S U M M A R Y

SUMMARY OF THE THESIS ENTITLED "INVESTIGATIONS ON THE SPECTRA OF SOME DIATOMIC MOLECULES" TO BE SUBMITTED BY **T. M. PATEL** TO THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, BARODA FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PHYSICS.

Atomic and molecular spectroscopy has progressed tremendously during the last four decades. Theoretical foundation for the study of the spectra of diatomic molecules was laid by Hund H, Mulliken R. S., Van vleck J. H. and others. Since then the progress of study and interpretation of molecular spectra was very rapid. It has been proved beyond doubt that spectroscopy is the most important source of knowledge and information about the molecular structures and their behaviour. In the thesis to be submitted under the title **"INVESTIGATIONS ON THE SPECTRA OF SOME DIATOMIC MOLECULES (PbCl AND PbO)"** a detailed and systematic study of Lead monochloride and Lead monoxide molecules is presented.

The thesis is divided into two Parts. Part I includes introduction to the subject of

molecular spectra, a historical survey of the work reported so far on PbCl and PbO molecules by earlier workers, problem and the experimental techniques to obtain the spectra under investigations. Part II deals with rotational analyses of PbCl and PbO bands and the rotational temperature of PbO molecule using J assignments, rotational constants and intensity measurements of rotational lines in the spectra of the abovesaid molecules. Electron configurations, results and discussion and further plan of work has been included at the end.

In order to make the thesis self-contained, brief accounts of the vibrational structure of electronic bands, intensity distribution in a band system, vibrational and rotational isotopic shifts, rotational structure of electronic bands and rotational temperature are given in Chapter I. Historical survey of the work reported by earlier workers on the spectra of PbCl and PbO molecules and their available spectroscopic data is given. From the historical survey, problem taken up in the present investigation has been explored. It has been nicely explained why the latest work on

PbCl molecule reported by Philip Mathew (1979) demands reinvestigation of the spectra of PbCl. This is the content of Chapter II. The sources which are generally employed in the study of band spectra of diatomic molecules in emission are described in Chapter III. The high frequency discharge tube source is described in detail as it served to excite the spectra of molecules reported in the thesis. 2-meter plane grating spectrograph to photograph the spectra, microdesitometer to obtain relative intensity records and planimeter to measure the area of intensity peaks are also described in this chapter.

Part II begins with Chapter IV. This chapter includes the work on the spectra of PbCl molecule. The excitation and photographing of (0,5), (0,4), (0,3) and (2,1) bands of $A \longrightarrow X_1$ system of PbCl molecule at the highest available dispersion in the laboratory has been described. Then follows the rotational analyses of these bands leading to the evaluation of rotational constants of PbCl. Chapter V begins with the discussion on intensity measurements of rotational lines and vibration - rotation bands. It includes the rotational analysis

of (1,0) band of D ——> X system. Further the determination of rotational temperature of the source emitting the spectrum of PbO has been discussed by employing (1,0), (0,1) and (0,2) bands of D ——> X system. Chapter VI includes electron configurations, results and discussion on the spectra of PbCl and PbO molecules taken up in the present investigations. The experimental results obtained during the course of present work are correlated with the theoretically derived electronic states of PbCl and PbO. Further plan of the work on these molecules has been pin-pointed. It has been emphazised that the whole work may be taken up again using the most modern laser spectroscopic techniques.

The work reported in the thesis on PbCl and PbO molecules is original and wherever observations of others are used, they are acknowledged as **"REFERENCES"**.

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