EMISSION SPECTRUM OF BROMINE EXCITED
IN THE PRESENCE OF ARGON

Part III. The Band System in the Region 2660-2590 Å

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ABSTRACT

The wavelengths and wavenumbers of the band heads of the system
2660–2590 Å as obtained from the plates taken on the first order 21-feet
grating spectrograph are given along with its vibrational analysis. This
system is shown as the transition from an upper state at $T_e = 56776 \text{ cm}^{-1}$
with $\omega_e = 108.0 \text{ cm}^{-1}$ to the $^3\Pi_u (O_2^+)$ state at $T_e = 15918 \text{ cm}^{-1}$. The
lower state is the same as that of the two systems in the regions 2950–
2670 Å and 3150–2970 Å reported earlier.

INTRODUCTION

In the earlier two papers¹,² the band systems in the regions 3150–2970 Å
and 2950–2670 Å were analysed and discussed. In this paper the band
system in the region 2660–2590 Å will be analysed and discussed.

VIBRATIONAL ANALYSIS

The experimental details are the same as described in the earlier paper.¹
The wavelengths and wavenumbers of the band heads of the system 2660–
2590 Å measured from the plates taken on the 21-feet grating spectrograph
in the first order are given in Table I. This system is very weak and the
band heads are not sharp. Therefore the error involved in the measure-
ments of band heads may be upto $\pm 5 \text{ cm}^{-1}$. The vibrational analysis and
the corresponding intensity distribution and Frank-Condon parabola are
given in Tables II and III respectively.

The vibrational analysis shows that the lower state of the system is the
upper state of the visible absorption band system in the region 8672–5110 Å.

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Govt. of India.
This state, as shown in the earlier two papers, is also the lower state for the system 2950-2670 Å as well as for the 3150-2970 Å. The \( \Delta G' (v + \frac{1}{2}) \) and \( \Delta G'' (v + \frac{1}{2}) \) values for the system are shown in Table II. The \( \Delta G^* (v + \frac{1}{2}) \) values for the lower state as obtained by Venkateswarlu and Verma from the analysis of the 2950-2670 Å system along with those obtained by Darbyshire and Brown from the analysis of the visible absorption bands are also included in Table II for comparison.

The observed \( \Delta G' (v + \frac{1}{2}) \) values could be fairly well represented with the vibrational constants \( \omega_0 = 106.5 \text{ cm}^{-1} \) and \( \omega_0 x_0 = 1.5 \text{ cm}^{-1} \). The vibrational constants for the lower state are those obtained by Darbyshire from the analysis of the visible absorption band system.

It is to be mentioned that no reliable isotopic shifts could be measured though one expects two weak isotopic band heads for each main band. This