Results & Discussion

The essential aspects of fluorescent lamps are (i) The gas discharge and (ii) The phosphor coating. The former is a low pressure mercury discharge which when ignited electrically gives rise to a substantial amount of invisible radiation in the ultraviolet range, most of which is at 253.7 nm. The later converts this radiation into visible. This conversion should cover the entire range of visible region, if the effect of white light is to be faithfully produced Another important aspect is the amount of visible radiation generated from a given amount of UV radiation. This ratio gives the conversion factor and it should be high.

The characteristics of phosphors discussed above can be ascertained by taking its emission spectra and measuring its quantum efficiency. The material should be capable of accepting the 254 7 nm radiation almost in its entirity. Hence the excitation spectra also assumes significance. This chapter contains the measurement and investigation of the above mentioned parameters. All these parameters give the characteristics of the phosphor material even before it is used in the actual lamp. The parameters would most certainly indicate the quality of lamp to be made However, the manufacturing process and certain factors related to chemistry (chances of reaction of mercury with the phosphor material) are important enough to be taken into consideration. It is on account of these factors that the ultimate lamp quality can be ascertained only after a lamp is made out of the phosphor material. The quality of lamp is decided in general by two factors, Lumen output and Colour coordinates. The former gives a measure of the intensity of light produced by the lamp, while the later gives the colour quality of the lamp and its proximity to the ideally desirable colour quality, described by a parameter called Colour Rendition Index (CRI).

Thus, it can be suggested that lumen output of a lamp would have a direct dependence on the amount of UV converted to visible radiation i.e. the quantum efficiency. Moreover the emission spectra can be related to the colour coordinates An attempt has been made to correlate the above parameters. Factors related to the manufacturing process viz. pressure of gas and coating thickness have been also considered briefly.

The phosphor material in general has a host lattice in which impurities are incorporated. These impurities act as the activators or co-activators i.e. the luminescence centres. The phosphor coating inside the lamp is continuously bombarded with electrons and ions from the gas discharge and also the UV photons generated by the gas discharge The bombardment of these particles are likely to cause the formation of centres, which trap these particles or store the incident energy. Such centres have been studied by using thermoluminescence and EPR techniques. Thermoluminescence glow curves have been recorded by using gamma rays and ultra violet radiation of 254 nm as excitation sources. The spectrum of thermoluminescence for gamma ray excitation has been also recorded for all the samples.

The thermoluminescence centres mentioned above are likely to involve the activator and coactivator ions, which are themselves, the centres of fluorescence In such a case i.e. in case of the activator/coactivator ion being a thermoluminescence centre, whether its role as fluorescence centre would be affected or otherwise, is a question that merits concern. To find out, if the activator/coactivator ions are associated with thermoluminescence centres, EPR investigations were carried out. The peaks of a thermoluminescence glow curve are associated with one or more than one radical of the phosphor material. On heating these radicals are annealed at the particular temperature which corresponds to the glow peak. The EPR investigations at these temperatures reveal the radical or radicals responsible for it.