Spiral Crystals of Magnesium Sulphate

IN a communication in *Nature* of March 2, p. 493, there is a photograph of zinc sulphide crystals of spiral shape.

Fig. 1

I have observed crystals of similar form growing from saturated magnesium sulphate solution. The solution was made by saturating hot 5 N sulphuric acid solution with magnesium oxide, and filtering the reaction mixture into an evaporating basin. After the resulting solution had stood in the open for two days, it was observed that the bulk of the water had evaporated off, leaving a solid layer of magnesium sulphate, the surface of which was covered with a hairy network of crystals, some as much as half an inch long, and most of which terminated in a flat spiral (Fig. 1). Their thickness was in most cases less than that of a human hair. When examined under $\times 50$ magnification, the curved crystals showed no sign of segmentation. The photograph was taken by B. G. Airlie and G. Davies. The distance between the top and bottom crystal in this enlargement was 6 mm.

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Role of Photons in a Self-Quenching Geiger-Müller Counter

A NUMBER of investigators have studied the spread of discharge along the anode of self-quenching Geiger-Müller counters, but the relative importance of photo-ionization of the gas and photo-emission from the cathode in such tubes has not yet been fully determined. The mechanism of the discharge spread along the anode is thus still under discussion¹.

We have carried out a set of direct experiments and have come to the following conclusions in an unambiguous manner, regarding the photo-emission from the cathode of a self-quenching counter: (1) photo-emission from the cathode is caused by ultra-violet as well as by visible radiations, but that due to the former is more pronounced; (2) photons are present over a much wider region around the anode wire than is usually believed.

In one set of experiments two identical coaxial counters, each 2.5 cm. in diameter, were placed in a

glass tube facing each other 3 cm. apart. The filling was an argon-alcohol mixture at a total pressure of 10 cm. of mercury with 10 per cent alcohol. A gelatine filter 2-B, 2.5 cm. in diameter, or a thin glass disk of the same size could be introduced between the two counters when desired. The voltage of the Geiger-Müller tubes was supplied by two independent stabilized power units.

The pulses produced under normal working conditions of the two counters were fed into the coincidence unit (*AREE* type 1036-B) of resolving time one microsecond and the coincidence pulses were recorded in the scaler (*AREE* type 200-A) both with gelatine filter 2-B lying between the counters and without it.

It has been observed that the number of coincidences is always greater when there is no filter, and that it decreases in proportion to the path of photons intercepted by it as it is introduced in between the two counters. As the filter cuts out all ultra-violet radiations, we conclude that the coincidences obtained when the filter blocks the path of the photons between the two counters completely must be due to visible radiations produced in the counter avalanches. That these coincidences were not accidental or due to electric pick-ups was confirmed by separating the counters by about 60 cm., when not more than one coincidence was obtained per 3 min., even though the counting-rate in one counter was increased to about 1,500 counts per min. using a collimated gamma-ray source while there were about 200 counts per min. in the second.

It was further observed that the number of coincidences showed pronounced increase if the photons produced in the avalanches of one counter were reflected on the inner surface of the cathode of the second instead of allowing them to pass right through the body of the second counter and to strike against the glass envelope where the anode wire was sealed.

The number of coincidences with filter 2-B or the thin glass disk lying between the counters was found to be the same in any given interval of time, which indicated that no appreciable number of photons of wave-lengths in the range 3300–4000 Å., the absorption limits of glass and gelatine filter respectively, was passing from one counter to the other under the conditions of these experiments.

Separate experiments were carried out to investigate the photo effect of visible radiations obtained from a light source on the cathode of a counter. We have observed that the photo-sensitivity of the counter varies linearly with the intensity of visible radiations at wave-lengths greater than 4000 Å. The ultra-violet radiations below 4000 Å. were cut down in these experiments with filter 2-B and the intensity of visible photons was varied by using neutral density filters supplied by Messrs. Kodak, Ltd., London.

A typical set of results is as follows: plateau lengths 200 V. and 260 V. Plateau slopes 0.05 and 0.025 per cent per volt.

Coincidences obtained per 5 min.: (1) without filter 2-B, 68; (2) with filter 2-B, 24; (3) with reflected photons, 155. These readings were reproducible for days within the limits of statistical variations.

Details of the experiments will be published elsewhere.

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