DJALMAITE, A NEW RADIO-ACTIVE MINERAL

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Introduction

While traveling through Conceição County, in the state of Minas Gerais, studying a pegmatite which is being mined for aquamarine and bismuth ore, Dr. Octavio Barbosa brought me a few specimens of minerals of the niobium-tantalate family, found on the Posse farm, in the Brejaúba district. The geological occurrence of the minerals has been described by him in *Mineração e Metalurgia*, vol. **11**, No. 13, 1938.

Three types of deposits are being worked at Brejaúba, and all of them come from the same pegmatite. They are: (1) the pegmatite itself; the mines being located at the top and on the hillside of Posse hill; (2) the eluvium which is derived from the erosion of the pegmatite; and (3) the alluvium of Posse creek (See Fig. 4).

The pegmatite is composed chiefly of kaolinized microcline and quartz found in veins and pockets; bismuth ore in "nests," associated with the quartz veins; non-commercial sheets of muscovite mica; green, yellowish-green, light blue and light brown beryl associated likewise with quartz veins; decomposed garnet; columbite; magnetite; monazite; samarskite; and tourmaline.

In addition to some of the above minerals, the alluvium contains a mineral similar to eschwegeite, emerald (rarely), and a new mineral with a yellowish-brown, greenish-brown or brownish-black color occurring in shining octahedral crystals, the description of which is given below. This mineral has sometimes been classified as betafite or microlite. A crystallographic study was made of the larger and more perfectly developed crystals.

Crystallographic Study

This new mineral is found in forms showing a perfect octahedron, modified on each corner by four faces, which with the octahedron gives a total of 32 faces (See Fig. 3).

In order to calculate the indices of these faces we used their relative position with reference to the octahedron faces. Thus, the angle between the face in question (*hkl*) and that of the octahedron (111) was found to be 28°23′.

The measurement was made with a Babinet goniometer. As the crystal did not have perfectly plane faces, small pieces of cover glass were glued to the faces, in order to obtain good reflections. However, in spite of this procedure a high degree of accuracy was not attained.

In like manner the angle of the adjacent octahedron faces was measured, the value of which was found to be 71°45′, the error being 1°14′. The inclination of the normal to the axes is 54°44′30″.

Figure 1 is a stereographic projection showing poles of both (111) and (*hkl*), indicated by P and P', respectively; X, Y, and Z being the projections of the rectangular axes.

In the triangle $P'PX$ the sides $P'P$ and PX and their included angle are:

$$PX = 54°44'30''$$
$$PP' = 28°23' \quad \text{(measured)}$$
$$\text{angle} \quad P = 120°$$
$$\cos P'X = \cos PX \cdot \cos P'P + \sin PX \cdot \sin P'P \cdot \cos 120°$$
$$= 0.3138$$
$$P'X = 71°42'50''.$$

The pole P' makes equal angles (71°42′50″) with X and Y, and an angle of 26°21′30″ with Z. The cosines of these angles are in the ratio of 0.3:0.3:0.9, hence the form has the indices (113).

The theoretical value of the angle $P'P$ between (111) and (113) can be calculated from Fig. 2.

$$\text{angle } POZ = 54°44'30''$$
$$P'OZ' = OAZ'$$
$$\tan OAZ' = \frac{OZ'}{OA} = \frac{1/3}{1/\sqrt{2}} = 0.4106$$
$$\text{angle } OAZ' = 25°14'20''$$
$$\text{angle } POP' = 29°30'10''$$

Thus the goniometric measurement was in error by 1°7′.

Refractive Index

The index of refraction has been determined by the immersion method. The immersion medium used was Merwin's solution, and the refractive index was found to be 1.97.

Chemical Composition

The chemical composition is as follows:

Ta_2O_5	72.27
Nb_2O_5	1.41
TiO_2	2.54
SnO_2	Trace
ZrO_2	0.80
UO_2	2.17
UO_3	9.38
WO_3	0.18
Bi_2O_3	0.98
PbO	1.10
FeO	0.56
CaO	3.40
MgO	0.24
H_2O	4.62
	99.65

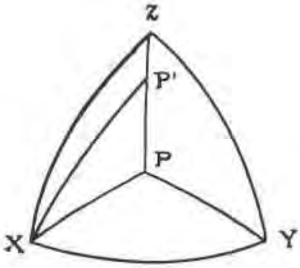

FIG. 1

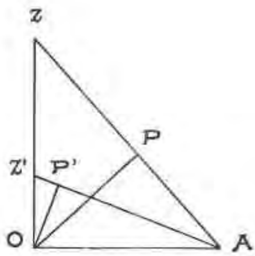

FIG. 2

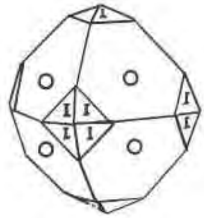

FIG. 3

FIG. 4

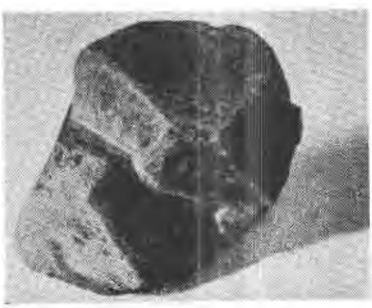

FIG. 5

Although it has not been possible to give an exact formula, on account of the alteration to a hydrate, the mineral is to be regarded as an uranium-bearing tantalate together with other bases and titanium in small amounts.*

Physical Properties

Color—04ie and 08ie of Ostwald scale.
Streak—04ge (light yellow) Ostwald scale.
Powder—04ge Ostwald scale.
Specific gravity—5.75–5.88.
Hardness—5.5.
Fracture—Irregular.
Cleavage—None.
System of symmetry—Isometric.
Habit—Octahedral.

Observed forms: icositetrahedron $i = (311)$ and octahedron $o = (111)$, the latter being dominant (Fig. 3).

Optical Properties

In thin section the new mineral has the following properties:
Translucent, yellowish-brown, greasy luster, strongly refringent.

Chemical Composition

A tantalate of uranium and other bases, with a small amount of titanium.

Conclusions

The physical properties of the mineral indicate that it is closely related to betafite and samirésite; it also resembles eschwegeite.

In the current literature no reference has been found for this mineral. As suggested by Dr. Octavio Barbosa, who furnished the specimens for the present study, we propose for the new mineral the name *Djalmaite*. It is a deserving tribute to Dr. Djalma Guimarães, the well known Brazilian mineralogist and petrologist.

Acknowledgments

Thanks are due to both Drs. Octavio Barbosa and Viktor Leinz for their valuable suggestions, and to Dr. Emilio A. Teixeira for the translation of this note into English.

* Note by Dr. Harry Berman.

The best formula obtainable seems to be of the type $AB_3O_8(O, OH)$ with $A = U^4, U^6$, Ca, Pb, Mg; and B = (Ta, Cb, Ti, Zr).

The analysis represents a composition distinct from any recorded mineral and is apparently a Ta, U-rich member of the betafite group. Other members are blomstrandine, the titanium-rich member, and samirésite, with much lead.