

## 2. NOTES ON THE SPECTRA OF THE PRECIOUS EMERALD AND OTHER GEM-STONES.

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The spectrum of the true emerald consists of a broad pure-green transmission with three (new) very difficult hair-lines in the red. These are (*a*) and (*b*), a close pair near B, on the other side from the ruby-complex, *i.e.*, facing C: the approximate wave-lengths are  $\lambda\lambda 6805$  and  $6795$ ; and (*c*) at about  $\lambda 6330$  (very faint). There is also a very hazy wider band between these, round about C.

The spectrum of  $\text{Cr}_2\text{O}_3$  in a borax-bead contains a hazy band with a fairly sharp edge at  $\lambda 6800$ , so that the colour of emerald may be due to chromium: chromium glass does not show this band, nor do beads of vanadium or uranium show anything. Chromium acetate solution shows a similar band, but slightly displaced towards the yellow.

The artificial emerald and the sapphire, either natural or artificial, have no hair-lines in their spectra. This is true also of the following coloured minerals which were examined: Rubellite, red spinel, amethyst, purple fluorspar, blue aquamarine, rose quartz, lepidolite, and topaz, and also purple titanium beads. Blue-green spinel has a broad band in the violet at about  $\lambda 4550$  to  $\lambda 4600$ . The artificial emerald is merely a green sapphire (probably coloured with iron as well as titanium), and can thus be easily distinguished from the real emerald: whereas at present there is no satisfactory criterion between natural and artificial sapphires or rubies.

The well-known almandine spectrum has been measured, as the wave-lengths do not seem to have been published: (*a*) Very faint, about  $\lambda 6150$ ; (*b*) strong,  $\lambda 5750$ ; (*c*) broad, about  $\lambda 5300$ ; (*d*) strongest,  $\lambda 5070$  to  $5050$ ; and (*e*) very faint and broad, about  $\lambda 4600$ .



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