LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

Structure of the Extremely Soft X-Ray Absorption of Solids

The structure of the absorption of several metals and compounds has been studied in the region from 170A to 500A with a small vacuum spectrograph of the Thibaud type. The absorbing films were prepared by distillation within the vacuum spectrograph onto celluloid films which have been shown previously to be quite transparent in this region.[1] The deposit was observed during distillation by both reflected and transparent light. Celluloid films which have been aged for a few days in a dry room are remarkably resistant to the heat of the distilling furnace and if only a millimeter in diameter will withstand a pressure difference of several mm of mercury. Ilford Q plates proved much more sensitive than oiled plates and more uniform than Schumann plates. Structure in addition to that given in an abstract in the program of the Washington meeting of the Physical Society has been found on examining films of several thicknesses of each substance. The strongest absorption of the metals does not appear at the position of the edge but at shorter wave-lengths and both metals and compounds show sharp bands indicating to a large extent that the empty states of solids retain their individual character and overlapping is not so extensive as has been expected.

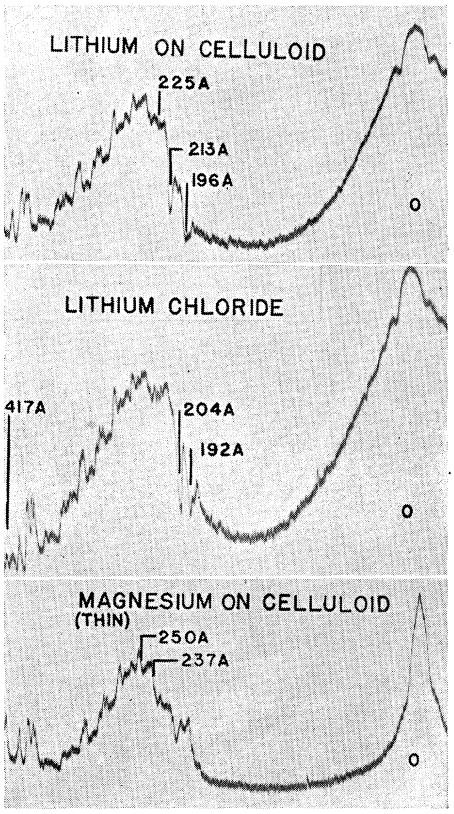

FIG. 1. Microphotometer curves of absorption spectra taken with a hot spark source.

Typical microphotometer curves of the spectra of a hot spark transmitted by films of lithium metal, lithium chloride, and magnesium metal on celluloid are shown in Fig. 1. For lithium in addition to the band at 213A given in the author's abstract,[2] there is a second band at 196A and the relatively faint edge at 225A. Apparently the observations of Skinner and Johnston[3] were made on a thicker film giving only the edge as a private communication confirms both bands and the edge. The positions of the sudden increases of absorption probabilities found in this manner agree with the excitation potentials measured by Skinner[4] if a contact potential correction of one volt is made. Lithium chloride gives very sharp bands at 204A and 192A. The other lithium halides show a similar pair of bands in the same region but the sodium halides only on prominent band at 372A. The widths of these bands which are due to the alkali ion of the crystal are about the same as those found by Hilsch and Pohl[5] which are due to the halide ion of the same series of crystals. Their separations are such as to indicate that there must be two sets of lattice levels one of which belongs more to the alkali ion and another belonging to the halide ion. The halides of magnesium show a band near 235A which like most of those from the alkali halides is less than one volt wide. The absorption observed from a number of thin films of magnesium metal is not in agreement with that given by Skinner and Johnston as a second edge at 237A is much stronger than the expected edge at 250A.

The levels for lithium as calculated by Millman[6] fit very poorly with the structure of the absorption spectrum. Calculations along such lines by others predict much broader absorption than is found in both metals and compounds.

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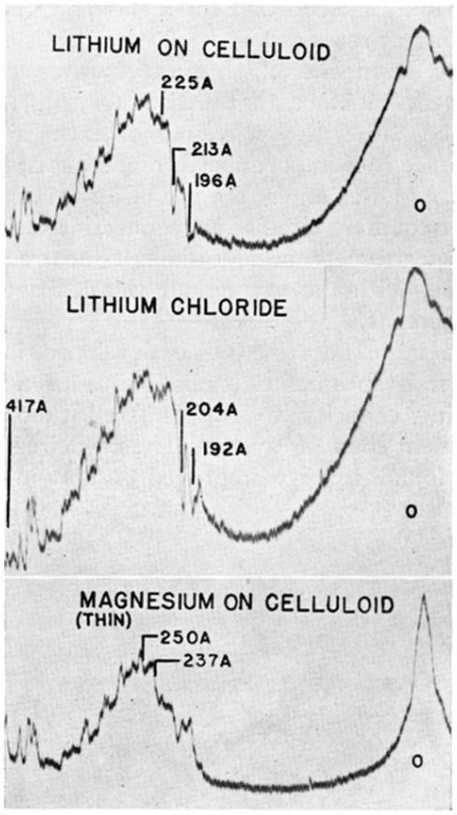
Harvard University,
June 4, 1936.

[1] O'Bryan, J. Opt. Soc. Am. **22**, 739 (1932).
[2] Washington meeting, Am. Phys. Soc. (1936).
[3] Skinner and Johnston, Nature 137, 826 (1936).
[4] Skinner, Proc. Roy. Soc. **A135**, 84 (1932)
[5] Hilsch and Pohl, Zeits. f. Physik **59**, 812 (1930).
[6] Millman, Phys. Rev. **47**, 286 (1935).



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