

NOTISER

Sur une Palygorskite d'Åna-Sira (Norvège du Sud).

PAR

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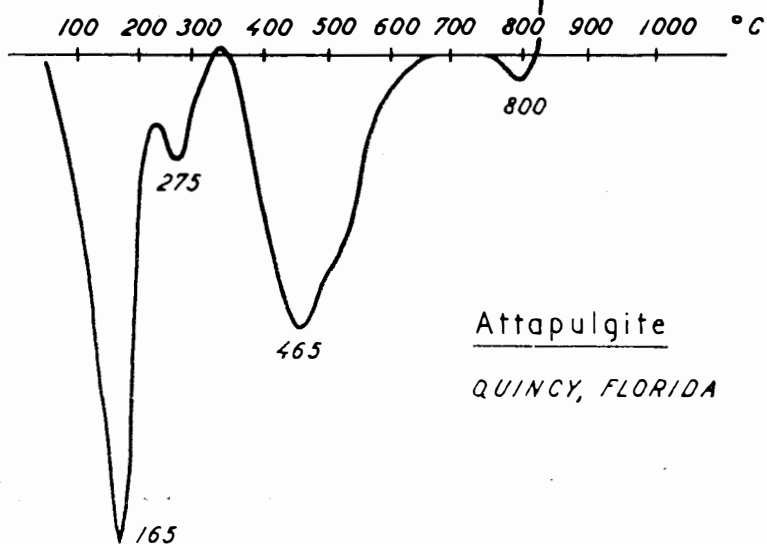
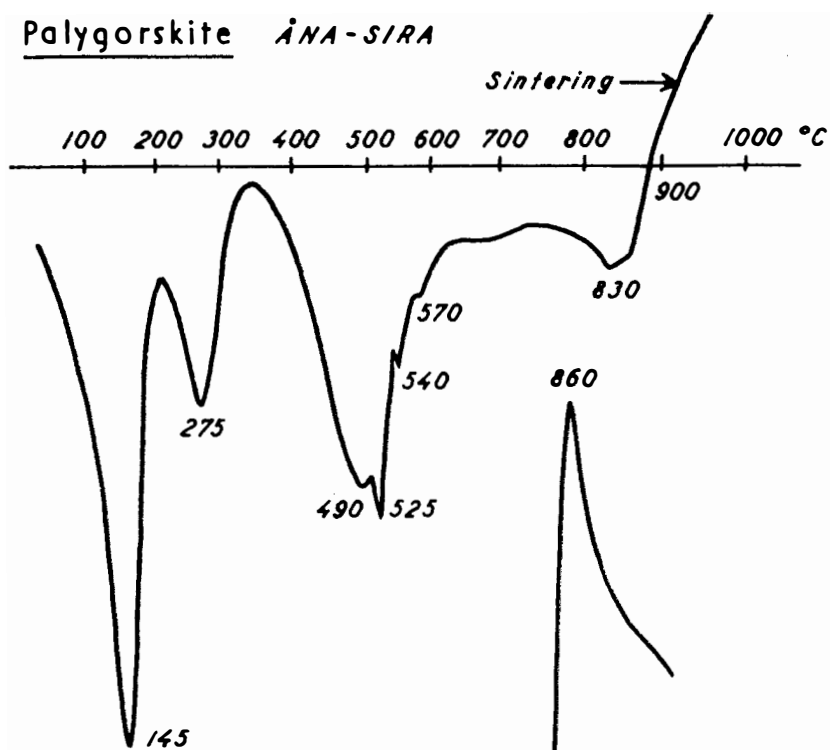
Abstract: Palygorskite occurs as sheets of mountain leather in some joints of the Åna-Sira anorthosite. The mineral has an hydrothermal mode of origin. Optical, chemical and DTA data are given.

Les joints qui traversent le massif anorthositique d'Åna-Sira sont en relation les uns, avec l'intrusion de dykes de mangéro-norite probablement précambriens, les autres, avec des dislocations régionales plus récentes du socle. Les premiers ont drainé les solutions résiduelles des mangéro-norites et sont caractérisés par un remplissage quartzofeldspathique ilménitifère, souvent pégmatisique. — Ils sont recoupés et légèrement rejetés par les seconds, à partir desquels l'anorthosite et les dykes anciens sont saussuritisés, et ce avant tout dans des zones kakiritisées (vallée d'Åna-Sira).

Le remplissage des diaclasses du second type est formé normalement par la paragenèse préhnite-épidote-quartz-carbonates. A la route menant d'Åna-Sira à Flekkefjord (plus précisément entre la bifurcation vers le Berefjord et la montée de Haaskog) j'ai observé à côté de joints pareils, d'autres fissures, qui rejetaient elles-aussi des veinules de pégmatisite ilménitifère, mais dont le remplissage particulier était formé de plaques de carton de montagne (palygorskite).

Il n'est pas évident sur le terrain pourquoi il a pris naissance ici de la préhnite, là de la palygorskite. Dans les deux cas, la roche encaissante est une anorthosite grossièrement grenue, à bandes hololeuocrates et leuconoritiques. Il ne peut toutefois y avoir de doute sur le fait que la palygorskite s'est formée à la suite d'une attaque de l'andésine et de l'hypersthène de l'anorthosite par des solutions aqueuses d'origine profonde.

Le carton de montagne forme des feuilles étendues, de un à plusieurs mm d'épaisseur. Sa surface est lisse ou présente parfois des stries de glissement. Ce carton est constitué par un matériau blanc opaque, léger, assez flexible, qui ne se déchire que difficilement. C'est un feutre

Palygorskite *ANA-SIRA*

de fibres enchevêtrées, couchées de préférence dans le plan du joint. Le minéral fibreux n'est accompagné par aucune impureté, comme le montre l'étude microscopique, ainsi qu'un diagramme Debye-Scherrer.

Ce dernier est caractéristique d'une palygorskite.

Le minéral d'Ana-Sira a les propriétés optiques suivantes:

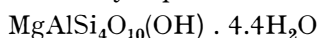
Ng	= 1,532 +/— 0,001
Np	= 1,524 +/— 0,001
Ng—Np	= 0,008 +/— 0,002
(—) 2V	= environ 60° (difficile à mesurer avec précision par suite de superpositions de fibres)
Ng	= parallèle à l'allongement.

Chauffé au Bunsen, la palygorskite se contracte un peu en prenant une teinte grisâtre, puis fond en un émail blanc bulleux.

Son analyse chimique a conduit aux résultats suivants:

	% poids	prop. cations
SiO ₂	56,30	938
TiO ₂	néant	—
Al ₂ O ₃	12,58	246
Fe ₂ O ₃	0,43	5 (Fe total comme Fe ₂ O ₃)
MnO	trace	—
MgO	9,66	240
CaO	0,19	3
H ₂ O +	12,19	1354
H ₂ O —	8,98	998
	100,33	analyste P. Antun.

La formule générale des palygorskites n'est pas encore définitivement établie. Mon analyse pourrait très bien se traduire par



Le diagramme obtenu par l'analyse thermique différentielle (Fig. 1) montre en effet qu'un groupe (OH) est lié au réseau. L'attapulgit de Quincy (Florida) présente un comportement tout à fait comparable, ce qui prouve une fois de plus que les deux termes, palygorskite et attapulgit, s'adressent à la même substance et que le second synonyme est superflu.

Remerciements. Je remercie sincèrement Mr. le prof. Tom. F. W. Barth, de l'Université d'Oslo, pour son aide et ses conseils, Mr. Sæbø, étudiant au Geologisk Museum Oslo, pour la prise d'un diagramme Debye-Scherrer et Mr. le statsgeolog R. Selmer-Olsen, qui a bien voulu effectuer dans son laboratoire les deux analyses thermiques différentielles.

Addendum by T. F. W. Barth.

Mountain leather has been observed at various localities in Norway but never further investigated. Antun's description of the Åna-Sira material prompted us to investigate with x-rays some additional specimens of mountain leather that were available to us. (The diagrams were taken by Mr. P. Sæbø). Two of the specimens gave x-ray powder patterns identical to that from Åna—Sira, and are thus additional examples of Norwegian palygorskites.

Both specimens were collected in 1937 when the railroad was under construction west of Kristiansand. In the upland («hei») between Greipstad and Øyslebø the railroad follows a breccia zone. On joints and sheared surfaces large sheets of white mountain leather composed of *palygorskite* and *calcite* were found at Fossestøl; more earthy varieties of the same substances filling cracks were collected at Krosen. These localities are at the railroad track 1 and 2 km respectively, east of the lake Høyevann.

Other minerals occurring in this system of breccia zones are *hematite* (compact, platy, red hematite) and, on the track just south of Høy Station, *pyrolusite* in composite groupings of needle-like lustrous crystals (polianite). Manganese oxides have been known to occur in fissures in the gneisses around Kristiansand and Mandal (S. Foslie, N. G. U. no. 126, 1925) but large, well-defined crystals (polianite) have not been described before.

A pulverizer for micas and micaceous minerals.

by

HENRICH NEUMANN

The process of grinding micas in an agate mortar to a powder sufficiently fine for x-ray work is both tedious and awkward. Even after a thorough grinding the grains still have a sufficient size to give spotted films because of single crystal reflections. This effect can be avoided by prolonged grinding, but then the lines will often be blurred and too poorly defined for accurate measurement, probably as a result of distortions of the crystal structure because of the weak bonding between individual layers of the mica lattice. Crushing in the several different types of commercial mills gives equally unsatisfactory results.

A mica pulverizer built in the Mineralogical Museum of Oslo University works so well that it would seem worth while publishing details of its construction.

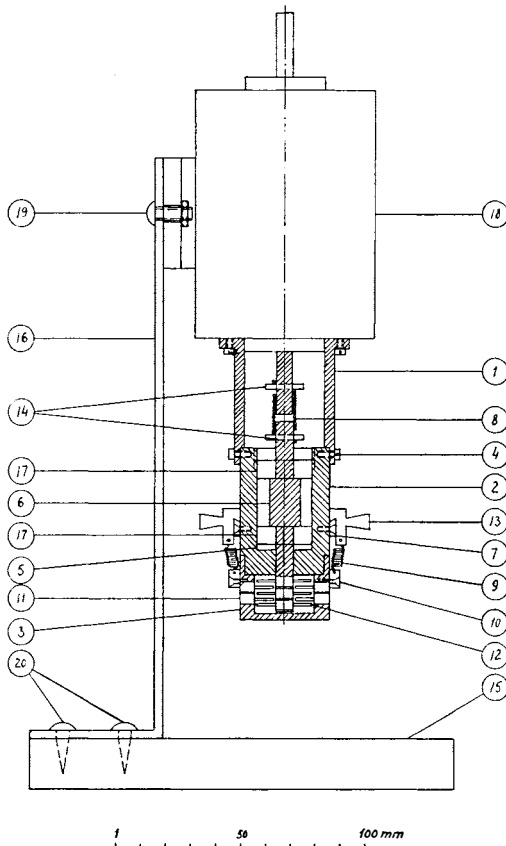


Fig. 1. Drawing of the mica pulverizer giving details of the construction. 1. Connecting ring. 2. Ballbearing holder. 3. Container. 4. Screwed disc. 5. Disc. 6. Axle. 7. Ring. 8. Spring. 9. Spring. 10. Spring-fastener. 11. Fixed knives. 12. Rotating knives. 13. Clamp. 14. Pin. 15. Base. 16. Stand. 17. Ballbearing. 18. Motor, 1/10 Hp., 9000 rpm. 19. Nut and bolt. 20. Wood-screws.

The principle is very simple: mica particles floating in the air are hit by sharp knife edges which split them without causing any lattice distortions. In practice this is effected by having two sets of knives in a small container, one set fixed and the other revolving at a speed of 9000 r.p.m. The edges of the two sets of knives face each other, and the knives are sufficiently far apart to give no scissor effect. The revolving knives are «feathered» so as to cause the mica grains to whirl about within the container when the pulverizer is running. The details of the construction are given in Fig. 1.

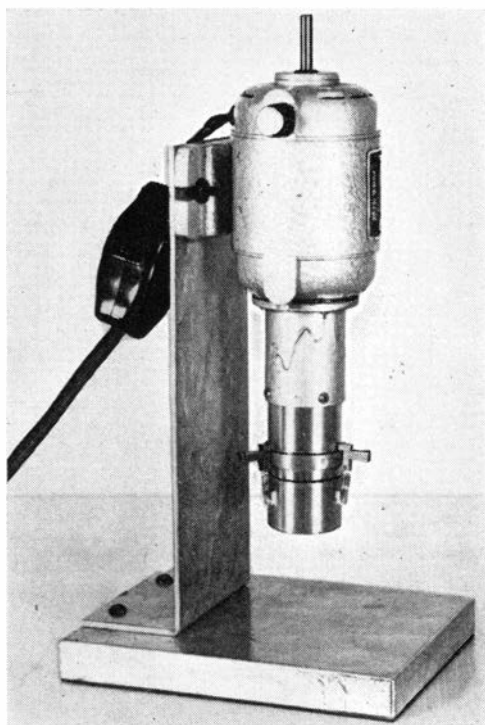


Fig. 2. The mica pulverizer.

The pulverizer may be built on a large or small scale according to requirements. The one drawn in Fig. 1 works well with samples from 0.01 gms to 2 gms, which are reduced to powders of x-ray size in 10 minutes. The powder is fine enough to keep the preferred orientation effect to a minimum. If a very high degree of accuracy in the intensity measurements is required, this effect can be eliminated in the conventional way by making the spindle of a not too finely reground, wetted and dried mixture of the mica powder with an amorphous, low-resorbing substance such as organic coal and a little gum tragacanth.

The principle of the instrument was outlined by the author to instrumentmaker Thorolf Nordby, who with his usual skill designed and built it.

Rapid crystal growth in a glass at room temperature.

BY

OLAV H. J. CHRISTIE

During the microscopical examination of the crystals mentioned in the following note, I have been able to follow growth of nepheline crystals at room temperature during 3 days. The growth of the crystals is shown in Figs. 1 and 2.



Fig. 1.

Fig. 2.

Fig. 1. a) initial stage, formed at 1015°C , b) crystal after one day at room temperature, c) end stage, obtained in 3 days.

Fig. 2. a) initial stage, formed at 1015°C , b) crystal after heating up to 700°C for 15 minutes.



Fig. 3. Nepheline from a corroded refractory stone.

It has not been possible to analyze the crystals as they are small and almost black, due to Fe_2O_3 absorbed from the surrounding glass. (Table 1 in the following note). In all probability we are dealing with nepheline. The fibrous form of nepheline is shown in Fig. 3, well known from samples of corroded glass furnace bricks.

It has not been possible to repeat the rapid growth at room temperature. I have made more than 50 attempts, but all the experiments have been unsuccessful. I have been able, however, to reproduce the initial stage in one case, and the end form in numerous cases. By heating the initial stage to ca. 700°C for 15 minutes, the fibrous form was developed. Normally the growth of the crystals in the studied glass is exceedingly slow at this temperature.

**Possible sub solidus
phase borders in the corundum field of
the system $\text{SiO}_2\text{—Al}_2\text{O}_3\text{—Na}_2\text{O}$**

BY

OLAV H. J. CHRISTIE

Crystals formed in a glass taken from the surface of an industrial glass tank furnace refractory brick of the melting zone have been studied. The results indicate the presence of two, possibly three, sub solidus phase borders in the corundum field of the $\text{SiO}_2\text{—Al}_2\text{O}_3\text{—Na}_2\text{O}$ diagram.

The top of the furnace was made of «Silicastones», containing ca. 98 % SiO_2 . The alkaline vapors from the glass batch condense on the ceiling and cause the formation of a $\text{SiO}_2\text{—Na}_2\text{O}$ glass. The viscosity of this glass decreases as the Na_2O content increases, and finally it will run down to the walls of the furnace. The wall bricks, having a composition according to Table 1a, will be corroded by the $\text{SiO}_2\text{—Na}_2\text{O}$ glass and add Al_2O_3 to it. The studied glass, thus formed, had a composition according to Table 1b.

	a	b
SiO_2	33 %	58,3 %
Al_2O_3	67 %	27,0 %
Fe_2O_3		0,3 %
CaO		1,6 %
Na_2O		12,9 %
	100	100,1

Table 1, chemical composition, a) of the unattacked refractory stone, b) of the studied glass.

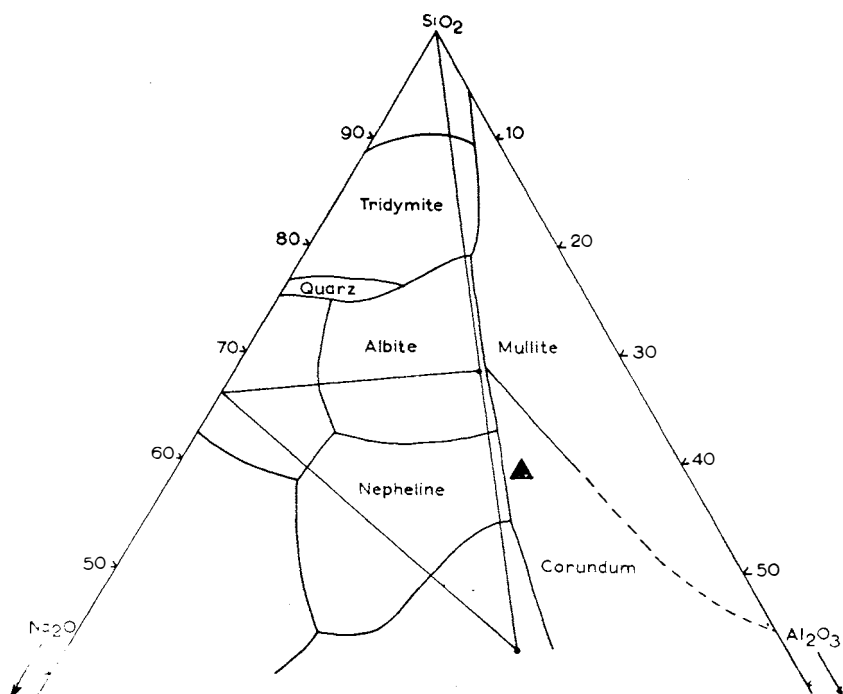


Fig. 1. Part of the phase diagram $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-Na}_2\text{O}$. The studied glass marked by a triangle.

The chemical composition of the glass, marked by a triangle, is projected into the pure $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-Na}_2\text{O}$ phase diagram in Fig. 1.

The studied glass from the glass covered refractory brick was remelted and ground until uniform index of refraction was obtained.

The glass was heated at different temperatures in a platinum furnace. The temperature readings were made with a Pt-90Pt10Rh thermocouple calibrated against a standard thermocouple from the U. S. National Bureau of Standards.

The habit of the crystals formed during the heat treatment was studied under the microscope. The crystals were analyzed by x-ray analysis.

Microscopical Examination.

One sample was kept at 1270°C for 15 minutes. The index of refraction of the very small crystals formed during this heat treatment was much higher than the index of refraction of the glass. Because of lack of material it was not possible to analyze these crystals by means of x-ray. They are supposed to be corundum.



Fig. 2. Normal habit of albite obtained by devitrification above 1020°C .

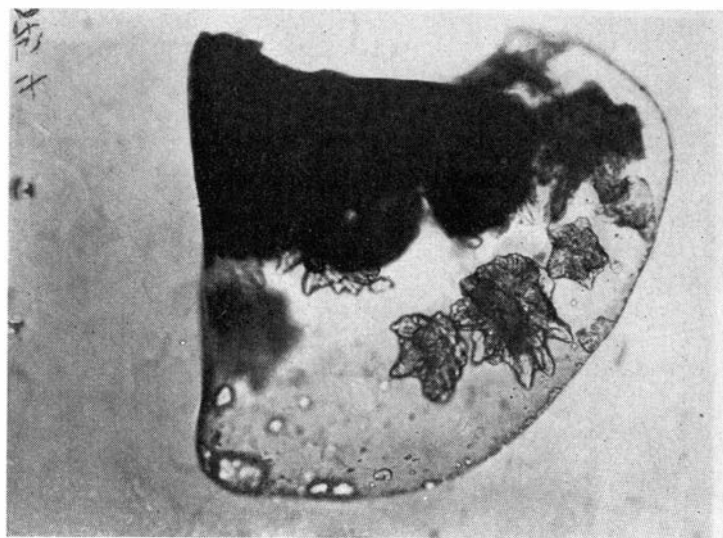


Fig. 3. Normal habit of nepheline obtained by devitrification below 1015°C .

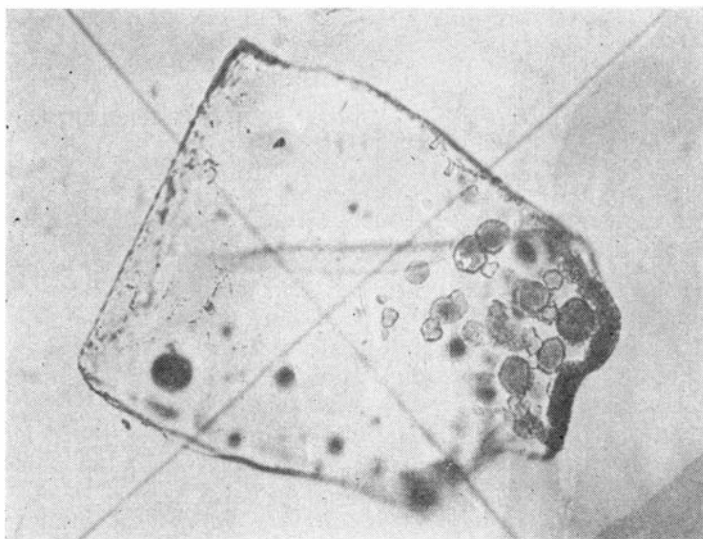


Fig. 4. Crystals formed at 860° C.

There was a change of the habit of the crystals at 1015° C—1020° C. Above 1020° C crystals as shown in Fig. 2 occurred, below 1015° C crystals as shown in Fig. 3 occurred. There was another distinct change of the habit of the crystals at ca. 800° C. These crystals are shown in Fig. 4. The growth of the crystals at this temperature, however, was too slow to give sufficient material for x-ray analysis even after 5 weeks.

X-ray Analysis.

The results from the powder patterns of the studied glass heated at different temperatures are shown in Table 2.

Degree Centigrade	Crystals formed according to powder pattern
1150	Albite
1047	Albite
1035	Albite
1020	Albite
1015	Nepheline
1005	Nepheline
995	Nepheline

Degree Centigrade	Crystals formed according to powder pattern
980	Nepheline
960	Nepheline
860	No Lines

Table 2, Devitrification products at different temperatures.

The lines of albite formed in the studied glass are rather indistinct, but the observed 10 strongest lines had the same spacing as the 10 strongest lines in the pattern of albite from Schmirn, Tyrol, our record number 2283. The fact that albite was found at 1150° is due to an admixture of the anorthite molecule.

The lines of nepheline formed in the studied glass are sharp and correspond to those of nepheline from Ariccia, Alabama Mountains, our record number 2260.

One sample was kept at 980° C to show if nepheline is metastable in the studied glass at this temperature. The powder pattern indicates that the nepheline was unchanged after 3 weeks. Another sample was kept at 1047° C, and the powder pattern indicates that the albite was unchanged after 1 week.

Conclusion.

This investigation indicates the presence of two, possibly three, sub solidus phase borders in the corundum field of the phase diagram $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-Na}_2\text{O}$. The temperature of the phase border corundum-albite in the studied glass is unknown, the phase border albite-nepheline is, in this glass, situated at 1020° C—1015° C. The microscopical examination showed another change of the crystal habit at 880° C — 860° C. It is not known, whether this change is merely a change of the habit of nepheline, or if it indicates the presence of a crystal which is not nepheline.

ACKNOWLEDGEMENTS

Miss E. Christensen, Geological Survey of Norway, made the chemical analysis of the glass, the x-ray films were taken by Mr. Sellevoll, Mr. Sæbø and Mr. Sverdrup, and dr. H. Neumann kindly assisted in the interpretations of the x-ray patterns of the crystals.

Professor T. F. W. Barth placed at my disposals the laboratory facilities of Mineralogisk Geologisk Museum. To these persons I wish to express my sincere thanks.

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Mineralogisk Geologisk Museum.

Appendix.

It is in this connection of interest to mention, that dr. J. H. Welch, in a lecture delivered at the 3rd. International Congress of The Activity of Solids in Madrid April 1956, reported the formation of corundum at sub solidus temperatures in a glass of the composition of anortite.