is shown in fig. 3. There is no evidence of any crystal structure. The oxide layer was field-etched with hydrogen in stages, imaging with argon between each stage of etching. It was possible to arrest the removal of oxide at a stage where both oxide and metal were visible, as in fig. 4, which should be compared with fig. 5 where the oxide has been removed completely.

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Diglycine sulphate – an interesting new dielectric crystal species

Experiments carried out on the growth of triglycine sulphate (TGS) [1] and its variation with the pH [2] led to the discovery of a new crystal, which has some interesting anomalies in its physical properties.

Solutions prepared with sulphuric acid and glycine in proportions of 1:1, 1:2, and 1:3, all yielded monocrystals of TGS. If, however, sufficient sulphuric acid was added to bring the solutions to a pH less than 1, a new species was obtained. If the pH was over 1.9, the crystals were TGS; if it was between 1 and 1.9, non-TGS crystals appeared.

The new crystal species had well-formed faces, good transparency and a more rapid growth than the TGS. Studies carried out with the use of X-ray techniques showed that it was a crystal belonging to the Space Group $P_{2/c}$, with parameters:

$a = 9.62$ Å, $b = 8.67$ Å, $c = 6.75$ Å and $\beta = 106° 30'$.

A quantitative chemical analysis was made and the results showed that the substance was $SO_4H_2(NH_2CH_2COOH)_2$. H_2O, i.e. diglycine sulphate with a molecule of water. Its density was 1.63 g/cm^3 which indicates that in each cell unit 2 molecules of said composition were present.

The crystal had a transition at 72°C. This result was obtained from differential thermal analysis and above the transition temperature it was found to change to a polycrystalline state, in which an opaline aspect was observed.

Measurements of the dielectric constant as a function of temperature were taken simultaneously on three plates of 1 to 2 mm thickness and 1 cm^2 area, which were cut in directions approximately perpendicular to crystallographic axes *a*, *b* and *c*. Colloidal silver was used as electrodes. The measuring device was a 1615-A, General Radio bridge; measuring operation – 0.5 V/cm. The results obtained are shown in fig. 1; these confirm the crystalline transition at 72°C. It was at first thought that the increase in the dielectric constant at this temperature was due to a loss of water, such as has been confirmed in other crystals, e.g. sodium rubidium tartrate [3], but thermal-balance analysis showed that most of the water was lost at temperatures above 150°C (fig. 2).

Because of this anomaly in the temperature dependence of the dielectric constant, it was thought that the crystals might be antiferroelectric; hence, sheets were cut in different directions and their possible hysteresis cycle studied. Nothing conclusive was found. If an antiferroelectric axis exists, it cannot be the twofold axis.

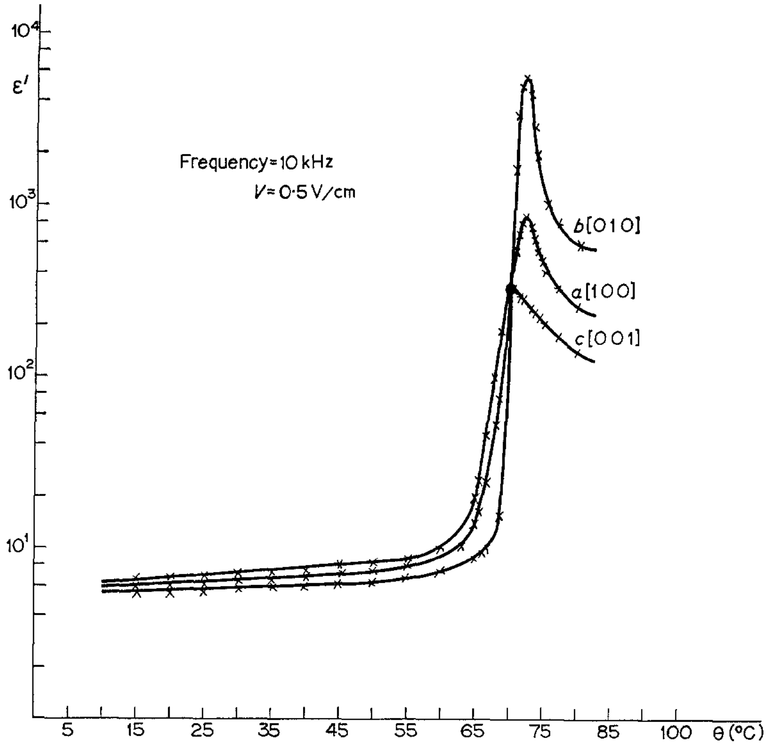

Figure 1 Measurements of the dielectric constant(ε) versus temperature for three plates of diglycine sulphate cut perpendicular to the crystallographic axis *a*, *b* and *c* respectively.

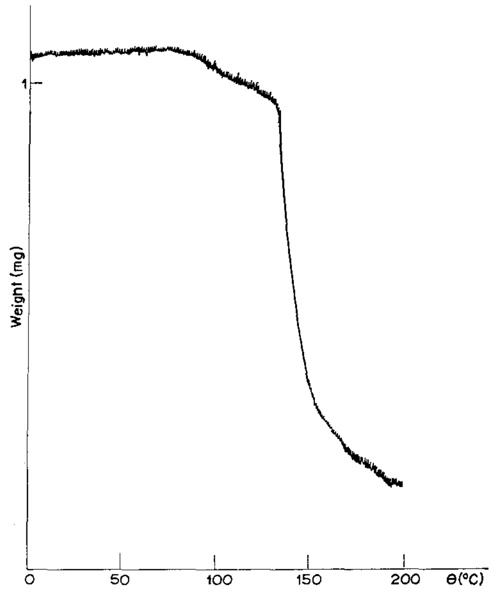

Figure 2 Thermal balance measurements on a sample of diglycine sulphate.

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