

New band systems of NiBr molecule in visible region

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Abstract. Thermal emission spectrum of NiBr molecule excited by vacuum graphite tube furnace revealed the existence of ten new band sub-systems in the region $\lambda\lambda$ 5540-4720 Å which were attributed to $A \rightarrow X$, $B \rightarrow X$, $C \rightarrow X$ and $D \rightarrow X$ transitions. Vibrational analysis was carried out for each of the systems mentioned above. $A^2\Delta$ has been suggested as the ground state of NiBr molecule with an electronic interval of about 533 cm^{-1} . Transitions responsible for NiBr spectrum appear to be of the type $^2\pi - ^2\Delta$ and $^2\Delta - ^2\Delta$.

Keywords. Thermal emission; molecular spectra; spectra of inorganic diatomic molecule: transition elements.

1. Introduction

The early study of the emission spectrum of nickel bromide was made by Mesnage (1939) using high frequency discharge technique and later by Krishnamurty (1952) using heavy current discharge. Reddy and Rao (1960) photographed 62 emission bands in discharge in the region $\lambda\lambda$ 4700-4050 Å and classified them into six systems. Sundarachary (1962) obtained few additional bands in the region $\lambda\lambda$ 4525-4050 Å and tried to reassign them into four groups.

The previous workers had photographed the emission spectrum excited by various discharge techniques and were consequently confronted with a large number of atomic lines which had made the measurement and identification of bands quite uncertain. The molecular constants even for the ground state reported by them were not consistent. In thermal emission the chances of involvement of ground state are higher and the spectrum is almost free from atomic lines. It was therefore decided to examine the thermal emission spectrum of NiBr molecule.

2. Experimental

The vacuum graphite tube furnace of this laboratory was used for these studies. A small quantity of anhydrous nickel bromide (B.D.H.) mixed with spec-pure nickel powder (Johnson Mathey) was placed inside the graphite tube of 10 cm length and internal diameter of 8 mm. After making necessary routine adjustments and evacuation of the furnace chamber nitrogen gas was introduced at a pressure of 45 cm of mercury. The most favourable temperature for the proper development of bands