NOTE ON *SPODUMENE* FROM NAMAQUALAND.

By G. C. SCULLY, M.A., and A. R. E. WALKER, A.R.C.Sc., B.Sc.

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The chief object of this note is to record the occurrence in Namaqualand of a lithia-bearing mineral whose optical and other physical properties enable us with considerable confidence to refer to the species *Spodumene*.

Spodumene is a lithium aluminium silicate whose chemical formula is given as $\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2$.

This note is intended to serve as an introduction to a later paper in which we hope to supplement the description here given and also to deal with several of the other minerals which we have found in association with it.

We collected the material described below in a prospecting pit near Jackals Water, about twenty-seven miles distant, in a northerly direction, from Steinkopf.

It occurs in extremely coarse pegmatite (intrusive in gneiss) chiefly in the form of large prismatic crystals, many of which are from 3' to 4' in length and from 6" to 1' in width; also as veins. At, and near the surface, it is much altered to a white powder.

The principal minerals of the pegmatite are milky quartz, microcline and muscovite mica, but, in addition to these—and closely associated with the *Spodumene*—there are greyish and somewhat smoky quartz (frequently graphitically intergrown with felspar), lithia mica, petalite (?), tantalite, and a pale brown garnet. Bismuth ochre is disseminated throughout.

Three differently coloured varieties of *Spodumene* occur, viz., greyish white, pale amethyst, and pale green; beyond these differences in colour there are no noticeable variations either in physical or chemical properties. All three possess a degree of hardness equal to that of quartz.

The results of a large number of determinations of the specific gravity vary from 3.16 to 3.18, these variations being attributed to slight differences

in degrees of freshness in the pieces determined; the freshest and least cracked specimen gave the value 3.18.

There are three directions along which the mineral may readily be cleaved; two of these are extremely good cleavages and have proved to be parallel to the faces of the unit monoclinic prism; the third, which is not quite so perfect, is orthopinacoidal. The prism angles—as nearly as one can determine them from cleavage fragments with a simple contact goniometer—are 93° and 87° . Experiments carried out on a small cleavage fragment by means of a reflecting goniometer, gave a mean value of the principal prism angle, $1\bar{1}0 \wedge 110$, of $93^\circ 9'$; the orthopinacoidal cleavage face symmetrically cuts across the solid angle between these two prism faces.

Thick sections of the mineral are only slightly pleochroic. Orthopinacoidal sections extinguish parallel to the traces of the prismatic cleavage, whilst other sections extinguish obliquely with regard to the same direction.

From a clinopinacoidal section $\nabla \wedge \dot{C}$ (given by the traces of the prismatic cleavage) was determined to be $26^\circ 40'$; this very closely approximates to the value of $Bx_a \wedge \dot{C}$ given by Dana.*

COMPARISON OF OBSERVATIONS WITH DANA'S DATA.

Namaqualand Material.	Dana's Data for <i>Spodumene</i> .
$G : 3.16-3.18$	$3.13-3.20$
$H : 7$	$6.5-7$
Prismatic cleavage angle : $93^\circ 9'$	$93^\circ 0'$
Pleochroism : slight	Distinct in sections of dark green varieties
Extinction angle : $\nabla \wedge \dot{C} = 26^\circ 40'$	$Bx_a \wedge \dot{C} = +26^\circ$ or $\nabla \wedge C = +26^\circ$
Refractive indices : Na $\alpha = 1.651$ Na $\beta = 1.670$ Na $\gamma = 1.679$	Na $\alpha = 1.651$ Na $\beta = 1.669$ Na $\gamma = 1.677$
Chemical tests : Proved presence of Li and of SiO_2	Chemical formula : $\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2$

The mean refractive index as determined on a Herbert Smith refractometer was 1.66; the scale was not sufficiently large nor was the shadow sufficiently well defined to determine the refractive indices for the principal

* "A System of Mineralogy," Dana. 6th Ed.

light vibration directions. Experiments carried out on a highly polished orthopinacoidal surface by means of the Abbé refractometer gave values for β and γ of 1.670 and 1.679 respectively. From a clinopinacoidal surface the value $\alpha = 1.651$ was obtained.

For the above determinations sodium light was used; the temperature was 22° C.

All three varieties give a marked lithium flame reaction. Under the blowpipe they become white and opaque, swell and eventually fuse; in the microcosmic salt bead they give the reaction for SiO_2 .

One of us (G. C. S.) has undertaken to make quantitative chemical analyses of the different varieties, the results of which will be published in a later paper.

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