SUMMARY

The thesis embodies systematic analyses of the emission spectra of halides of calcium (CaCl, CaBr and CaI) and iodides of Strontium and Barium. A high frequency discharge tube source was found most suitable to excite the molecule. A preliminary survey of the spectra was carried out on a Hilger medium quartz spectrograph and E_2 - glass spectrograph. Having established the conditions of excitation, the spectra were photographed on a Carl-Zeiss two meter plane grating spectrograph at a dispersion of about 7.5 to 1.8 A°/mm for the purpose of studying the vibrational structure of the different band systems. A (0,0) band of B system of CaCl molecule was photographed at higher dispersion to study the rotational structure of this band.

The thesis is divided into two parts. Part I includes an introduction to the subject, a historical survey of the work reported by earlier workers and the experimental techniques to obtain the spectra. In order to make the thesis self-contained a brief account of the vibrational structure of bands and intensity distribution in a band system along with that of rotational structure of a simple band and spin splitting are given.

The main object in selecting the molecule is elucidated. The sources which are generally employed in the study of the spectra of diatomic molecule in emission are discussed. The high frequency discharge tube source is described in detail as it served to excite the spectra of the molecules reported here.

The results obtained in the present study and vibrational and rotational analyses of the different band systems are included in Part II. Electron configurations of various electronic states of the molecule and conclusions drawn from the present study are included in Part II.

Chapter IV deals with the vibrational analyses of the band systems of CaCl, CaBr and CaI molecules. From the vibrational analysis of $B^2\Sigma - X^2\Sigma$ system of CaCl molecule isotopic effect and spin splitting are established. The vibrational constants are also modified. In CaBr molecule the correctness of the vibrational assignments are checked by the vibrational isotopic effect. A number of new bands are also observed. In CaI molecule a new band system has been observed in the blue-green region for the first time. The vibrational analysis suggests that the states involved in this

transition are two excited states. The upper state involved is observed for the first time.

Chapter V deals with vibrational analyses of SrI and BaI molecules. In SrI molecule a new band system has been analysed for the first time and vibrational constants are evaluated. In BaI molecule the C-X system has been analysed for the first time and the vibrational constants are evaluated. The vibrational analyses of D and E systems are modified.

Chapter VI deals with the fine structure analysis of B-X system. The spin splitting of the B-level has been established. The rotational constants have been reported.

In the last chapter the electron configurations of the group II(a) monohalide molecules have been discussed in detail. The observed phenomenon in the present investigation are correlated with the theory and structure of the bands are interpreted.