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NICKELIFEROUS LAZULITE FROM BARABOO, WISCONSIN

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In 1958 the writer collected a specimen of Baraboo Quartzite containing a thin (2 mm) vein of light blue-green lazulite. The locality is about 5 miles south of the town of Baraboo, Wisconsin in Sec. 30, T. 11N., R. 7E. on a talus slope above Devils Lake. Other than representing a new locality for lazulite the specimen was of little interest until a qualitative scan of the emission x-ray spectrum indicated significant nickel and cobalt as well as iron.

Only about 200 mg was contained in the whole sample, of which it was possible to separate about 45 mg by hand picking both in reflected and transmitted light. A partial analysis by x-ray emission for Fe, Co, Ni was carried out using a lithium borate fusion method, with Cr_2O_3 as an internal standard, for the unknowns and a series of artificially prepared standards. The working curves (scaled intensity ratios *vs.* per cent oxide) were linear over the range of 12% to 0%.

In addition, two lazulites were analyzed for comparison, one of which (Graves Mt., Ga.) has an analysis published in the literature (Pecora and Fahey, 1950). Also an analyzed olivine and W-1 were included as checks. Fe and Co are arbitrarily reported as FeO and CoO. For each of the analyzed samples ferrous and ferric are recalculated to total as FeO for comparison. The results are given in Table 1. Considering all the oxides together the maximum analytical error is $\pm 3\%$.

The Baraboo lazulite is higher in Ni and Co by an order of magnitude than any member of the lazulite-scorzalite series reported on by Pecora and Fahey (1950). They list semiquantitative results which place Ni in the .0X% to .00X% range, and Co in the range of .00X% to .000X%.

The optical properties (Table 2) were determined in NaD light. When all FeO, NiO, and CoO of the Baraboo sample are calculated to an equivalence in FeO the result is FeO = 2.39% and the implied ratio Mg/Mg+Fe is 0.898. With the exception of the γ index, which is

TABLE 1. PARTIAL ANALYSIS BY *X*-RAY EMISSION

	Lazulite, Baraboo, Wis.	Lazulite, Graves Mt., Ga.	Lazulite, Bahia, Braz.	Standard, W-1	Olivine, N. Carolina
FeO	1.55%	4.42%	1.41%	10.11%	7.92%
NiO	0.73	0.02	0.04	n.d.	0.38
CoO	0.14	n.d.	n.d.	n.d.	n.d.
Analyses of knowns from literature (total iron recalculated to FeO)					
FeO		4.49%		10.18%	7.84%
NiO		0.0X		0.0093	0.37
CoO		n.d.		0.0060	n.d.

n.d. (not detected).

TABLE 2

$\alpha = 1.610 \pm .003$	Biref. = .029
$\beta = 1.631 \pm .003$	2V approx. 70°
$\gamma = 1.639 \pm .003$	Dichroic from pale blue to colorless.

slightly low, the optical values plot neatly on the optical variation curves for the series, as determined by Pecora and Fahey (1950).

X-ray powder patterns, using filtered Fe radiation, were prepared of all three lazulites (Baraboo, Graves Mt. and Bahia). They are identical, with almost exact correspondence of 101 "lines" of measurable intensity down to 0.97 Å. Careful optical studies were made seeking impurities that might be adding Ni to the lazulite. None was found. In addition, *x*-ray exposures of long duration failed to show any additional lines of contaminants such as millerite, niccolite, etc. The Ni and Co are probably present as substitutions for Fe, as in other ferromagnesian minerals.

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