

MINERALOGICAL SOCIETY (LONDON)

A meeting of the Society was held on Thursday, January 22nd, 1953, at 5 P.M., in the apartments of the Geological Society of London, Burlington House, Piccadilly, W.1 (by kind permission).

The following papers were read:—

(1) CHERALITE, A NEW MINERAL OF THE MONAZITE GROUP.

By Mr. S. H. U. Bowie and Mr. J. E. T. Horne.

The name cheralite is proposed for a new mineral of the monazite group from a kaolinized pegmatite at Kuttakuzhi, 23 miles E.S.E. of Trivandrum, Travancore. The mineral, which is remarkable for its high contents of ThO_2 (31.50%), U_3O_8 (4.05%) and CaO (6.30%), has the formula $(\text{TR}, \text{Th}, \text{U}, \text{Ca}) (\text{P}, \text{Si}) \text{O}_4$, where TR is dominantly Ce, La, Pr and Nd.

It occurs as rough green crystals with the following physical properties: cleavage (010) distinct, (100) difficult, parting on (001) poor; hardness 5; specific gravity 5.28; $\alpha=1.779$, $\beta=1.780$ and $\gamma=1.816$; $2V_\gamma=18^\circ$; $X=b$, $Z \wedge c 7^\circ$.

X-ray powder data show that cheralite is isostructural with monazite, huttonite and synthetic $\text{CaTh}(\text{PO}_4)_2$.

(2) CRICHTONITE, A DISTINCT SPECIES.

By Dr. F. A. Bannister, Dr. G. F. Claringbull and Dr. M. H. Hey.

Crichtonite described by de Bournon in 1813 and long supposed to be a variety of ilmenite has been shown to be a distinct species. It is rhombohedral with a very large unit cell having approximate dimensions $a=37$, $c=21 \text{ \AA}$, and has been shown to contain both ferric and ferrous iron with considerably more titania than ilmenite.

(3) X-RAY STUDIES OF BYTOWNITES AND ANORTHITES.

By Dr. P. Gay.

A number of bytownites and anorthites from different localities have been examined by x-ray methods. For almost pure anorthites two types of diffraction patterns may be distinguished: the presence of certain diffuse reflections may be used to differentiate between high and low temperature anorthites.

For patterns from less basic specimens it is probable that the presence of these reflections is influenced by the composition of the feldspar.

It is hoped that when the method is fully developed it will be of use to the petrographer in determining the previous geological history of basic plagioclases.

(4) THE ROLE OF WATER IN AMPHIBOLES.

By Dr. E. J. W. Whittaker.

Attention is drawn to the fact that the role of water in amphiboles in excess of that corresponding to two hydroxyl ions per formula unit can be inferred from the chemical analysis in certain cases. Two analyses of fibrous iron-bearing amphiboles are examined and shown to support the view that the excess water is present in the form of discrete molecules or extra hydroxyl ions, rather than as SiOH groups.

(5) PRELIMINARY X-RAY INVESTIGATIONS OF HILLEBRANDITE.

By Dr. L. Heller.

A single crystal of natural hillebrandite was investigated by x-ray methods. $a=16.60$, $b=7.26$, $c=11.85 \text{ \AA}$, $\alpha=\beta=\gamma=90^\circ$. The b axis shows strong pseudohalving. The space

group of the true structure is compatible with $P2_1/a$ ($Z=12$), and that of the pseudostructure with $Ccmm$, $Ccm2$ and $Cc2m$ ($Z=6$). Difficulties arise in reconciling the cell content with the space-group of the pseudostructure.

The following papers were taken as read:—

(1) THE UNIT CELL AND SPACE GROUP OF CHLOR-SPODIOSITE (Ca_2ClPO_4).

By Dr. A. L. Mackay (Communicated by Dr. J. W. Jeffery).

Synthetic Ca_2ClPO_4 , the chlorine analogue of the mineral spodiosite, was examined optically and by x -rays. Crystals are orthorhombic, with space group probably $Pbcm$, and dimensions $a=6.17$, $b=6.89$ and $c=10.74$ Å. Discrepancies in the literature are cleared up.

(2) THE PUMPELLYITE MINERAL SERIES.

By Dr. D. S. Coombs.

Pumpellyite from Calumet, Mich., has the following cell constants: $a=8.81 \pm 0.02$ Å, $b=5.94 \pm 0.01$ Å, $c=19.14 \pm 0.02$ Å, $\beta=97.6 \pm 0.2^\circ$; space group $A2/m$. The a and b cell edges are closely similar to those of epidote and lawsonite, and oriented intergrowths of pumpellyite and lawsonite sharing these cell edges are described. The "basal cleavage" reported by various writers is ascribed to two different planes, there being a more easy cleavage parallel to (100) and a poorer cleavage parallel to (001). A thermal analysis by Dr. R. J. McLaughlin and powder photograph data are presented. Published chemical analyses are reviewed and are supplemented by semi-micro determinations of iron. These are used to draw up curves relating optical properties to iron content.

(3) A HYDROUS MICA FROM YORKSHIRE FIRECLAY.

By Mr. K. Carr, Dr. R. W. Grimshaw, and Professor A. L. Roberts.

A micaceous type mineral which was isolated from a Yorkshire fireclay has been shown by chemical, microscopic, x -ray and thermal tests to be an illite or hydrous mica. Flakes of the mineral, some of which are 2–3 mm. square, can be obtained in a very pure state. Along cracks and fissures there appears to be an alteration mineral which is most probably a kaolin type clay mineral. Structurally the hydrous mica can be ascribed to the recent notation of Norrish and Brown where oxonium ions are postulated as replacing alkali ions in the mica sheets.

The mineral appears to be diagenic in origin and a similar type is present, often in amounts up to 30%, in fireclays from many localities.

(Titles and abstracts kindly submitted by G. F. Claringbull, General Secretary.)

A meeting of the Society was held on Thursday, March 26th, 1953, at 5 P.M., in the apartments of the Geological Society of London, Burlington House, Piccadilly W.1 (by kind permission).

The following papers were read:—

(1) THE HYDRATED CALCIUM SILICATES RIVERSIDEITE, TOBERMORITE AND PLOMBIERITE.
By Mr. J. D. C. McConnell (communicated by Prof. C. E. Tilley).

The minerals riversideite, tobermorite and plombierite are shown to correspond to the three hydration states recognized in the calcium silicate hydrate (1) group by Taylor (1953). The characteristic (002) spacings are 9.6 Å, 11.3 Å and 14.6 Å respectively and the corresponding approximate molar water contents are 0.5, 1.0 and 2.5 mols. Tobermorite from Skye has been examined, and its variable refractive indices related to a variable water content. It consists mainly of the 11.3 Å hydrate.

The 11.3 Å hydrate, in a pure state, occurs in contact rocks at Ballycraigy, Larne, Northern Ireland. This mineral is orthorhombic $\alpha=1.570$, $\beta=1.571$ and $\gamma=1.575$; $a=\gamma$, $b=\beta$ and $c=\alpha$; $a=11.3$ Å, $b=7.33$ Å and $c=22.6$ Å; space group *C222*.

Both the 9.6 Å and 14.6 Å hydrates have been prepared from tobermorite from Ballycraigy. The 9.6 Å hydrate (artificial riversideite) has refractive indices $\alpha=1.600$, $\beta=1.601$ and $\gamma=1.605$. A natural material corresponding to the 14.6 Å hydrate is found at Ballycraigy and this has been identified with the mineral plumbierite. Hydration of the minerals larnite and melilite is described.

(2) NATURAL AND SYNTHETIC JALPAITE (Ag_3CuS_2).

By Dr. G. F. Claringbull.

When investigating the silver-copper sulphides, G. M. Schwartz (1935) failed to synthesize or detect any mixed sulphide other than stromeyerite (AgCuS). Jalpaite (Breithaupt, 1858; Kalb and Bendig, 1924) is here confirmed by *x*-ray diffraction as a distinct phase in nature and has been synthesized from the melt. It has also been detected with acanthite in both natural and synthetic silver-copper sulphides containing as little as 5% Cu_2S .

The new evidence suggests that the low-temperature acanthite phase is stable only when relatively copper-free.

(3) A GRANOPHYRE FROM COIRE UAIGNEICH, ISLE OF SKYE, CONTAINING QUARTZ PARAMORPHS AFTER TRIDYMITE.

By Prof. L. R. Wager, Mr. D. S. Weedon and Dr. E. A. Vincent.

The granophyre where examined to the S.E. of Blaven has a ring-dyke form, the margins being chilled against the country rock to a flinty material.

The chilled rocks contain 5% of phenocrysts, consisting of plagioclase (An_{50}), orthopyroxene (58% MgSiO_3) and tridymite, now inverted to quartz, set in a cryptocrystalline groundmass. The central part of the granophyre is shown to be derived from the same magma as the margin, both by chemical analysis and by the presence in each of similar phenocrysts in similar amount. In the central more coarsely crystalline part, the groundmass shows two different textures side by side; one characterized by a second generation of criss-crossing tridymite crystals and the other by areas of quartz and feldspar with a normal granophyric texture.

It is suggested that the granophyre was intruded at relatively high temperature, the marginal material being rapidly chilled to give a cryptocrystalline groundmass. Away from the margins the material cooled more gradually, allowing crystallization of a second generation of tridymite before the temperature fell sufficiently to permit normal granophyric intergrowth of quartz and feldspar. The two textures thus produced bear striking resemblances to those seen in certain thermally metamorphosed arkoses.

(4) QUANTITATIVE MINERALOGICAL ANALYSIS OF CLAY AND SILT FRACTIONS BY DIFFERENTIAL THERMAL ANALYSIS.

By Mr. R. J. McLaughlin.

The details of an apparatus for differential thermal analysis and its standardization are given. Clay and silt fractions from soil horizons of weathered arkoses are investigated using chemical, *x*-ray and differential thermal methods of analysis. The correlations between the three methods are discussed. It is shown that in the group investigated there is a direct relation between area of thermal peak and percentage of mineral present, and this may be used to obtain rapid quantitative evaluations. Effects of grain size, dilution of specimen and impurities are discussed in relation to their influences on the quantitative evaluation.

The following papers were taken as read:—

(1) HIGH-ORDER PLATES FOR THE MICROSCOPIC EXAMINATION OF MINERAL GRAINS.
By Dr. F. Smithson.

When the usual wedges or plates commonly employed for determining optical sign fail in cases of highly birefringent minerals, gypsum or quartz plates representing 10, 20 or 30 orders on Newton's scale are frequently effective. Preparation and use in determining sign of interference figure and sign of length are described.

(2) THE EFFECT OF GRINDING ON MICAS: I. MUSCOVITE.
By Dr. R. C. Mackenzie and Dr. Angela A. Milne.

Chemical, x-ray and thermal methods have been used to examine the changes induced by dry-grinding muscovite for periods up to 24 hours. The cation-exchange capacity increases with time of grinding up to about 150 m.e./100 g., and this figure can be approximately related to the amount of K^+ rendered exchangeable; the crystal structure appears to suffer almost complete breakdown after 8 hours, but a recrystallization occurs thereafter, the product differing from muscovite in several respects; an increase in hydration is shown by thermal measurements. After heating to $1000^{\circ}C.$ the unground material is relatively unchanged but the ground material recrystallizes to leucite. These changes are correlated and discussed.

(3) THE RELATION BETWEEN AREA AND VOLUME IN MICROMETRIC ANALYSIS.
By Dr. F. Chayes.

Discusses the theoretical basis of the micrometric analysis of rocks and in particular the superposition error (R. B. Elliott: *Min. Mag.*, 29, 833).

(Titles and abstracts kindly submitted by G. F. Claringbull, General Secretary.)