

and by ourselves, and in experiments on the action of palladium, does not reach the order of magnitude of  $10^{-8}$  c.c.

It is scarcely necessary to emphasise the fact that the sensitiveness of our method, though limited to  $10^{-8}$  c.c., is sufficient to decide with certainty the other questions dealt with in our first communication, such as the helium content of meteorites, the helium development of radioactive deposits, and so on.

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Berlin, Mar. 2.

#### Measurement of Radiation Intensity by Photographic Methods.

IN a letter to NATURE of Jan. 16, 1926, p. 83, Dr. F. C. Toy criticised the use of calibration curves in photographic spectro-photometry; but the grounds for his objections were rather the difficulties in the way of adequate calibration than any quarrel with the main assumption involved, namely, the essential uniformity of the plates of a single batch. Recently, however, Miss C. H. Payne and Mr. F. S. Hogg have concluded that each of their plates requires separate calibration, a conclusion fully borne out by the sample curves given by them in Harvard Circular 301.

The work at this Observatory in connexion with Prof. Sampson's method of stellar spectro-photometry has been free from trouble due to the variations of individual plates: indeed, the curves for different batches of plates, on the similarity of which no reliance is placed, are far more consistent than those for individual plates at Harvard. Fig. 1 shows

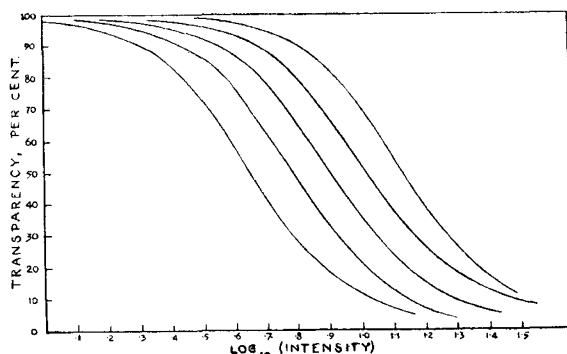


FIG. 1.

the calibration curves for wave-length 6100 Å.U. of the five batches of plates of the same make used during the last three years. It will be noticed that the differences are confined to the transparencies smaller than 20 per cent., that is to say, to the region which is strongly affected by the duration and temperature of development. A much closer agreement would have resulted had the first and fourth batches received somewhat longer development. The differences found at Harvard are of a totally different character, affecting the whole curve. In this respect they strongly resemble those found by Messrs. L. A. Jones and E. Huse (Eastman Kodak Research Laboratory Communication No. 193), which were eventually traced to different batches of chemicals used in making up the developer.

This suggests that these variations of individual plates may be due to the sensitiveness of the emulsion to slight changes in the composition of the developer, in which case a change of developing agent might lead to consistent results.

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#### Ionisation Potential of Hydrogen Fluoride.

THE ionisation potential of hydrogen fluoride has not yet been worked out experimentally. Several attempts have been made to calculate it on thermochemical data, on the assumption that hydrogen fluoride is ionised into  $H^+$  and  $F^-$ . Such a calculated value, notably by Glocker (*Phil. Mag.*, 1924), appears to be  $15.67 \pm 0.7$  volts.

Such a process of ionisation with molecular dissociation at the lowest ionisation voltage has been doubted by Mackay (*Phys. Rev.*, 1924), who has stated that even in the cases of those hydrogen halides where thermochemical data have yielded results in accord with experiment, the coincidence may be fortuitous. It has also been shown by Duffendack (*Phys. Rev.*, 1925) that "even with an intense arc in HCl vapour up to 70 volts, no trace of hydrogen spectrum could be obtained."

I have calculated the ionisation potential of fluorine,  $F = 16.7$  volts (*Phys. Rev.*, awaiting publication). This calculated value seems to be justified by Prof. H. Dingle's recent observation of the ionisation potential of the neutral fluorine atom (approx. 17.0 volts) (*Proc. Roy. Soc., A*, 113, 323). Ionisation values of hydrogen chloride, bromide, and iodide are all found to be greater than the corresponding values of chlorine, bromine, and iodine; and hence one is led to believe that the ionisation potential of hydrogen fluoride may also be greater than 16.7 volts or that the thermochemically determined value is too low.

On the other hand, there is reason to believe that the ionisation products of hydrogen fluoride may be  $(HF)^+ + e$ . This is the same kind of ionisation as that of the neon atom into  $(Ne)^+ + e$ . Hydrogen fluoride and neon are known to have a similar structure and an exactly similar disposition of outer electrons. In the case of hydrogen fluoride, the nuclear distance between the atoms is known to be greater than the atomic radius of neon (Bragg and Bell, *NATURE*, Mar. 24, 1921, p. 107), and thus the ionisation potential of hydrogen fluoride may be expected to be nearly equal, though somewhat smaller than that of neon (21.5 volts).

On the present view of ionisation in hydrogen fluoride, it can be shown on the Bohr-Sommerfeld theory that

$$I_{HF} \cdot (r_{HF}^2) = I_H \cdot (r_H^2) \cdot n.k$$

where  $I_H$  and  $r_H$  stand for ionisation potential and radius of the normal (1, 1) orbit of hydrogen respectively, and  $I_{HF}$  is the ionisation potential of hydrogen fluoride and  $r_{HF}^2$  is the mean square radius of the outer  $n, k$  electron orbit of HF.

By this method of calculation  $I_{HF} = 18.04$  volts,  $I_{HCl} = 13.8$  volts.

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#### The Nuptial Pad of Kammerer's Water-bred Alytes.

I WAS delighted to read in NATURE of April 30, p. 635, a letter from Dr. Przibram vindicating the validity of Kammerer's results.

May I direct attention to one feature in the much-discussed Alytes which renders the assumption of fraud absurd?

This specimen when I saw it in 1923 showed a nuptial pad only on one side. Who, if he had wished to 'fake' an Alytes so as to deceive the public, would treat one palm only with Indian ink?

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