5. *Reversal in the Spectra of Beryllium.*

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The specimen of beryllium used in obtaining the spectra was nearly pure, containing small traces of various elements as Al as impurities. The spectra was obtained by the discharge of a condenser battery (capacity $1.5 \mu\text{F}$) at 30 kV, or by ordinary discharge from a small transformer (15 kV) without a condenser. In the former case, a portion of the sample was instantaneously vaporised, and the spectra showed remarkable reversal; in the latter, the vapour was of small amount and consequently the lines were nearly free from absorption. The spectra were photographed by means of a 6' concave grating (ruled space 2.5'' with 15000 lines to the inch) on a Rowland mounting of special construction. The dispersion of the first two orders being small, the third and fourth order spectra were specially examined by a microphotometer, using 0.01 mm. slit.

The special feature in the spectra of beryllium is the self-reversal of the strong lines obtained by the disruptive discharge in BeI and BeII. As shown in Fig. 1, the line 3322 ($2^3P_{0,1,2} - 2^3S_1$) in the third and 2495 ($2^3P_{0,1,2} - 3^3D$) in the fourth order spectrum of BeI are found near each other. They are distinct triplets under high dispersion, but with the grating here used, they are not resolved. The grating spectra are shown below the photometric curves in all the figures. The disruptive discharge causes reversal in both of the lines, the amount being greater for 2495, as is naturally to be expected from the nature of the spectral term. (Fig. 1a). With ordinary discharge, no such reversal is observed, but the lines are associated with ghosts, as shown by the humps on the sides of the photometric curve in Fig. 1b. Similar remark applies to 2651 of BeI (pp' lines of Paschen-Götze), which consists of an assemblage of six lines according to Back.¹⁾ The lines as a whole are reversed in the disruptive discharge (Fig. 2a) and the ghosts on both sides of the line are sharply defined in the ordinary discharge (Fig. 2b).

An instance of the line in BeII may be given by the doublet

1) Paschen-Götze: *Seriengesetze der Linienspektren*, Leipzig, (1922) 71; Bowen a. Millikan: *Phys. Rev.* **28** (1926), 256-258.

Fig. 1a.
Disruptive
Discharge

Fig. 1b.
Ordinary
Discharge

3322 (III)

2495 (IV)

Fig. 2a.

Fig. 2b.

2651 (IV)

Fig. 3a.
Disruptive
Discharge

Fig. 3b.
Ordinary
Discharge

3132 (IV)

3131.324 and 3131.972 ($1^2S_{\frac{1}{2}} - 2P_{\frac{3}{2}, \frac{1}{2}}$) in the fourth order. The photometric curve of the lines in disruptive discharge Fig. 3a indicates two minima corresponding to the doublets. The interval is 0.65 Å by micrometric measurement, while photometric measurement makes it 0.60. According to the usual discharge the lines are simply broadened (Fig. 3b), so that the photometric curve is much flattened. The line 2495 of BeI in the fifth order to the left of 3132 preserves the same character as in Fig. 1b already noticed. The strong line further towards the left belongs to another element, and has different characteristic from that of Be.

It is to be remarked that the reversal of the lines of Be here noticed strongly resembles that observed with Tl by the disruptive discharge.¹⁾ Further, it is to be noticed that the Be-doublet with the mean position 3131.65 and the Hg-triplet 3131.56 are both of great intensity, and the wave-length difference between the two is less than a tenth of angstrom. The lines can perhaps be utilised in some spectroscopic studies, such as the investigation of resonance spectra.

1) Nagaoka a. Futagami: Proc. **3** (1927), 140.