XLI.—*A Crystalline Tricupric Sulphate.*

By W. A. SHENSTONE.

A CONSIDERABLE number of basic copper sulphates have from time to time been examined by various chemists. Up to the present, all of them, except bronchantite, native tetracupric sulphate, have been described as amorphous powders of green or orange-yellow colour, which have generally been obtained from the normal sulphate by treatment with cupric oxide or hydrate, or by the action of alkali on

376 SHENSTONE: A CRYSTALLINE TRICUPRIC SULPHATE.

it in quantity insufficient for the production of cupric hydrate. The existence of several of them is doubtful, however, and not long since Pickering (*Chem. News*, **47**) stated that only two definite compounds have in reality been prepared in this way. As the salt I am about to describe is a crystalline basic copper sulphate obtained artificially, it is therefore not without interest.

In the course of the experiments on the solubility of salts in water at high temperatures made not long back in conjunction with Dr. W. A. Tilden (*Phil. Trans.*, 1884, Pt. I), I observed in the tubes in which copper sulphate and water had been heated deposits of bright green crystals, always, however, in very small quantity. I was able to prepare rather larger quantities by heating the crystals of copper sulphate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, at about 200° for a few hours, in tubes containing a few grams of the salt, and draining off the mother-liquor while still hot. By washing the solid part of the contents of the tubes with water a green product consisting of crystalline fragments was obtained. On an average, 0.25 gram per tube was secured.

Analysis gave the following results:—

1.	0.2943	gram	gave	0.1913	gram	BaSO_4 .
2.	0.2745	„		0.1811	„	„
3.	0.2384	„		0.1309	„	copper.
4.	0.2459	„		0.1330	„	„

These numbers correspond with the following percentages:—

	SO_4 .	Cu.
1.....	26.78	—
2.....	27.18	—
3.....	—	54.90*
4.....	—	54.08
Mean.....	26.98	—

These results lead to the formula of a tricupric sulphate,

which requires 53.75 per cent. Cu and 27.07 per cent. of SO_4 .

The salt is permanent when heated in the air to 190° , is insoluble in water, soluble in dilute sulphuric acid, and consequently if the substance is left for a few weeks in contact with its mother-liquor, it gradually disappears.

Attempts to prepare other crystalline basic salts by this method have not yet led to any results.

* Known to be high, as the Cu weighed was *slightly* oxidised in drying it at too high a temperature.

After a great many attempts to obtain large crystals for measurement I have been unable to do so.

Mr. H. A. Miers, of the British Museum, however, very kindly undertook to examine those which I obtained, and his results are given in the supplement to this note. I may say that he tells me it was not possible to get better measurements on account of the small size of the crystals. And that he does not "find any very obvious relation between the forms of the crystals of this tricupric sulphate and those of bronchantite."