difficult to cut the specimen with a carborundum saw and sections were made using a diamond saw. No regular cleavage was observed and only an irregular fracture was obtainable.

Spectrochemical analysis indicated iron and manganese to be the major elements present plus small amounts of silicon, aluminium, barium and traces of other elements. Wet chemical analysis gave a content of:

29.0% manganese by weight

14.6% iron by weight

POLISHED SURFACE STUDIES*

The specimen is of complex mineralogy, very fine grained, considerably oxidized, and in general, a particularly difficult problem for mineralogical study. Fig. 1. is a photomicrograph made under low magnification. The very bright small particles (low left center) are hematite. The smooth fairly bright areas are jacobsite; the brightness varies as it is oxidized and hydrated to limonite, which most of the darker areas represent. In addition to jacobsite and hematite, several other phases are discernible. A

* Study performed by Dr. C. Milton of the U. S. Geological Survey, Washington 25, D. C.