

evidence for a broad resonance level giving a group of yield approximately 0.4 that of the main group was found, but there was no sign of any second group of range greater than 4 cm produced by the full range alpha-particles.

In spite of this the magnetic deflection was tested. The minimum range entering the counter was reduced to 5 cm and a comparison made with protons from coal gas. The curves show a reasonable agreement and the conclusion is that the short range products from nitrogen are principally protons.

Thus we have found no evidence of emission of deuterons in polonium alpha-particle disintegrations of boron and nitrogen.

We wish to thank Professor A. F. Kovarik for his advice and help in discussion, Professor H. C. Urey for a gift of heavy water, and Dr. C. T. Lane for advice in running the magnet.

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August 11, 1934.

* F. Perrin, C. R. **194**, 2211 (1932).

² Rutherford, Chadwick and Ellis, *Radiations from Radioactive Substances*, p. 290.

³ G. Stetter, *Zeits. f. Physik* **34**, 158 (1925).

⁴ Rutherford and Kempton, *Proc. Roy. Soc. A* **143**, 724 (1934).

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The Absorption Spectra of Formaldehyde and Hydrogen Cyanide in the Far Ultraviolet

We have recently found a new absorption spectrum of formaldehyde in the region 1750–1150A. The absorption is very strong and most of the bands appear at a pressure of 0.1 mm in the spectrograph, the light path being about 1.5 meters. They consist mainly of two electronic series going to the same limit. About seven members of each series were found. The lower members are accompanied by many vibrational transitions. The higher ones can be extrapolated in the form of a Rydberg series to an ionization potential of 10.9 volts. This agrees very well with the value 11.3 ± 0.5 volts found by Jewitt¹ employing the usual methods of electron impact.

In this connection it is interesting to note the agreement between the limits of the electronic series in acetylene and ethylene² with the values for their ionization potentials as given by Tate and Smith,³ and Kallman and Dorsch.⁴ The values we obtain are 11.4 and 10.4 volts, respectively, which are in good agreement with the values 11.6 ± 0.1 and $10.0 \pm ?$ volts determined by the methods of electron impact.

The bands of formaldehyde show very strong predissociation in the region 1740A. If it is assumed that this is due to interaction with the initial state the process being $\text{H}_2\text{CO} \rightarrow \text{H}_2\text{C} + \text{O}$ we find the strength of the C=O bond to be 164 cal./mol. in fairly good agreement with thermochemical data.

The general similarity between the ultraviolet absorption spectra of acetylene, ethylene and formaldehyde is quite striking. They all have spectra in the region 3000A to

1800A which come out at fairly high pressures. They also possess spectra of an apparently different type having much higher transition probabilities below 1800A. These latter consist of electronic series going to the ionization potentials of the molecules.

The investigations on HCN revealed bands extending from 1450A to well below 1000A. The bands in the region 1400A are single headed and are shaded towards the red. They are given very well by the following formula

$$\nu = 68,645 + 901(v + \frac{1}{2}) - 22(v + \frac{1}{2})^2. \quad (1)$$

Slight predissociation sets in at the $v=4$ band. The same vibration pattern does not repeat itself in the bands at lower wave-length, the vibration frequencies being considerably larger. The latter bands are too diffuse to be analyzed thoroughly but it is probable that they form an electronic series going to the ionization potential of HCN at 14.8 volts. The bands given by (1) come out at somewhat higher pressures than those at lower wave-lengths. This indicates that here again we have the two types of absorption found in the previously mentioned molecules.

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¹ Private communication from Professor R. G. J. Fraser.

² W. C. Price, *Phys. Rev.* **45**, 843 (1934).

³ Tate and Smith, *Phys. Rev.* **39**, 270 (1932).

⁴ Kallman and Dorsch, *Abhandlung aus der Kaiser Wilhelm Institut*, Vol. 12 (1929).

Surface Magnetization in Ferromagnetic Crystals. II

We reported in a recent Letter to the Editor¹ certain peculiarities of the surface magnetization of a single crystal of silicon iron, the polished face of which was not much inclined to a plane of form $\{100\}$. In order to explain the maze-like pattern of narrow lines formed by temporary condensation of a magnetic colloid close to this surface, and the enhancement of alternate lines of the maze by normal magnetic fields of the two possible signs, we had to suppose that the surface consisted of small blocks (possibly cubes) of square section, magnetized parallel to the surface along axes of form $\langle 100 \rangle$ and $\langle 110 \rangle$, the former being preferred. These two directions are, respectively, directions for easiest magnetization and for next-to-easiest magnetization in single crystals of silicon iron.

It occurred to us that the patterns obtainable on a $\{100\}$ plane in nickel should be different from those found in iron; for even if the surface still broke up into square blocks, all directions of easiest magnetization—here of form $\langle 111 \rangle$ —would now lie at 35° to the polished surface. After some optical difficulties occasioned by the smaller scale of the patterns developed on a suitable polished disk cut from a single nickel crystal,² we are able to show that conditions are, indeed, different from those in silicon iron. Fig. 1 gives two pictures of the same region with normal magnetic fields of opposite sign. The colloid particles collect in dots of various density which we find show best under slightly oblique illumination, so that each seems to cast a shadow.