LETTERS TO THE EDITOR

VISIBLE BANDS OF THE BiCl MOLECULE

The visible band system (λλ 6172–4220 Å) of the BiCl molecule has been known for many years and has been photographed under high resolution by Morgan, Khan2 and Rao and Rao.3 The present study of these bands was undertaken on a new 35 ft. concave grating spectograph (Singh and Tiwari)4 of higher dispersion and resolution with a view to determine more accurately the molecular constants of BiCl.

The bands were conveniently excited by an uncondensed transformer discharge. Exposures of eight hours on Agfa Isopan Plates were sufficient to photograph the bands in the second order with a dispersion of 0.33 Å/mm. An enlargement of the (0, 4) band is shown in Fig. 1.

The rotational lines were measured for ten bands, (0, 0), (0, 1), (0, 2), (0, 3), (0, 4), (0, 5), (0, 6), (0, 7), (0, 8), (0, 9), (0, 10), against iron arc standard lines taken from M.I.T. Tables (Harrison, 1939).5 An examination of the rotational structure of the bands, revealed the existence of only two branches, P and R, well resolved even for low J values.

Younger and Winnans6 have shown that a complete and sensitive test for determining the correct numbering of the rotational lines requires:

(a) the equality of the combination differences \( \Delta_2 F(J) \) from two or more bands.

(b) straight lines on a plot of \( \Delta_2 F(J)/(J + \frac{1}{2})^2 \) versus \( (J + \frac{1}{2})^2 \).

Either (a) or (b) alone will not form a complete test. Thus it was difficult for earlier workers to fix the J numbering very accurately because the plot mentioned in (b) is very sensitive for low J values.

Revised Rotational Constants for six bands are given in Table I.

<table>
<thead>
<tr>
<th>Band Assignment</th>
<th>( B_r' ) values in cm(^{-1})</th>
<th>( B_r'' ) values in cm(^{-1})</th>
<th>Band origin in cm(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.0692</td>
<td>0.0890</td>
<td>20243.65</td>
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<td>0.0692</td>
<td>0.0803</td>
<td>20542.42</td>
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<td>0.0806</td>
<td>20943.12</td>
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<tr>
<td>0.0</td>
<td>0.0787</td>
<td>0.0810</td>
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<tr>
<td>0.0</td>
<td>0.0789</td>
<td>0.0816</td>
<td>22823.22</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0790</td>
<td>0.0816</td>
<td>22823.22</td>
</tr>
</tbody>
</table>

\( r_r' = 2.668 \) Å ; \( r_r'' = 2.478 \) Å

FIG. 1. Band at 4866-6 Å. (0, 4)

Rotational constants for the bands (0, 2), (1, 1), (1, 2) and (2, 1) and the details of the analysis will be communicated later.

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Department of Spectroscopy, Banaras Hindu University, Varanasi-5, June 28, 1968.