

*Alumian and natroalunite.*

THE type material, the examination of which forms the subject of this paper, was collected by A. Breithaupt's son from three mines in the Sierra Almagrera, Southern Spain ( $37^{\circ} 16' N.$ ,  $1^{\circ} 47' W.$ ), and described by Breithaupt in 1858.<sup>1</sup> It is a decomposition product formed on pyrite and galena-bearing veins in an argillaceous schist and was accompanied by limonite. Breithaupt remarked that the mineral was composed of microscopic crystals, probably rhombs, that its density was 2.77-2.89, and that it consisted of alumina and sulphuric acid only, and gave to it the formula  $Al_2(SO_4)_2O$ .

Breithaupt's mineral has been re-examined optically and chemically and the cell dimensions have been determined from a powder photograph. The specimen (B.M. 92951) is a compact white piece with a few faint brown streaks (limonite) here and there. When scraped with a knife it yields a powder which if examined microscopically is seen to consist of minute rhombs (average size *c.*  $10\mu$ ). It was a matter of some difficulty to obtain  $\epsilon$  but it is close to 1.590 and the mineral is optically

TABLE I. Chemical analysis and empirical unit-cell contents (rhombohedral cell) of alumian, together with other relevant data and the theoretical composition of natroalunite  $NaAl_3(SO_4)_2(OH)_6$ .

	Theoretical.		Cell contents.		
Na <sub>2</sub> O	7.6	7.8	Na·	1.0	
K <sub>2</sub> O	0.1		K·	—	$D_4^{20} 2.780 \pm 0.005$
BaO	0.1		Ba··	—	
SrO	0.9		Sr··	—	R.I. (Na light)
PbO	0.6		Pb··	—	$\epsilon 1.590$
Al <sub>2</sub> O <sub>3</sub>	36.8	38.4	Al···	2.9	$\omega 1.574$
Fe <sub>2</sub> O <sub>3</sub>	0.4		Fe···	—	
SO <sub>3</sub>	38.3	40.2	SO <sub>4</sub> ··	1.9	Cell dimensions (hexagonal axes)
H <sub>2</sub> O <sup>+</sup>	14.9	13.6	OH·	5.9	$a 6.983 \pm 0.002 \text{ \AA.}$
H <sub>2</sub> O	nil		H <sub>2</sub> O	0.3	$c 16.699 \pm 0.002 \text{ \AA.}$
	<u>99.7</u>	<u>100.0</u>			

positive. All relevant data are brought together in table I. The composition of the mineral shows that alumian is in fact the sodium end-member of the alunite series, a mineral so far unrecorded. The other data in the table confirm this statement. The water in the rhombohedral unit cell in excess of that demanded by the ideal composition for natroalunite is probably without significance, representing simply

water persistently retained owing to the finely divided state of the mineral.

*Dept. of Mineralogy,  
British Museum.*

A. A. MOSS

<sup>1</sup> Berg. hütten. Ztg., vol. 17, p. 53.

### *The nature of chlorospinel.*

CHLOROSPINEL was described in 1840 by G. Rose,<sup>1</sup> as a new grass-green variety of spinel from the Slatoust district, south Urals, characterized by the presence of considerable  $\text{Fe}_2\text{O}_3$  and absence of  $\text{FeO}$ ; two density determinations gave 3.591 and 3.594, in fair agreement with the densities calculated for the two analyses by H. Rose (table I, anal. 2 and 3) on the assumption (which is likely to be only approximately true) of a linear variation in density from  $\text{MgAl}_2\text{O}_4$  3.55 to  $\text{MgFe}_2\text{O}_4$  4.51; anal. 2, 3.63; anal. 3, 3.68. It has not been reported elsewhere and though it was synthesized by J. Morozewicz<sup>2</sup> no density or optical data were obtained on the synthetic material.

There are hardly any other original references to chlorospinel in the literature. N. Koksharov<sup>3</sup> states that it occurs 'in der Umgegend der Kussinsker Hütte' and both N. Koksharov<sup>4</sup> and P. Eremeyev<sup>5</sup> refer to its occurrence in chlorite-schist at the newly-discovered Praskoviev-Evgenevsky mine, Shishimsk Mts., but the identification is not based on an analysis, and must be regarded as uncertain.

Recently N. G. Sumin,<sup>6</sup> confirming and extending work by L. L. Shilin,<sup>7</sup> has shown that two distinct green spinels occur in the Shishimsk area; one, occurring in ore-veins with chlorite and magnetite, has refractive index  $n$  1.724 and was classified by Shilin as a common magnesium spinel; Shilin's analysis of the perovskite-magnetite-spinel ore shows it is not a zinciferous spinel, and its low refractive index suggests that it contains little  $\text{FeO}$ , so despite its green colour it cannot be classified with the ceylonites found elsewhere in the Slatoust region<sup>3,4,5</sup>. The second green spinel, from the chlorite-schist, has  $n$  1.782, and agrees well in appearance and associations with Rose's chlorospinel; but an analysis by V. A. Moleva (table I, anal. 4), made on material in the Museum of the Academy of Sciences, U.S.S.R., collected in the first half of the nineteenth century, shows it to be a gahnospinel; Sumin therefore concludes that H. Rose's analyses were in error, and that his chlorospinel was in fact a gahnospinel.