LESSERITE, A NEW BORATE MINERAL*

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Lesserite is a new monoclinic polymorph of the triclinic mineral inderite, $Mg_2B_6O_{11} \cdot 15H_2O$. It occurs in the Jenifer mine in the Kramer district, Kern County, California, associated with inderite,[1] borax, ulexite, and realgar in a buried erosional valley that locally cuts the upper portion of the borate beds. Apparently, magnesium-rich seepage through the valley fill has reacted with the sodium borates to form the relatively insoluble magnesium borates. Lesserite occurs associated with inderite, and both minerals have formed at temperatures and pressures not far above ordinary. The mineralogy and geology of the Kramer deposit has been described by Schaller (1929).

Lesserite occurs as prismatic crystals up to 10 cm. in length and 1 cm. in cross-section. The monoclinic crystals show only the forms (110), (120) and (001). Doubly terminated crystals were observed. (110) usually is preponderant, and the prisms then have a nearly square cross-section with $(110) \wedge (\bar{1}10) = 96°44'$. *X*-ray study by the Laue and Weissenberg methods established the diffraction symmetry as $2/m$. The crystal class is uniquely established as monoclinic prismatic, $2/m$, by the observed space group, $P2_1/a$.

The cell dimensions are:

a_0 12.12 ± .04 Å	$a_0:b_0:c_0 = 0.920:1:0.518$
b_0 13.18 ± .04	Cell contents 2 ($Mg_2B_6O_{11} \cdot 15\ H_2O$)
c_0 6.83 ± .01	β 104°49′ (*x*-ray), 104°32′ (morph.)

The measured morphological angles are (001) ρ 104°32′; (110) ρ 90°, ϕ 48°22′; (120) ρ 90°, ϕ 29°21′; the corresponding angles calculated from the *x*-ray data are 104°49′, 48°20′ and 29°20′. *X*-ray powder spacing data are given in Table 1.

Lesserite has an indistinct cleavage on (001) and a good cleavage on (110); the (110) cleavage is not as easy or perfect as the (010) cleavage of inderite. The fracture is flat conchoidal to irregular. The mineral is colorless and transparent, with a weak vitreous luster. The hardness is $2\frac{1}{2}$, apparently a little less than in inderite, and the specific gravity is 1.785 ± .002 (meas.), 1.76 (calc.). Optically positive, with $n\mathrm{X} = 1.488$, $n\mathrm{Y} = 1.491$, $n\mathrm{Z} = 1.505$ (all ± .002); $2\mathrm{V} = 37° \pm 2°$ (meas.); $\mathrm{Z} \wedge c = 9°$ in the

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[1] Inderite as used herein refers to the mineral conditionally described as inderite by Frondel and Morgan, reference below.

TABLE 1. *X*-RAY POWDER SPACING DATA FOR LESSERITE
Copper radiation, nickel filter, in Angstrom units.

I	*d*	*I*	*d*	*I*	*d*	*I*	*d*
2	8.63	2	3.63	3	2.552	2	1.993
6	6.52	2	3.49	4	2.502	1	1.948
5	5.84	8	3.34	2	2.432	1	1.910
10	5.66	10	3.26	1	2.402	2	1.891
9	5.01	6	2.94	3	2.347	1	1.870
1	4.62	4	2.93	1	2.322	2	1.848
3	4.34	5	2.82	2	2.132	1	1.826
2	3.98	1	2.74	1	2.086	1	1.800
2	3.71	6	2.65	1	2.045	1	1.784

Also additional lines of smaller spacing.

obtuse angle. Dispersion not perceptible. A chemical analysis, cited below, is in very close agreement with the formula $Mg_2B_6O_{11} \cdot 15H_2O$. The

	MgO	B_2O_3	H_2O	Insol.	Total
1.	14.41	37.33	48.28	0.08	100.10
2.	14.40	37.32	48.29		100.00

1. Lesserite, California. V. Morgan, analyst. Ca and Sr present in spectrographic traces.
2. Theoretical weight percentages, $Mg_2B_3O_{11} \cdot 15\ H_2O$.

formula of inderite is known with equal certainty (Frondel and Morgan (1956)). Lesserite is insoluble in water, but dissolves readily in dilute HCl. Before the blowpipe it fuses to a white enamel.

Kurnakovite, $Mg_2B_6O_{11} \cdot 13H_2O$, is close in composition to lesserite. The properties of this mineral, described by Godlevsky (1940) from Kazahkstan, differ from those of lesserite but are suspiciously close to those of inderite. The name lesserite is after the late Mr. Federico Lesser, one of the founders of the international borate industry.

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