

has been highly desirable. Such evidence is provided by Fig. 1, *B*, where (1) the (420) is diffused even while the (331) line is still a sharp doublet, despite the addendum (2) that the (331) occurs at the small reflection angle where the resolution on geometrical grounds is much less. Now this means, on the small crystal theory, that the dimensions of the grains in the [331] directions are large ($c. 10^{-4}$ cm.), whilst in the [420] directions they are very small ($c. 10^{-7}$ cm.). These two aspects are mutually contradictory. Therefore the small crystal hypothesis is here untenable.

A similar differential resolution of the doublets has been found well marked in rolled α -brass.

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The True Weight of Benzopurpurin 4B, and the Electrical Conductivity of its Aqueous Solutions

A PAPER has recently been published by Robinson and Mills¹ in which certain properties of Benzopurpurin 4B are precisely defined. The concentration of the solutions has been determined by these authors by drying in an oven at 105° C.

The purpose of this communication is to point out that many direct cotton dyestuffs are so extremely hygroscopic that one or two per cent of moisture remains at this temperature. In the course of exact work in this laboratory on the absorption of direct dyestuffs by cellulose, Benzopurpurin 4B (amongst other dyes) has been prepared in a pure state, and the apparent dry weight determined under various conditions, with results of which the following are typical:

	I.	II.
Relative wt. air dry	113.6	114.4
„ „ dried in 110° oven for 24 hours	101.7	101.5
„ „ dried at 110° C. <i>in vacuo</i> over P ₂ O ₅	100.0	100.0
„ „ in 110° oven again	101.5	101.7

The moisture content of this substance, and of the other direct dyestuffs so far examined, appears to vary continuously with the relative humidity of the surrounding atmosphere. (R.H. in 110° C. oven is of the order 1 per cent.) It appears, therefore, that the electrical conductivities and other constants given by Robinson and Mills will be in error by about 1.9 per cent, the approximate moisture regain at 105° C.

The general principles of the drying of hygroscopic substances at high temperatures are illustrated in a paper, "The Dry Weight of Cotton", by Davidson and Shorter.²

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¹ *Proc. Roy. Soc., A*, 131, p. 576; 1931.
² *Shirley Inst. Mem.*, 8, p. 197; 1929.

Formation of Periodic Precipitates in the Absence of a Foreign Gel

RECENTLY many workers¹ have reported on the formation of periodic precipitates in the absence of another gel. We have obtained periodic precipitates in the slow coagulation of sols of ferric hydroxide, chromic hydroxide, and stannic hydroxide by small quantities of univalent electrolytes like potassium chloride and sodium bromate. Freshly precipitated ferric hydroxide was peptised by the minimum quantity of acetic acid, which was then boiled off; the sol was further purified

by hot dialysis. The concentration of the purified sol was 39.2 gm. per litre. The chromic hydroxide sol was obtained by adding ammonium carbonate solution to hot chromic chloride and then purified by continuous hot dialysis. The concentration of the purified sol was 32.5 gm. per litre.

We obtained the stannic hydroxide sol by peptising stannic hydroxide (freshly precipitated from stannic chloride and freed from chloride) with ammonia and afterwards driving it off by boiling. The sol contained 12.4 gm. of SnO₂ in a litre.

These observations can be explained from the theory of periodic precipitation given out by Dhar and Chatterji.² The theory states that periodic precipitation is caused by the adsorption of the sol by the precipitate of the same substance; hence, according to this theory, periodic bands are obtained only when the sol and the precipitate co-exist. In the present case, when the sol is coagulated slowly by the addition of small quantities of univalent electrolytes, the sol and some of the precipitate coagulated from it exist together for a sufficient length of time. Hence adsorption of the sol by its precipitate occurs, giving rise to periodic bands. On the other hand, when the sol is rapidly coagulated by the addition of large quantities of electrolyte, the sol soon passes from the sol to the precipitate condition. The sol and the precipitate thus do not co-exist for a sufficient length of time. Hence no ring formation takes place.

It will be interesting to note in this connexion that we could not obtain periodic precipitates by the coagulation of the same sols with polyvalent electrolytes.

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¹ NATURE, 128, 1042, Dec. 19, 1931; 129, 205, Feb. 6, 1932.
² N. R. Dhar and A. C. Chatterji, *J. Phys. Chem.*, 28, 41; 1924. *Kolloid. Zeit.*, 37, 3, 89; 1925. *Z. anorg. Chem.*, 159, 129, 186; 1926.

Winter in the Ionosphere

IN a recent Geophysical Discussion at the Royal Astronomical Society,¹ I suggested that there is evidence of a close connexion between the mechanisms of ionisation of the Kennelly-Heaviside and Appleton regions of the ionosphere. The evidence depends on coincidences in the annual variations of received long and short wave signals.

Hollingworth² reported a very abrupt change in received signal intensities measured at Slough, Manchester, Glasgow, and Aberdeen, and in polarisation measured at Slough, on wave-lengths of more than 10,000 metres, "during the last week of October and the first week of November 1924". The new mean values attained at this onset of the radio winter were maintained "until the beginning of May 1925", although the May change was much less spectacularly abrupt than the November change. The phenomenon, which I have called the Hollingworth anomaly, was repeated at the end of October 1925, and it was shown that the primary characteristic of the radio winter is the persistence of abnormal polarisation throughout the hours of daylight.

Wilkins, observing here daily from July 1931, was receiving radio telephone signals from Rome and Sardinia on the ultra-short wave-lengths of 10.06 metres and 9.8 metres respectively with fair regularity until Nov. 1, 1931. From that date no signals in the ten-metre region were heard, despite daily observation.

Hollingworth was undoubtedly dealing with waves returned from the lower parts of the Kennelly-Heaviside region—he had in fact measured the equivalent height of reflexion as about 75 km.—and Wilkins was almost equally certainly concerned with an electron