LETTERS TO THE EDITOR

SOME NEW BANDS OF BORON MONOXIDE

While doing some investigations on the boron monoxide bands, we excited the spectrum in various sources to obtain the known a, β and the combination systems of the molecule. The bands were excited in arc and flames and were also tried in a discharge. In the arc and in the flame, we could detect the three sequences of discrete bands accompanying the fluctuation bands, first observed by N. L. Singh[1] and ascribed by him to the transition $C^2\Sigma \rightarrow B^2\Sigma$ of $B^{11}O$ molecule.

When we tried to excite the bands in discharge with BCl_3 vapour, we could also obtain the same bands in the presence of oxygen in the discharge. However, in the picture (Fig. 1) obtained with this excitation, there appeared two new groups on either side of the groups already reported by Singh. The picture was taken on a Hilger constant deviation spectrograph. The wavelengths of these discrete bands measured in these additional groups are as follows:

Red-side group				Violet-side group			
No.	Intensity	λ in Å	$\nu_{vac.}$ in cm.$^{-1}$	No.	Intensity	λ in Å	$\nu_{vac.}$ in cm.$^{-1}$
1	5	6205·0	16111	1	1	4899·3	20411
2	4	6226·0	16057	2	1	4923·4	20311

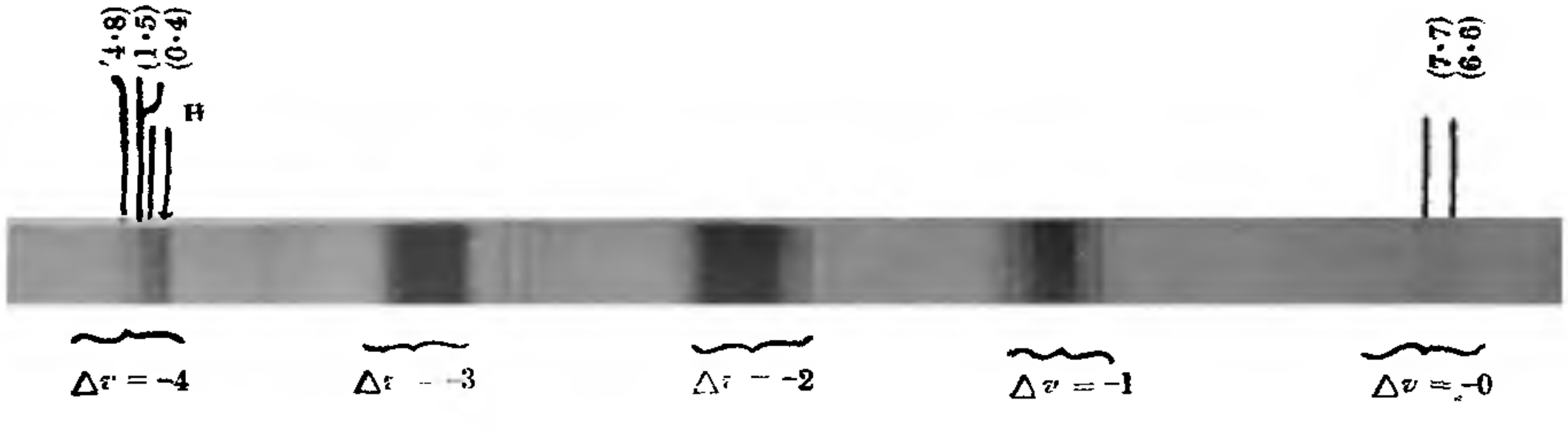

FIG. 1. The system with the new bands marked

v′ \ v″	0	1	2	3	4	5	6	7	8
0			18530	17314	16111* (16109)				
1				18493	17294	16111* (16109)			
2					18442	17267			
3					*19563*	*18391*	*17231*		
4						19484	18324	17176	16057* (16057)
5							19384	18248	
6							20411* (20415)		
7								20311* (20282) Diffuse	

N.B.—Bracket figures give the calculated values of ν.

As they gave the same structural appearance as Singh's bands, we tried to see whether we could fit them into the $C^2\Sigma$—$B^2\Sigma$ system by using Singh's band head equation.

$$\nu = 21030 + (1113{\cdot}3\,v' - 14{\cdot}3\,v'^2) - (1268{\cdot}8\,v'' - 9{\cdot}98\,v''^2)$$

for the same On comparison of the calculated and observed values of the band heads, the new discrete bands obtained on the plates fit into the sequences $\Delta v = -4$ and $\Delta v = 0$ not reported so far.

The Deslandre's table with the new and existing bands is drawn up below where the new bands observed are shown with an asterisk.

The new bands therefore are (0, 4), (1, 5) and (4, 8) of $\Delta v = -4$ sequence and (6, 6) and (7, 7) of the $\Delta v = 0$ sequence. It may be noted in the above table that although only one band head is actually measured at λ 6205·0 ($\nu = 16111\ \text{cm.}^{-1}$), it represents two distinct bands (0, 4) and (1, 5) according to the band head equation. The (7, 7) band being diffuse, its wavelength measurement is uncertain by a relatively larger margin.

The absence of intermediate bands (2, 6) and (3, 7) in the $\Delta v = -4$ sequence observed here, confirms the rather peculiar character of intensity distribution for the system, already remarked by Singh. Absence of intermediate bands in a sequence is not a very uncommon feature. Such a phenomenon is noticeable in a number of cases. For instance, in PN, the transition $A^1\Pi$—$X^1\Sigma^+$ records the missing of two intermediate bands (2, 2) and (3, 3) in the particular sequence. In BO β system too, the band (2, 1) is missing in the sequence $\Delta v = +1$ although the adjoining bands (1, 0) and (3, 2) are strong enough. Other similar cases can also be cited.

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1. Singh, N. L., *Curr. Sci.*, 1942, **11**, 276; *Proc. Ind. Acad. Sci.*, 1949, **29**, 424.