the various processes to be established, and to various other oxides. Precision measurements of gas adsorbed and desorbed are being introduced, and the significance of substrate is being investigated.

Although too early to embark on any rigid theoretical consideration of the significance of the results, it is clear that providing the general picture of semi-conduction as given by Mott is accepted, then these measurements must yield direct information of the nature of the catalytic processes occurring, as related to adsorbed gases on semiconducting oxide catalysts.

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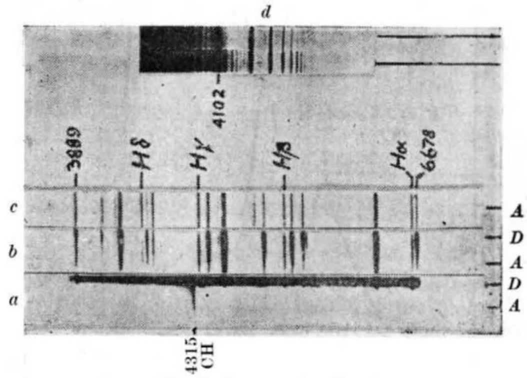
Afterglow of the Balmer Spectrum of Hydrogen

IN a paper published during the War the late Lord Rayleigh reported some new experiments about the hydrogen spectrum, indicating a duration of Balmer lines of more than 10^{-5} sec., which is roughly one thousand times greater than the values calculated from quantum mechanics and experimental results with positive rays. The method consists in producing a strong luminosity induced by a powerful condenser discharge in an electrodeless glass tube. Each discharge produces a jet of luminosity, squirting out of the electric field by thermal expansion into a side tube where the decay of the Balmer lines is observed and measured[1]

Lord Rayleigh did not attempt any explanation of this result and apparent discrepancy. Jablonski has remarked that the mean duration of lines is not always identical with the mean life in initial states of corresponding transitions. After having considered the various mechanisms which can produce atoms in the upper level, he thinks that the persistence of the luminosity results from the radiative recombination of atomic hydrogen ions[2].

Born, Fürth and Ladenburg[3] prefer to believe that Lord Rayleigh's experiments can be understood on the basis of the known relatively long life of free hydrogen atoms and their re-excitation "by radiation and, especially, by the diffusing electrons and positive ions". The rise of the relative intensity of the blue-green H_β lines (4861 A.) observed by Lord Rayleigh with decreasing luminosity is ascribed to the sensitivity of the eye, which has a maximum in the green part of the spectrum.

In view of making a choice between the two above interpretations, new experiments were performed on the hydrogen afterglow. The experimental arrangement is the same as already described[4]. It permits a careful separation of the light of the discharge from that of the afterglow one. The excitation energy used in our experiments is weak and is not sufficient to show the persistence of the luminosity in pure hydrogen. But when this element is diluted in neon or helium a strong afterglow can be observed. In the case of helium, traces of hydrogen almost always present are sufficient to give the phenomenon. Other impurities like CO and CH destroy the afterglow: the spectrum *a* shows that only the band 4315 of CH persists in this case. The impurities are eliminated either by producing a powerful discharge between two magnesium electrodes or by immersing the discharge vessel in liquid nitrogen.



D, discharge; *A*, afterglow

Spectrum *b* shows the modification of the emission of helium containing traces of hydrogen when the discharge is cut off. The Balmer lines suffer less variations than He I lines, and the relative intensity of H I increases with time. This later variation can be seen easily by comparing the spectrum at the beginning of the afterglow with spectrum *c* emitted 10^{-3} sec. after breaking the discharge. The duration of the lines increases with the quantum number n and the intensity of distribution of the Balmer spectrum varies with time (compare spectra *b* and *c*).

By measuring the decay of luminosity with the time, we have evaluated the duration of the H_γ line at 10^{-4} sec. after breaking the discharge.

It is possible to show that the emission in question follows the capture of electrons by ions by studying the afterglow at the limit of the Balmer series. The discharge and the afterglow were photographed in the ultra-violet region with an Arnulf – Lyot spectrograph. The results are illustrated by the spectrum *d*. In the afterglow, the hydrogen spectrum is extended further than in the discharge; at the same time, the higher level lines of He I grow in intensity.

The above results, although they do not allow a direct comparison with Lord Rayleigh's experiments, show that hydrogen atoms can radiate the whole Balmer series in afterglow. The persistence of the lines at the limit of the series seems to be conclusively in favour of an emission by radiative recombination between ions and electrons.

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Decay Scheme of ^{181}Hf

IN continuation of our previous analysis of the decay scheme of ^{181}Hf [1], we have carried the work further with higher resolving power and using a spectrometer with a thin Geiger–Müller window. We have also carried out delayed coincidence measurements to study the metastable state reported by De Benedetti and McGowan[2]. We have attempted to eliminate various possible decay schemes which have been proposed[1–3], in favour of one to be discussed here.