Oscillations of Hollow Quartz Cylinders

WITH reference to the letter by Ny Tsi-Zé and Tsien Ling-Chao published in NATURE of August 11, 1934 (p. 214), it is interesting to note that annular quartz rings cut in a plane perpendicular to the optic axis were investigated by Giebe and Scheibe[1] in 1928, by the luminous resonator method. Such a ring, oscillating in its fundamental longitudinal mode, was also made by Dye, and was afterwards developed to form the primary standard of frequency at the National Physical Laboratory. More recently, similar rings oscillating in an overtone longitudinal mode have been investigated in an attempt to incorporate the most successful features of the different types of quartz oscillators which have been developed to form frequency standards in this and other countries.

In the type of ring oscillator now being investigated, the exciting electrodes consist of two brass cylinders around the inner and outer edges of the ring. An overtone circumferential mode of vibration having six nodes is employed. The ring may be mounted rigidly at the nodal points so that movements within the electrodes are completely eliminated. By adjustment of the width of the ring, that is, the difference between its internal and external radii, it has been found possible to reduce the temperature coefficient of frequency over a limited range to a few parts in a hundred million, which is a hundred times smaller than the usual coefficient for longitudinal vibrations of quartz. The temperature at which the low coefficient is obtained can be adjusted to any desired value.

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[1] Giebe and Scheibe, *Elektrische Nachrichten-Technik*, **5**, 81; 1928.

Plasticity of Crystals of Sylvine

ATTENTION has frequently been directed to the plasticity of crystals of rocksalt when immersed in water. Some see the cause of the plasticity in the removal of surface layers with their cracks and defects. Others suppose that water penetrates the crystal lattice and acts as a lubricant. It is interesting to observe the behaviour of crystals in a state of recent formation from solution or melt. For this purpose I have made some experiments with sylvine(KCl).

I find that crystals of sylvine which, like those of rocksalt, are brittle under normal conditions, become plastic after treatment with water. At high temperatures (700°–780°) sylvine possesses noticeable plasticity: it is deformed by small loads. The mobility of deformation may be adopted for calculation of the viscosity of the crystals, although variable in its value.

Crystals taken out of the solution in which they are grown and wiped with filter paper are very plastic at first. If exposed to the air without any special drying they become fragile in a few hours.

Sylvine crystallises in the form of parallelepipeds, sheets and fibres; sometimes also in skeleton forms.

Sheets of 0·1 mm. thickness are so plastic that they can be bent so as to form tubes. Fibres 0·2–0·3 mm. in thickness and up to 10 cm. in length bend under their own weight.

Consequently sylvine crystals on forming either from melt or from solution possess considerable plasticity, and must yield easily to mechanical stresses. This may explain the frequent occurrence of bent and twisted crystals.

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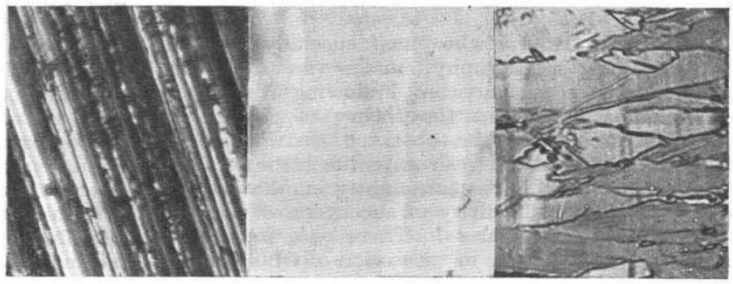
Electrolytic Method for obtaining Bright Copper Surfaces

IT is possible to polish a copper surface electrolytically by making it the anode in an aqueous solution of orthophosphoric acid at high current density (minimum 25 amp./dm.^{2}). This mode of polishing is particularly suitable for metallographic examinations, and has been used for the examination of copper deposits in presence of various colloids.



A *B* *C*

FIG. 1. ×400.

The specimen is first roughly treated with emery paper, then cleaned cathodically in an alkaline solution and finally inserted for about two or three minutes in an aqueous solution of orthophosphoric acid, 50 per cent by volume of the commercial product, specific gravity 1·71. The current density was maintained at 60 amp./dm.^{2} of the total surface. The solution had to be cooled to avoid considerable increase of temperature. Any metallic plate will serve as cathode. Gas being vigorously evolved, a rotating anode helps to get a uniform effect. The microscopic analysis of the surface shows the lines produced by emery polishing (Fig. 1, *A*) to vanish completely (Fig. 1, *B*) and an attack by means of the usual agents gives the image reproduced on Fig. 1, *C*. Should this attack be insufficient, the anodic polishing can be repeated for about thirty seconds to obtain a fresh surface ready for another attack. This method is much more rapid and more economical than polishing by alumina.

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Twinning in Alpha Iron

IN a letter to NATURE of June 1, A. B. Greninger reports having observed twinning in alpha iron. Slow cooling through the A_3 temperature produced twins of the banded type, whilst deformation and recrystallisation resulted in twins which were seldom

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