was found to contain 0.6 per cent of D. Tests made after 24 and 48 hours showed a constant 1.3 per cent of heavy hydrogen in the hydrogen of the ethylene. Assuming that at this value equilibrium was attained, we obtain for the distribution coefficient of heavy hydrogen between water and ethylene (that is, per cent heavy hydrogen in the hydrogen of the water phase compared with per cent heavy hydrogen in the hydrogen of the ethylene phase) a value of $1:0.58 = 1.7$.

The interchange of hydrogen between benzene and water was obtained in a similar way: 0.16 gm. of benzene was heated with 0.135 gm. of water containing 3 per cent of heavy water in a sealed tube of 50 c.c. capacity, in presence of 1.45 gm. of the nickel catalyst. After 2 hours, the heavy hydrogen content of the hydrogen in the benzene was 1.5 per cent and the same value was found after 6 and 12 hours. These data give for the partition coefficient of heavy hydrogen between water and benzene (at 200°) a value of 1.05.

The above processes seem to provide a convenient method for the replacement of H by D in organic compounds containing double bonds or aromatic rings.

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¹ J. Horiuti and M. Polanyi, NATURE, 132, 819, 931; 1933. *Manch. Lit. Phil. Soc.*, 78, 47; 1934.

² *Chem. and Ind.*, 53, 489; 1934. E. K. Rideal, *Chem. and Ind.*, 53, 610; 1934.

³ *Trans. Far. Soc.*, 30, 663; 1934.

Interferometer Patterns of the Hydrogen Isotopes

It has been suggested to me that the accompanying photographs (Fig. 1) showing the Fabry-Perot patterns of the red Balmer line for ordinary hydrogen and for a mixture containing an appreciable amount of the heavier isotope, might be of interest to readers of NATURE. They were taken by Dr. E. Gwynne Jones with the arrangement used by him and by Dr. S. Tolansky for their fine-structure researches, in order to estimate the percentage of heavy hydrogen in this mixture, which was being used by Dr. R. W. B. Pearse and me for other purposes. Originally the gas was supplied to Prof. F. Paneth by Dr. P. Harteck.

The tube used as a source of light was excited by a high-frequency discharge, with external electrodes, and exposures were made at or above room temperature. With an étalon gap of 3 mm. the fringes for

Fig. 1. Fabry-Perot fringes of H_α . Ordinary hydrogen (top); mixture containing 10-15 per cent of the heavy isotope (bottom).

the heavier isotope (which show the doublet structure of H_α^2 so clearly) were separated from those of the lighter by some $2\frac{1}{2}$ orders as indicated in Fig. 1.

I have recently shown that this method affords a ready means of estimating quantitatively the relative amounts of the two isotopes in a mixture. In Fig. 2, fringes are shown for three different tubes prepared by Prof. Paneth. The way in which the concentration

Fig. 2. Patterns for mixtures containing 10 per cent (top), 33 per cent (middle), and 75-80 per cent (bottom) of heavy hydrogen. The position of the heavy isotope doublet is marked.

of diplogen is increased from 10 to more than 75 per cent by continued electrolysis of water is well shown in the photographs.

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Anomaly in the Specific Heat of Ferrous Chloride at the Curie Point

THE susceptibility of ferro-magnetic metals above the Curie point depends on temperature according to the law $\chi (T - \theta) = C$. A similar relation holds for the anhydrous salts $FeCl_2$, $CoCl_2$, $CrCl_3$ and $NiCl_2$, θ varying from 20° to 67° K. It appears natural to assume that at temperatures below θ , these bodies become ferro-magnetic.

Measurements made at Leyden¹ show that at temperatures below θ the magnetic susceptibility of all these bodies depends on the field-strength; it can, however, by no means be said that they become ferromagnetic in the ordinary sense.

FIG. 1.

In order to clear up the nature of this anomaly we have measured the specific heat as a function of temperature, since this relation should show whether the anomaly is connected with the appearance of a molecular field or not. This is all the more interesting, inasmuch as Landau's² theory would lead us to expect peculiar ferromagnetic phenomena in some of these salts. The first body to be investigated was $FeCl_2$, the specific heat of which (C_p for 1 gm.-mol.) is plotted as a function of temperature on Fig. 1. The experiments show a large jump in the specific heat at 23.5° K., the shape of the anomaly being similar to that found in ferromagnetic metals. Hence we conclude that the anomaly in the specific heat, and also that in the susceptibility, of $FeCl_2$ is