A Short Note on the Arc and Spark Lines of Iodine

By

Masamichi Kimura

(Received Oct. 20, 1919)

Iodine emits light in many different ways. When it is excited electrically the colour of the light varies with the modes of excitation and it also changes with the forms of discharge tubes. The changes thus called forth in its spectrum were studied and the result obtained is given in the present note.

The colour of the glow in an ordinary Geissler tube containing iodine appears yellow in the wide part, but bluish green in its capillary. When a part of this capillary was further made narrower, the light from this part became more bluish, indicating that a change had occurred in its spectrum. In order to study the change brought out in the spectrum, a conical capillary was used in place of an ordinary one. Such a capillary was drawn from an ordinary glass tubing of 5 mm. diameter, the narrowest part being about 0.1 mm, and its length 10 mm. A well defined vertical image of the glow in this conical part was formed on a slit of a small prism spectroscope, and the light coming from various points on the axis of the cone of light were simultaneously studied. An enlarged reproduction of the spectrogram thus obtained is given in Fig. 1, the upper part in the photograph representing the spectrum of the light emitted from the narrowest part of the capillary.

It was observed that certain strong lines in the upper part disappeared entirely from the lower, while a number of faint lines in the

upper were enhanced in the lower half. Thus lines in the iodine spectrum may be divided into two types, the strong lines belonging to the first type being, λλ 5178, 5185, 5199, 5216, 5678, 5690, 5710, 5739, 5950, 6075 etc., and those of the second, λλ 4862, 4897, 4917, 5119, 5235, 5894 etc.

From these we see that lines of the first type belong to the spark lines of iodine, while those of the second type to the arc lines. Thus the insertion of a constricted part in the path of the discharge makes spark lines stronger and suppresses arc lines.

Such a change of the intensity distribution in the spectrum was also brought out by sending condensed discharges through an iodine tube having no constricted portion. When such a tube was connected to the terminals of an induction coil and simply excited by it, the spectrum of the light consisted chiefly of lines of the arc type and of bands, lines of the spark type appearing, however, as faint lines at λλ 476, 516, 534, 540 and 550 (Fig. 2). But when a small condenser and a spark gap were put in the circuit, the arc lines and the band spectrum in the region from green to red, were reduced in intensity, and the spark lines enhanced at the same time.

When the gap was widened, the spark lines in the region from blue to violet were enhanced at the expense of those lying in the other region. In other words, the region of the maximum intensity in the line spectrum of iodine displaced toward the short wave length side as discharges got heavy. This change is seen from the photographs shown in Figs. 3 and 4.

Summary

1. The effect of constricting a portion of a discharge circuit on the spectrum of the light emitted from that part was examined and it was ascertained that spark lines were enhanced there while arc lines were suppressed.

2. The influence of a condensed discharge upon the spectrum of iodine was studied and it was found that the position of the maximum intensity in the spectrum of iodine displaced toward the short wavelength side as the discharge got heavy.

In conclusion, the writer wishes to express his thanks to Prof. T. Mizuno for the interest he has taken in this work.

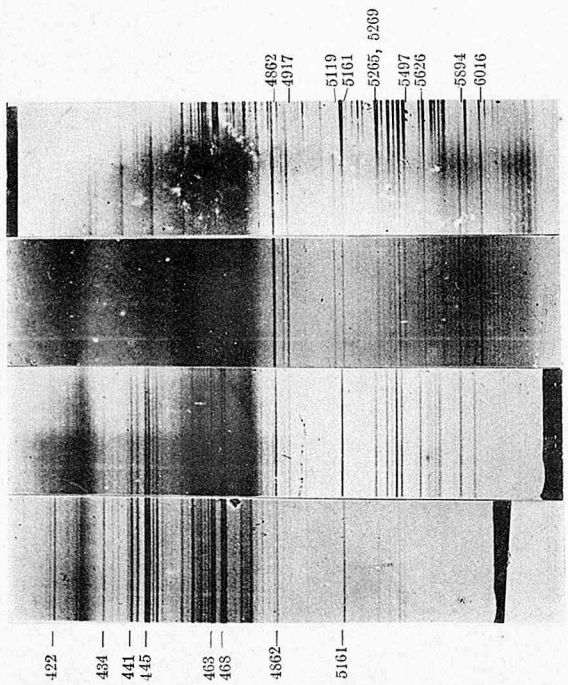

Fig. 1. Capillary

Bulb

Fig. 2. Small spark gap

Fig. 3. Medium spark gap

Fig. 4. Largest spark gap