# The Spectrum of the Luminosity of the Brush and the Glow Discharges of Electricity

By

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(Received May 19, 1921)

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In a previous paper[1] it was stated that the appearance of a positive brush at the anode of an influence machine was very similar to that of a tree; beginning from its start at the anode, it was divided into several branches which were also subdivided into many weak branchlets. Such a positive brush consisted of two parts, namely the intense luminosity near the anode and the weak luminosity as the continuation of the former. These two parts of the positive brush were different in their natures. The branches of the weak luminosity being a pilot of the other part of the intense luminosity, the arrival of the end of the latter at the cathode or at the negative brush caused, for the first time, a spark between the electrodes. In the case of the negative brush at the cathode of an influence machine, no such parts of the different natures as in the case of the positive brush were detected, and the mere arrival of the end of the negative brush at the anode or at the intense part of the anode brush gave rise to a spark between the electrodes.

When the positive and the negative brush discharge were made visible at each electrode respectively, and when a plenty number of negative ions was supplied uniformly to the anode, an entirely different phenomenon of discharge took place at the anode. The positive brush disappeared entirely and the surface of the anode which was just

1 Yoshida and Hirata, Mem. Coll. Sci. Kyoto, **4**, 89, (1919).

opposite to the cathode was now covered with a thin film of a pale violet positive glow as was stated in the previous paper.

Now in the present experiment, the luminosities in every part of the brush and the glow above stated in the air at ordinary pressure were spectroscopically examined separately. With a direct vision spectroscope the spectrum of the luminosity due to the brush and the glow discharges was photographed on panchromatic plates. The electric discharges of every kind above stated were made to take place on smooth surfaces of iron electrodes; and the spectrum lines of the spark between these iron electrodes were employed as the comparison spectrum for the determination of the wave lengths. As the luminosity of the brush and the glow discharges was very weak, the exposures of from four to eight hours were needed to take a photograph of a moderate intensity. From the photograph thus taken, it was observed that the spectrum of the brush and the glow was entirely the same for every kind of the brush and the glow discharges before mentioned, and that it was the band spectrum belonging to the second group of nitrogen. The head of every one of these bands being on longer wave side, they were diffused toward the opposite side. The wave lengths of the heads of these bands determined from the comparison spectrum of the iron spark are given in the following table.

The wave lengths in Å.U.

| | | |
|---|---|---|
| 4667 | 4413 | 4267 |
| 4572 | 4353 | 4198 |
| 4487 | 4343 | |

The values of the wave lengths measured are in fair agreement with those given in Kayser's Handbuch der Spektroscopie for the heads of the bands belonging to the second group of nitrogen. Thus we may conclude that, in the case of the air at ordinary pressure, the luminosities of the positive glow, the negative brush, the stronger part of the positive brush and the weaker part of the positive brush are all the same and they are mostly due to the band spectrum belonging to the second group of nitrogen.

In conclusion the writers' thanks are due to Prof. Mizuno for the interest he has taken in the research.