In this thesis the preparation and properties of thin films of certain semiconducting sulphides are reported. The films were grown by reactive evaporation and also by a new technique of activated reactive evaporation. The films were characterised with respect to their structure and morphology by X-ray diffraction, scanning electron microscopy and optical microscopy.

The studies discussed in this thesis were related to the development of some new phosphor materials and their use in powder and thin film electroluminescent devices and to their electrical and spectral characteristics. A number of EL phosphors were prepared and their properties studied. Emission spectra, I-V characteristics and B-I characteristics and brightness waves were analysed and a number of new results obtained.

This thesis aims to present the results of the experimental investigations on the Nitrogen laser excited fluorescence of some rare earth doped alkaline earth fluorides. It also contains the details of a pulsed Nitrogen laser, a fluorescence emission spectrometer and a lifetime spectrometer.

The thesis begins with a brief introduction to the different aspects of the luminescence in crystals. The different factors affecting the luminescence and the application of luminescence are described in this chapter. A brief introduction to laser crystals and the spectral characteristics of rare earth ions are also discussed in the second half of the chapter.

It has been observed that a good number of rare earth ions in different crystals absorb the UV radiations of the Nitrogen laser to emit fluorescence in the visible region. Moreover, being a pulsed laser with very high peak power of extremely short duration, lifetime measurement of excited states can be successfully carried out using this laser. A Nitrogen laser was therefore used as the source of...
Fluorescence studies of CaF₂:Ho⁺² for different concentrations of Ho⁺² are described in the next chapter. The emission spectra are recorded at both RT and LNT. Temperature dependent concentration quenching of fluorescence was observed for CaF₂:Ho⁺² and is discussed with the help of the energy level diagram of Ho⁺².

Visable fluorescence of Nd³⁺ in CaF₂, SrF₂ and BaF₂ for two different concentrations of Nd³⁺ is also studied with Nitrogen laser excitation and presented in chapter V. Strong blue emission was observed from these crystals. The energy levels and transitions involved in the visible fluorescence of Nd³⁺ are also included in this chapter.

The study of fluorescence of CaF₂:Er³⁺ is given in chapter VI. No visible fluorescence was observed under Nitrogen laser excitation and hence the emission of these crystals was studied with a Xenon arc excitation. The results and conclusions of the investigations are summarised in a separate chapter at the end of the thesis.

The results of the above investigations have been communicated in the form of following research papers:


S. P. 23. Vijayakumar, K. P. — Surfacing thin films by optical methods —