

# MEDDELELSER OM GRØNLAND

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## GRØNLANDS GEOLOGISKE UNDERSØGELSE

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### I.

#### ILIMAUSSITE, A NEW RARE EARTH-NIOBIUM- BARIUM SILICATE FROM ILÍMAUSSAQ, SOUTH GREENLAND

CONTRIBUTION TO THE MINERALOGY OF ILÍMAUSSAQ No. 10

By E. I. SEMENOV, M. E. KAZAKOVA  
AND V. J. BUKIN

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WITH 2 TABLES IN THE TEXT

С РУССКИМ РЕЗЮМЕ

### II.

#### ON THE MINERALOGY OF PYROCHLORE FROM THE ILÍMAUSSAQ ALKALINE INTRUSION, SOUTH GREENLAND

CONTRIBUTION TO THE MINERALOGY OF ILÍMAUSSAQ No. 11

By E. I. SEMENOV, H. SØRENSEN  
AND Z. T. KATAJEVA

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WITH 1 FIGURE AND 2 TABLES IN THE TEXT  
AND 1 PLATE

С РУССКИМ РЕЗЮМЕ

KØBENHAVN

C. A. REITZELS FORLAG

BIANCO LUNOS BOGTRYKKERI A/S

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BARIUM SILICATE FROM ILÍMAUSSAQ,  
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### Abstract

A new mineral —  $\text{Na}_4\text{Ba}_2\text{CeFeNb}_2\text{Si}_8\text{O}_{28} \cdot 5\text{H}_2\text{O}$  — found in a hydrothermal vein in nepheline-sodalite syenite (naujaite) of the Ilímaussaq alkaline massif is described. The mineral is named ilimaussite after the locality where it was found. It forms brownish-yellow lamellae and is associated with ussingite, chkalovite and epistolite. The specific gravity is 3.6. The mineral is optically uniaxial positive;  $n_e = 1.695$ ,  $n_o = 1.689$ . The mineral is hexagonal,  $a_o = 10.80$ ,  $c_o = 20.31$ ,  $V_o = 2052 \text{ \AA}^3$ ,  $Z = 3$ . The chemical composition is:  $\text{SiO}_2 - 31.28$ ,  $\text{TiO}_2 - 1.64$ ,  $\text{Nb}_2\text{O}_5 - 13.20$ ,  $\text{TR}_2\text{O}_3 - 10.60$ ,  $\text{Fe}_2\text{O}_3 - 3.18$ ,  $\text{BaO} - 23.62$ ,  $\text{Na}_2\text{O} - 7.00$ ,  $\text{K}_2\text{O} - 3.80$ , loss by ignition — 6.43; total 100.75.

### РЕЗЮМЕ

В гидротермальной уссингитовой жиле нефелинсодалитовых сиенитов (науяитов) щелочного массива Илимауссак (ЮЗ Гренландия) обнаружен новый минерал состава  $\text{Na}_4\text{Ba}_2\text{CeFeNb}_2\text{Si}_8\text{O}_{28} \cdot 5\text{H}_2\text{O}$ . Минерал назван илимауситом по месту его находки. Он образует коричневато-желтые пластинки и ассоциирует с уссингитом, чкаловитом и эпистолитом. Уд. вес 3.6. Одноосный, положительный.  $n_e = 1.695$ ,  $n_o = 1.689$ . Гексагональный.  $a_o = 10.80 \text{ \AA}$ ,  $c_o = 20.31 \text{ \AA}$ ,  $V_o = 2052 \text{ \AA}^3$ .  $Z = 3$ . Химический состав:  $\text{SiO}_2 - 31.28$ ,  $\text{TiO}_2 - 1.64$ ,  $\text{Nb}_2\text{O}_5 - 13.20$ ,  $\text{TR}_2\text{O}_3 - 10.60$ ,  $\text{Fe}_2\text{O}_3 - 3.18$ ,  $\text{BaO} - 23.62$ ,  $\text{Na}_2\text{O} - 7.00$ ,  $\text{K}_2\text{O} - 3.80$ , потери — 6.43, сумма — 100.75.

## INTRODUCTION

During a visit to the Ilimaussaq alkaline massif, South Greenland, in 1964, a new silicate of rare earth metals, niobium and barium was discovered by E. I. SEMENOV. The visit was made possible by a grant from the "Rask-Ørsted Fond" and was arranged in co-operation with the Geological Survey of Greenland. The mineral is named ilimaussite after the alkaline massif in which it was first found. The name ilimaussite has been approved by the I.M.A. Commission on New Minerals and Mineral Names.

Ilimaussite was discovered in a hydrothermal ussingite-analcime vein intersecting the poikilitic sodalite syenite (naujaite) of the northern slope of Nâkâlâq (sample no. 77358). It is always associated with chkalovite and epistolite.

Ilimaussite is a pegmatitic or high temperature hydrothermal mineral. Under supergene conditions it is easily altered and hydrated, and then becomes dull and non-transparent.

## Mineralogy

The mineral forms lamellar aggregates of  $15 \times 10 \times 3$  mm size in a pinkish-white mass of ussingite. The colour is brownish-yellow, the lustre resinous. The fracture is conchoidal, the hardness about 4 and the specific gravity 3.6.

The mineral is optically uniaxial positive;  $n_e = 1.695$ ;  $n_o = 1.689$ . Polysynthetic twins can occasionally be observed.

The X-ray powder diagram of the mineral is presented in table 1.

By means of single crystal photographs V. BUKIN found that the mineral is hexagonal. Layers hki0, hki1 and hki2 were recorded about the c-axis, 0kil- about a. The systematic absences were:

$$\begin{aligned} hh2\bar{h}l & - \text{no conditions} \\ \bar{h}h0l & - 1 = 2n \text{ present.} \end{aligned}$$

Hence the space group is one of the following:  $D_{6h}^3 = P6_3/mcm$ ;  $C_{6v}^3 = P6_3cm$ ; or  $D_{3h}^2 = P\bar{6}c2$ .

$a_o = 10.80 \pm 0.04 \text{ \AA}$ ,  $c_o = 20.31 \pm 0.07 \text{ \AA}$ ,  $c_o/a_o = 1.88$ ,  $V_o = 2052 \text{ \AA}^3$ .

Table 1. *X-ray powder diagram of ilimaussite.*(Cu radiation; Ni filter;  $r = 57.3$  mm).

No. of line	I	d obs. (Å)	d calc. (Å)	hkil
1.....	1	5.20	5.22	11 $\bar{2}$ 1
2.....	1	4.66	4.68	20 $\bar{2}$ 0
3.....	1	3.50	3.53	12 $\bar{3}$ 0
4.....	6	3.25	3.24	11 $\bar{2}$ 5
5.....	5	3.12	3.12	30 $\bar{3}$ 0
6.....	4	2.98	2.98	30 $\bar{3}$ 2
7.....	10	2.67	2.68	22 $\bar{4}$ 1
8.....	2	2.50	2.51	22 $\bar{4}$ 3
9.....	3	2.24	2.25	22 $\bar{4}$ 5
10.....	2(b)	2.022	2.031	41 $\bar{5}$ 1
			2.001	41 $\bar{5}$ 2
11.....	2(b)	1.816	1.824	41 $\bar{5}$ 5
			1.800	33 $\bar{6}$ 0
12.....	1(b)	1.694	1.696	33 $\bar{6}$ 4
			1.692	0.0.0.12
13.....	2	1.562	1.559	60 $\bar{6}$ 0
14.....	1	1.408	1.416	60 $\bar{6}$ 6

Note: b = broad line.

These cell dimensions are rather close to those of cerite:  $a_0 = 10.78$  Å and  $c_0 = 38.03$  Å ( $c_0/2 = 19$  Å). Cerite is also optically positive. Cerite does not, however, contain Ba or Nb and has much higher indices of refraction and specific gravity.

### Chemical composition

The results of the chemical analysis (carried out on 45 mg) are recorded in table 2. In addition to the elements listed in this table the spectrographic analysis (by I. P. TOYUSHEV) revealed Mn, Mg, Al and Ca. The rare earth metals of ilimaussite belong essentially to the cerium group and are present in the following proportions:

$\text{La}_{23,6}\text{Ce}_{55}\text{Pr}_{6,7}\text{Nd}_{14,7}$  (X-ray fluorescence analysis carried out in the laboratory of R. L. BARINSKY).

The chemical formula of ilimaussite, tentatively deduced from the results of the chemical analysis, is:



Table 2. *Chemical analysis of ilimaussite.*

	Weight %	Number of atoms
SiO <sub>2</sub> .....	31.28	0.521
TiO <sub>2</sub> .....	1.64	0.020
Nb <sub>2</sub> O <sub>5</sub> .....	13.20	0.099
TR <sub>2</sub> O <sub>3</sub> *.....	10.60	0.065
Fe <sub>2</sub> O <sub>3</sub> .....	3.18	0.040
BaO.....	23.62	0.154
Na <sub>2</sub> O**.....	7.00	0.226
K <sub>2</sub> O**.....	3.80	0.082
Loss of weight.....	6.43	0.714
Total.....	100.75	

Analyst: M. E. KAZAKOVA.

\* TR = rare earth metals.

\*\* Determined by flame photometry  
(E. A. FABRIKOVA).

### Editor's note

The material was collected during the investigations in the Ilímaussaq intrusion being carried out by Grønlands Geologiske Undersøgelse (the Geological Survey of Greenland) under the direction of Professor H. SØRENSEN. Publication authorized by the Director of the Geological Survey of Greenland.

The Russian manuscript has been translated into English by Mrs. A. DEMIN.

