CHAPTER V

SUMMARY

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The dissertation entitled "SOME STUDIES ON RE DOPED $SrSO_4$ PHOSPHORS" reports the systematic experimental study on preparation, characterisation and electroluminescence studies of $SrSO_4$:Dy, and $SrSO_4$:Tb phosphors, prepared both with and without the charge compensator, Na_2SO_4. The dissertation includes five chapters. Chapter-I opens with brief historical background of electroluminescence followed by upto-date literature survey of sulphate phosphors doped with various impurity elements. Introducing the phenomenon of concentration quenching of luminescence briefly, the problem undertaken in the present investigation is stated at the end of this chapter giving the scope of work.

Chapter - II gives the detailed information regarding synthesis of $SrSO_4$ phosphor used in the present study. This chapter begins with some general information regarding the classification of phosphors. Further presenting some highlights regarding the general considerations for phosphor synthesis, the detailed method of preparation of $SrSO_4$ phosphors is described, in this chapter. In all thirty four phsophors with diverse concentrations of Dy and Tb have been prepared with and without the addition of Na_2SO_4 as a charge compensator.

It is well known that the characterisation of phosphor before undertaking any Luminescence study is indispensible. Such studies help to understand the mechanism of emission of light in the phosphor system under consideration. The luminescence properties mainly depend on the crystal structure, the type of impurity doped and the number of impurity ions actually gone in the host lattice, during the preparation of the phosphor. The chapter III reports the results obtained from the study of characterisation of phosphor on the basis of structural, electrical, magentic and optical properties. The noteworthy achievements of structural characterisation is that the structure of prepared $SrSO_4$:Tb and $SrSO_4$:Dy phosphor is orthorhombic and the incorporation of the activator ion along with Na^+ does not bring about any structural change which rules out the possibility of formation of any new compound in the preparation of phosphors. The information regarding the electrical conductance and D.C. resistivity of phosphors is reported in this chapter. The doped atom has its shell partly filled with the electron and the electrons of the unfilled shell provide net magnetic moments and accounts for the magnetic properties of these ions in solid. The susceptibility change is a property of the difference in magnetic character of unexcited and trapped electrons. In chapter - III the magnetic behaviour of $SrSO_4$ phosphors prepared both with and without Na_2SO_4 have been

reported. Thermoelectric power measurements enables to understand the nature of prepared phosphors. The observations of thermoelectric power measurements reveals that the phosphor material prepared in the present investigation is of P-type. The visual observations show that the prepared phosphors do not exhibit fluorescence and thermoluminescence under UV-excitation. They were found to show fluorescence and phosphorescence and TL-response under X-ray excitation. This observation leads to conclude that the phosphor material, prepared in the present study, is a high band gap material.

The phenomenon of electroluminescence is found to be of great importance in oxygen dominated lattices and some phosphors are extensively studied. However, it is hard to find any reference on EL-behaviour of RE doped $SrSO_4$ phosphors in the powder form, although it belongs to oxygen dominated lattices. A detailed study of EL behaviour of $SrSO_4$:Dy and $SrSO_4$:Tb phosphors with & without charge compensator is reported in Chapter-IV.

The concentration quenching effect has been observed with optimum EL-output at about 0.01 wt % Tb in $SrSO_4$ phosphor prepared both with and without charge compensator. The role of Na^+ ion as a charge compensator has been predominetly observed, in the characterisation (Chapter II) and electroluminescence study

obtained in the present investigation and taking the help of available literature an attempt has been made to reveal the mechanism of EL in $SrSO_4$ phosphors. IN brief, the proposed EL-mechanism involves the following five steps.

1) Excitation of charge carriers by field ionisation of impurity ion electron.
2) Acceleration of charge carriers by the action of electric field localised in a narrow region.
3) Transport of energy to radiating site by the moment of accelerated charge carriers.
4) Transfer of energy to radiating center by the captur of charge carriers
5) Emission of light due to the transition from impurity state to impurity state.

The dissertation report closes with the Chapter - V which is devoted to narrate the summary of the work done in the present study.

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