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NOTE ON THE EMISSION BANDS OF THE SILVER IODIDE MOLECULE

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ABSTRACT. The silver iodide bands are obtained in emission using a high frequency oscillatory electrodeless discharge, through the vapour contained in a quartz tube. The complete band system is obtained. The stronger bands form the progression (o, v''). The intensity distribution of these bands in emission is compared with that in absorption and fluorescence.

INTRODUCTION

The band spectra of the halides of silver were first investigated by Frank and Kuhn (1927) in absorption and fluorescence. The complete vibrational analysis of the bands was due to Brice (1930 and 1931) who photographed the bands in absorption at temperatures higher than those obtained by Frank and Kuhn. Characteristic bands of the three molecules AgCl, AgBr and AgI are found in the vicinity of the resonance line of the silver atom at about λ3300. In addition to these main systems, absorption bands were reported in the further ultra-violet for AgCl at λ 2300 by Jenkins and Rochester (1937) and for AgI at λ 2250 by Metropolis (1939), having the respective common ground states.

In emission, only in AgCl was the main system reported (mention has been made by Brice of emission bands in AgBr also) by Brice who used a high voltage discharge in hydrogen at reduced pressure between silver electrodes containing the fused salt. The purpose of the present note is to describe the results of experiments performed to excite the bands of silver iodide in emission which do not appear to have been hitherto done, and particularly to record the differences in the intensity distribution among the bands as excited by the various methods, *i.e.*, fluorescence, absorption and emission.

EXPERIMENTAL

Two different sources of excitation are used in this investigation. One is the ordinary uncondensed discharge from a quarter K.W. transformer giving 20,000 volts in the secondary and the other is a specially constructed low power high frequency oscillatory discharge between external electrodes. The silver iodide is heated to about 700° C in quartz discharge tube provided with sealed-in quartz end-on windows. The bands were found to be better developed in the high frequency discharge. Hilger medium quartz spectrograph was employed giving exposures of one to two hours.

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RESULTS

The bands obtained on our plates are diffuse and isotope effects are not resolved but approximate measurements could be made and the band system definitely identified with that of AgI as obtained by Frank and Kuhn, and by Brice under different conditions. The following table contains the wavenumbers of all the bands (AgI^{107}) given by Brice (1930). Columns 2 and 3 give the band heads obtained by Frank and Kuhn in flourescence and absorption at about 800° C. Column four contains bands measured by Brice in absorption at temperature higher than 800° C. The last column gives the intensities of the bands as octained in emission, in the present work. It would be seen that the system is excited only partially in absorption and in fluorescence while it appears completely in emission. The distribution of intensity among the bands in emission is similar to that in fluorescence, the stronger bands forming the progression (0, v″). In absorption, on the other hand, as might be expected from the differences in the temperature of the vapour, Frank and Kuhn obtained only the bands involving the lower quantum numbers while Brice could measure only those having higher vibrational quantum numbers. When represented on a diagonal array the intensities in emission gave a wide Condon parabola with only one arm strongly developed, which appears to be a general characteristic of bands of several iodide moleceules.

TABLE

v′, v″	Frank and Kuhn Fluor.	Frank and Kuhn Absor.	Brice Absor.	Authors Int.	v′, v″	Frank and Kuhn Fluor.	Frank and Kuhn Absor.	Brice Abs.	Authors. Int.
4·0	—	31565	—	..	1·8	—	-	29654	
3·0	—	31480	—	—	2·9	—	—	29565	...
2·0	—	31380	—	2	1·9	—	-	29455	0
1·0		31270	—	1	2·10	—		29368	2
0·0	31148	31153	—	4	3·11	—	—	29270	2
1·1	—	31067	—	1	2·11	—		29171	2
0·1	30943	30917	-	4	3·12			29076	0
1·2	—	30863	-	1	2·12	—	—	28976	0
0·2	30739	30744	—	4	3·13	—	—	28881	0
0·3	30535	30539		3	2·13	—	—	28781	1
0·4	30334	30339	—	3	3·14			28688	0
1·5	—	30260	—	2	3·15	—	-	28494	-
0·5	30132	30137	30136	0	4·16		—	28388	—
1·6	—	30056	30053	3	3·16	-	—	28303	-
0·6	29931	—	—	—	1·17	-	-	28194	—
1·7		29856	29853	—	3·17		-	28109	—
2·8	—		29765	—	—	—	-		

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REFERENCES

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