# EUXENITE FROM SABINE TOWNSHIP, NIPISSING DISTRICT, ONTARIO

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Euxenite, next to allanite, is the commonest rare element mineral in Canadian pegmatites. This particular occurrence was studied because it represents a new area in central Ontario, consists of unusually fine material, and was obtained in considerable quantity. It occurs in a pegmatite worked for feldspar, on lot 28, conc. I, Sabine Township, Nipissing District. The property is reached by a mine road which connects with the Trenton-Bancroft line of the Canadian National Railways near mile 113, which is about 3 or 4 miles north of Lake St. Peter station.

The dike in which the euxenite occurs is 12 to 20 feet wide and outcrops at intervals for a distance of 1000 feet or more, extending into lot 29. The strike is about N 60°F mag. and it probably dips to the north. The feldspar working is on lot 28. There is nothing particularly noteworthy about the dike. It is the ordinary microcline-quartz type common in Ontario, consisting for the most part of a coarse graphic intergrowth of quartz and microcline, with occasional patches of microcline crystals, not usually over $1 \times 3$ feet, from which commercial feldspar was obtained at the expense of considerable hand cobbing. Very little plagioclase was seen in the working. Biotite was abundant, muscovite was not seen. Nodules, up to 1 inch diameter, of what was supposed at the time of the visit to be magnetite or ilmenite were common. Closer examination of some of this material in the laboratory, however, shows that it is martite. It is non-magnetic, has a reddish streak and contains by a rough qualitative test not over one per cent $TiO_2$. On reducing it to a powder occasional grains present impart a blackish hue to the predominant hematite color and are feebly magnetic. It seems likely that this material was originally magnetite which has been transformed to hematite. In some specimens what appears to be the magnetite cleavage is retained.

The euxenite occurs chiefly as masses up to four inches in diameter, often associated with biotite, in microcline which is considerably fractured and reddened by iron rust for a radius of a foot or more from the euxenite. The euxenite masses consist

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of the pure solid mineral uncontaminated by intergrowths of other minerals and are really aggregates of large crystals grown together, the outer surfaces often bearing good crystal faces. Some small individual crystals were also seen. Sometimes a martite nodule may be in contact with the outer surface of the euxenite masses. The feldspar surrounding the euxenite, though badly fractured and stained red, presumably by iron, appears to be typical microcline. When crushed and examined in oil under the microscope practically all grains show the microcline twinning and all have indices less than 1.530, but when examined as hand specimens under the binocular microscope a few scattered minute perthitic intergrowths of plagioclase were seen, which it was estimated would constitute not more than one per cent of the whole.

No large masses of quartz were exposed. There is some smoky quartz but it is not deeply colored. At the time of the writer's visit a cut 4-5 feet deep had been made over a length of 30 feet and four carloads of feldspar had been shipped.

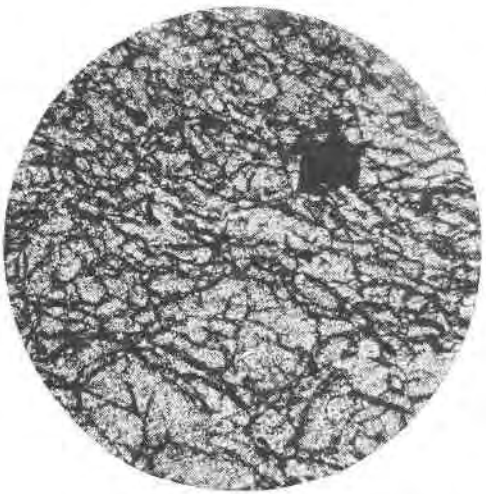

FIG. 1. Highly magnified photograph by transmitted light of a thin section of Sabine township euxenite, showing regular fracturing and freedom from inclusions. The black spot represents a hole in the section. The photograph does not give a true picture of the section. Actually the fractures are very narrow and sharp with little or no alteration along the edges.

The euxenite is pure black en masse, reddish brown, transparent, and isotropic in thin splinters, grains or sections under

the microscope. The powder is yellowish brown. It has an unusually brilliant, mirror like, vitreous lustre. It lacks cleavage and has a subconchoidal fracture. It is very brittle with a hardness of 6.5. Sp. Gr.=5.002. In thin sections under the microscope it appears to be perfectly pure and homogeneous and unusually free from evidences of alteration, such as bleaching or visible decomposition along the edges of fractures. The mineral is intensely fractured (Fig. 1), as are all minerals of this sort, and in a rather more uniform and regular way than is commonly the case. It seems likely that the fracturing seen here is almost entirely due to the increase in volume resulting from autoxidation. Shearing and normal alteration have had but little part in producing the fractures. This view might be criticized on the ground that common minerals such as, apatite, tourmaline, garnets, etc., enclosed in similar Precambrian pegmatites are also usually much fractured. The difference lies in the fact that the radioactive minerals are always very much more intensely and more regularly fractured, and on a much more minute scale than are the common minerals. Even a mineral so soft and brittle as apatite is never fractured to a degree remotely comparable to the complete microscopic shattering always seen in uranium and thorium minerals.

The sample used for analysis was hand picked under the binocular microscope and consisted of the most brilliant material, absolutely free from visible impurities. The analysis yielded the following results:

EUXENITE FROM SABINE TOWNSHIP, NIPISSING DISTRICT, ONTARIO

| | Per Cent | Mol. Wt. | Bases | Acids |
|---|---|---|---|---|
| PbO | 1.35 | 222 | 0.0061 | |
| (Pb=1.25) | | | | |
| $UO_2$ | 8.61 | 270.2 | 0.0318 | |
| $UO_3$ | 0.20 | 286.2 | 0.0007 | |
| U=7.76=9.15$U_3O_8$ | | | | |
| $ThO_2$ | 3.94 | 264 | 0.0149 | |
| Th=2.46x0.38=0.93 U equivalent | | | | |
| $(Ce,La,Di)_2O_3$ | 0.44 | 330 | 0.0013 | |
| $(Yt,Er)_2O_3$ (At. Wt. 108) | 24.31 | 264 | 0.0921 | |
| FeO | 0.00 | 72 | | |
| $Fe_2O_3$ | 2.07 | 159.7 | 0.0130 | |

| | | | | |
|---|---|---|---|---|
| MnO | 0.28 | 70.9 | 0.0040 | |
| $Al_2O_3$ \| BeO | 0.26 | 102.2<br>25.1 | 0.0026 | |
| CaO | 1.92 | 56 | 0.0343 | |
| MgO | 0.03 | 40.3 | 0.0007 | |
| $Na_2O$ | 0.17 | 62 | 0.0027 | |
| $K_2O$ | 0.04 | 94 | 0.0004 | |
| $ZrO_2$ | 0.05 | 122.6 | | 0.0004 |
| $SnO_2$ | 0.07 | 150.7 | | 0.0005 |
| $TiO_2$ | 22.96 | 80.1 | | 0.2866 |
| $Ta_2O_5$ | 2.65 | 443 | | 0.0060 |
| $Cb_2O_5$ | 28.62 | 266.2 | | 0.1075 |
| $SiO_2$ | 0.09 | 60.3 | | 0.0015 |
| $H_2O-110°$ | 0.08 | | 0.2046 | 0.4025 |
| $H_2O+110°$ | 2.15 | 18 | 0.1200 | |
| He, etc. | Not determined | | | |

Sp. Gr. = 5.002 at 20.30°

$\frac{Pb}{U+0.38\ Th} = 0.144$

The small amount of silica present indicates that the mineral has suffered but little normal alteration and the lead ratio is only slightly lower than that (0.15) of the best uraninites of the Ontario Precambrian.

As the ratio of $Cb_2O_3+Ta_2O_5 : TiO_2 = 1:2.5$ the mineral is to be classed as euxenite, following the suggestion of W. E. Brögger that the name euxenite be applied to those minerals with $Cb_2O_5$: $TiO_2$ between 1.2 and 1.3, and polycrase to those with ratio less than 1:4.