This thesis reports the results concerning the fluorescence properties of $\text{Eu}^{3+}$, $\text{Tb}^{3+}$, $\text{Sm}^{3+}$, $\text{Ce}^{3+}$, $\text{Ho}^{3+}$ & $\text{Dy}^{3+}$ doped in certain phosphors based on the host matrices of lanthanide oxyhalides, lanthanide phosphates and lanthanide vanadates. It comprises seven chapters.

First Chapter presents an introduction on the basic theory pertaining to the spectra of rare earth ions in order to analyse the optical materials under report here.

Second Chapter describes the preparation procedures employed in the production of different rare earth ions doped powder phosphors in microcrystalline structures. All these phosphor materials except the lanthanide oxychloride, have been synthesised in an inert ($\text{N}_2$) atmosphere, in order to prevent possible oxidation from the surrounding air in the furnace at an elevated temperature ($>1000^\circ \text{C}$). Lanthanide phosphors have been prepared from a solid state reaction, in which a precipitation technique has been adapted involving a direct and clean reaction process between the lanthanide oxides and the phosphoric acid without any by-products other than the water. Because of the hygroscopic nature of these lanthanide oxides, the starting oxides have been calcined at $700^\circ \text{C}$. However, the other remaining powder phosphors have been obtained by solid state reaction from the flux method.

Third Chapter reports the characterization of the fluorescence spectra of $(\text{Ln}, \text{Zn}) \text{OF:RE}^{3+}$ ($\text{Ln} = \text{Y}, \text{La}, \text{Gd}$ and $\text{RE} = \text{Eu}^{3+}, \text{Sm}^{3+}$ and $\text{Ce}^{3+}$) powder phosphors. The effect of zinc ions on the emission properties of rare earth ions has systematically been studied and the results are presented in three parts (A, B and C) respectively. The Part-A deals with the preparation and emission properties of $(\text{Ln}, \text{Zn})\text{OF:Sm}^{3+}$ powder phosphors. A bright yellow-orange color has been observed from these phosphors with an UV source due to the transitions $^4\text{G}_{52} \rightarrow ^6\text{H}_{65,72,82}$ of $\text{Sm}^{3+}$ ions. The color richness has been assessed by computing the color co-ordinates ($\bar{X}$, $\bar{Y}$) and relative fluorescence intensity ratios ($R$) from the measured emission spectra. Scanning electron microscope (SEM) studies have also been carried out for these materials and it is noticed that the addition of zinc in the host matrix brings in with the changes in the average particle size of the phosphors and thereby significantly influencing the fluorescence characteristics of dopant $\text{Sm}^{3+}$ ions. Based on the
to a shorter wavelength side. The emission level wavelengths ($\lambda p$), effective half bandwidth ($\Delta \lambda p$) and the relative fluorescence intensity ratios (R) have been calculated. From the SEM images of all Ce$^{3+}$: phosphors, it is observed that the average particle size is increased with the zinc content to 4$\mu$m from 0.82$\mu$m. For ZnOF:Ce$^{3+}$ phosphor, the average particle size is 2.77$\mu$m. From these studies a couple of phosphors (Gd$_{0.5}$, Zn$_{0.5}$)OF and ZnOF:Ce$^{3+}$ could be suggested as ideal materials and these results have been published in:

**FLUORESCENCE SPECTRA OF (Gd, Zn)OF:Ce$^{3+}$ POWDER PHOSPHORS**


*Fourth Chapter* explain the preparation and fluorescence properties of rare earth doped lanthanide oxybromide powder phosphors those are quite useful in X-ray intensifying screens. The contents of this chapter are presented in three parts (A, B & C). *Part-A* deals with (Ln$_1$,Ln$_2$)OBr: Eu$^{3+}$(Ln=Y, La, Gd) powder phosphors prepared by solid state reaction method with rare earth oxides as starting materials in an inert (N$_2$) atmosphere at the elevated temperatures. In this synthesis, ammonium bromide has been used as a brominating agent, while the KBr functions as a flux for a proper crystallisation. A bright red emission ($^6$Do$^\rightarrow$^7$F_2$) was observed from all these phosphors under an UV-source and the color richness was evaluated through color co-ordinates ($X$, $Y$) from the CIE-diagram. The relative fluorescence intensity ratios (R) for the different measured emission levels were also evaluated in order to examine the host matrix compositional effects. The best fluorescence performance was observed from (Gd$_{0.9}$Y$_{0.1}$)OBr:Eu$^{3+}$ and LaOBr:Eu$^{3+}$ phosphors and these results are published in:

**FLUORESCENCE SPECTRA OF Eu$^{3+}$ - DOPED LANTHANIDE OXYBROMIDE BASED POWDER PHOSPHORS**


*Part-B* gives the details pertaining to the synthesis of Sm$^{3+}$-doped GdOBr, (Gd$_{3.9}$Y$_{0.1}$)OBr, (Gd$_{3.9}$Y$_{0.4}$)OBr, (Gd$_{3.3}$Y$_{0.7}$)OBr & YOBr powder phosphors and their fluorescence properties. These phosphors display bright reddish-orange color due to the transitions of $^4$G$_{5/2}$ $^\rightarrow$ $^6$H$_{5/2}$ (red) and $^4$G$_{5/2}$ $^\rightarrow$ $^6$H$_{7/2}$ (orange) under an UV-source. The recorded fluorescence spectra have been analysed by computing the color co-
magnitudes of computed color co-ordinates and also from their fluorescence intensity ratios, it has been suggested that, LaOF:Sm³⁺ Phosphor could be identified as an efficient yellow-orange displaying phosphor material for its use on the color monitor screens. This section has been published in:

**THE EFFECT OF ZINC IONS ON THE FLUORESCENCE SPECTRA OF (Ln, Zn)OF:Sm³⁺ POWDER PHOSPHORS**


Part-B reports the preparation and luminescence spectra of Eu³⁺-doped (Ln, Zn)OF powder phosphors (where Ln = Y, La, Gd). From the solid state reactions at two temperatures 800°C & 1000°C in an inert (N₂) atmosphere with the ammonium fluoride (NH₄F) as the fluorinating agent. Under an UV-source, these phosphors have shown bright orange–red luminescent color and its efficiency has been estimated by computing their color co-ordinates (X, Y) from the chromaticity charts made available in the literature by the CIE. From the fluorescence spectra of Eu³⁺ phosphors, it has been observed that the hypersensitive transition (⁵D₀ → ⁷F₂) has shown a decrease in its emission intensity with the substitution zinc ions in the host matrix. From the recorded SEM images of (Y, Zn)OF: Eu³⁺ and GdOF: Eu³⁺ phosphors, it has been noticed that, the average particle size has been varying depending upon the choice of the host matrix. Based on the computed color co-ordinates (X, Y) and relative fluorescence intensity ratios (R), the phosphor GdOF:Eu³⁺ could be suggested as a potential phosphor. This section has been published in:

**THE EFFECT OF ZINC IONS ON THE FLUORESCENCE SPECTRA OF (Ln, Zn)OF:Eu³⁺ (Ln=Y,La AND Gd) POWDER PHOSPHORS**

*Spectroscopy Letters (USA) 33(3) (2000) 423*

Part-C narrates the preparation and fluorescence properties of Ce³⁺-doped GdOF, (Gd₀.₇₅, Zn₀.₂₅)OF, (Gd₀.₅, Zn₀.₅)OF, (Gd₀.₂₅, Zn₀.₇₅)OF and ZnOF powder phosphors, with a fixed (0.05mol) content of Ce³⁺-ions. These phosphors have shown emission in the UV region due to following two transitions of the Ce³⁺-ions

\[ 5d \rightarrow ^2F_{5/2} (4f) \text{ and } 5d \rightarrow ^2F_{7/2} (4f) \]

It has been noticed from the measured fluorescence spectra, with an increase in the zinc concentration, the peak positions of two emission transitions are shifted...
ordinates \((X, Y)\). The relative fluorescence intensity ratios (red/orange) are observed to be increasing with an increase in yttrium content and found that among the five Sm\(^{3+}\)-phosphors, YOBr:Sm\(^{3+}\) phosphor could be suggested as a good material for obtaining reddish-orange fluorescence color and this section has been published in:

**FLUORESCENCE SPECTRA OF Sm\(^{3+}\)-DOPED RARE EARTH OXYBROMIDE POWDER PHOSPHORS**

*Materials Letters (USA) 38 (1999) 121*

**Part-C** summarises the results on the fluorescence spectra of Tb\(^{3+}\)-and Ce\(^{3+}\)-doped GdOBr, LaOBr, YOBr, (Gd,La)OBr and (Gd,Y)OBr powder phosphors. Under an UV-source, these phosphors have shown bright green and blue colors due to the emission transitions \(^{5}D_{4} \rightarrow ^{7}F_{5}\) of Tb\(^{3+}\) & \(^{2}D(5d) \rightarrow ^{3}F_{\nu}\) of Ce\(^{3+}\), respectively. The measured fluorescence spectra have been analysed by computing the colour co-ordinates \((X, Y)\) and stimulated emission cross-section \((\sigma_{Ep}, \text{cm}^{-2})\) have been calculated only for the Tb\(^{3+}\)-doped phosphors. The relative fluorescence intensity ratios (R) for the different measured emission levels of Tb\(^{3+}\) and Ce\(^{3+}\)-doped phosphors were also evaluated in order to examine the Gd-Y and Gd-La host compositional effects on the emission spectra of these phosphors. From the scanning electron microscopic studies, it has been noticed that due to the layer structures of these phosphors, they crystallize in the form of plates. From these studies, it has been identified that the phosphor systems YOBr:Tb\(^{3+}\) and (Gd\(_{0.6}\), Y\(_{0.4}\))OBr:Ce\(^{3+}\) are efficient materials for observing bright green and blue colors, respectively. These results have been accepted for publication in:

**FLUORESCENCE SPECTRA OF Tb\(^{3+}\) AND Ce\(^{3+}\) - DOPED RARE EARTH OXYBROMIDE POWDER PHOSPHORS**

*Bulletin of Electrochemistry (India) 16(8)(2003) 345*

**Fifth Chapter** comprises the results of the fluorescence spectra of Eu\(^{3+}\), Tb\(^{3+}\), Sm\(^{3+}\), Dy\(^{3+}\) and Ho\(^{3+}\)-doped lanthanide oxychloride powder phosphors. All these rare earth doped lanthanide oxychloride powder phosphors were prepared from GdCl\(_4\), YCl\(_3\), LaCl\(_3\), TbCl\(_3\), SmCl\(_3\), HoCl\(_3\), DyCl\(_3\) and CaCl\(_2\) where CaCl\(_2\) acts as a flux at 700°C in an open atmosphere. The contents of this chapter are presented in three parts (A, B & C), respectively. **Part-A** analyses the emission spectra of Sm\(^{3+}\)-doped LaOCl, GdOCl, YOCl, (La,Y)OCl, (La,Gd)OCl and (Gd,Y)OCl powder phosphors. The Sm\(^{3+}\)-phosphors have shown the following emission transitions:

\[ ^{4}G_{s/2} \rightarrow ^{6}H_{9/2}, \quad ^{4}G_{s/2} \rightarrow ^{6}H_{7/2}, \quad ^{4}G_{s/2} \rightarrow ^{6}H_{5/2}. \]
The reddish-orange color emission richness was examined by evaluating the colour co-ordinates \((X, Y)\). Based on the relative fluorescence intensity ratios (red/orange) and the colour co-ordinates \((X, Y)\), it is observed that the LaOCl:Sm\(^{3+}\) phosphor exhibiting brighter reddish-orange fluorescent colour over the other materials and this section has been published in:

**FLUORESCENCE SPECTRA OF Sm\(^{3+}\)-DOPED LANTHANIDE OXYCHLORIDE POWDER PHOSPHORS**

*Materials Letters (USA) 27 (1996) 59*

*Part-B* summarises the fluorescence spectra of Dy\(^{3+}\) and Ho\(^{3+}\)-doped (La,Gd)OCl, (La,Y)OCl and (Gd,Y)OCl powder phosphors. Under an UV-source, these phosphors have shown two mixed colors of yellowish-blue and greenish-blue corresponding to Dy\(^{3+}\) and Ho\(^{3+}\)-ions respectively. The measured fluorescence spectra are characterised by determining their stimulated emission cross-sections and colour co-ordinates \((X, Y)\). The following transitions have been observed from the fluorescence spectra of Dy\(^{3+}\): phosphors: \(4_{F_{5/2}} - 6_{H_{15/2}}\) (yellow); \(4_{F_{5/2}} - 6_{H_{15/2}}\) (blue). The hypersensitive transition \(4_{F_{5/2}} - 6_{H_{15/2}}\) has been shifted towards the lower wavelength side in the dual lanthanide oxychlorides when compared with the single lanthanide oxychloride powder phosphors. Similarly, from the measured fluorescence spectra of Ho\(^{3+}\): powder phosphors, two emission transitions were identified: \(5_{S_{5/2}} - 5_{I_{6}}\) (green); \(5_{F_{3}} - 5_{F_{5}}\) (blue). The fluorescence intensity ratios of the green to blue are evaluated. From the systematic study, it has been found that the phosphors (La\(_{0.6}\), Y\(_{0.4}\))OCl: Dy\(^{3+}\) and (La\(_{0.7}\), Gd\(_{0.3}\))OCl: Ho\(^{3+}\) are novel materials for the observation of yellowish-blue and greenish-blue colours respectively. The results of this part have been published in:

**FLUORESCENCE SPECTRA OF Dy\(^{3+}\) AND Ho\(^{3+}\)-DOPED DUAL LANTHANIDE OXYCHLORIDE POWDER PHOSPHORS**

*Spectrochimica Acta (UK) 52A (1996) 367*

*Part-C* briefs out the results on the fluorescence spectra of Eu\(^{3+}\) and Tb\(^{3+}\)-doped single and dual lanthanide (La,Gd,Y) oxychloride powder phosphors. The Eu\(^{3+}\): phosphors have exhibited a bright red emission \(5_{D_{0}} - 7_{F_{2}}\) and in the case of Tb\(^{3+}\): phosphors a green emission \(5_{D_{4}} - 7_{F_{2}}\) under an UV-source. From the recorded fluorescence spectra of Eu\(^{3+}\): phosphors, the following five transitions have been identified: \(5_{D_{0}} - 7_{F_{4}}\), \(7_{F_{3}}\), \(7_{F_{2}}\), \(7_{F_{1}}\) & \(7_{F_{0}}\). Of these, transition \(5_{D_{0}} - 7_{F_{2}}\) has been more
intense compared to the other transitions with a little shift in their peak positions, depending upon the host matrix. From the recorded thermograms (from DTG) of the samples LaOCl:Eu³⁺ and (La₀.₇, Gd₀.₃)OCl:Eu³⁺ two sets of endothermic peaks have been identified at 153.8°C, 769.2°C and 165.3°C, 771.1°C, respectively. This reveals, at lower temperatures the water content has been removed and higher temperatures indicate the melting points of the phosphors. Similarly, from the measured fluorescence spectra of Tb³⁺: phosphors, the following four transitions have been identified: 6Dₓ - 7F₆, 7F₄, 7F₅ & 7F₃. From the fluorescence spectra, it has been noticed that the change in the host composition causes a significant influence both in the intensity and also the energy of the spectral lines. Thermal analysis has been carried out for the phosphors GdOCl:Tb³⁺ and (La₀.₆, Y₀.₄)OCl:Tb³⁺. Based on colour co-ordinates (X, Y) and relative fluorescence intensity ratios (R) it has been shown that GdOCl:Tb³⁺, (La₀.₆, Y₀.₄)OCl:Tb³⁺ are identified as two ideal phosphor materials for observing bright green colour and LaOCl:Eu³⁺, (La₀.₇, Gd₀.₃)OCl:Eu³⁺ could be suggested as promising red colour emission applications. These results have been published in:

**FLUORESCENCE SPECTRA OF Eu³⁺ AND Tb³⁺ - DOPED LANTHANIDE OXYCHLORIDE POWDER PHOSPHORS**

*Materials Chemistry and Physics (UK) 61 (1999) 156*

*Sixth Chapter* describes the synthesis and emission properties of Eu³⁺, Sm³⁺, Tb³⁺ and Ce³⁺-doped lanthanide phosphate phosphors and these were prepared from different reactions. The precipitation technique has been a direct and clean reaction between the lanthanide oxides and phosphoric acid and does not yield to any by-product except some water. The chemical reaction of this synthesis is as follows:

\[
\text{Ln}_2\text{O}_3 + \text{RE}_2\text{O}_3 + 2\text{H}_2\text{PO}_4 - 2\text{LnPO}_4;\text{RE}^{3+} + 3\text{H}_2\text{O} \hspace{1cm} (\text{Ln}=\text{La},\text{Y},\text{Gd}; \text{RE}=\text{Eu},\text{Sm},\text{Tb},\text{Ce})
\]

The dried precipitate was fired in an alumina boat for three hours at 950°C in N₂ atmosphere. This chapter has been presented in four parts of A, B, C & D. *Part-A* analyses the fluorescence spectra of GdPO₄:Eu³⁺, LaPO₄:Tb³⁺ and LaPO₄:Ce³⁺ powder phosphors. Based on the colour co-ordinates (X, Y) and relative fluorescence intensity ratios (R) calculated, the optimum concentration of each of these dopant rare earth ions (Eu³⁺, Tb³⁺, Ce³⁺) has been identified as 0.05 mol. The phase purity of the synthesized phosphors Gd₀.₉₅PO₄:Eu³⁺₀.₀₅, La₀.₉₅PO₄: Tb³⁺₀.₀₅ and La₀.₉₅PO₄:Ce³⁺₀.₀₅ was
checked by an X-ray diffractometry (XRD) and also from an FT-IR spectra. From the Scanning Electron Microscopic studies, it has been noticed that the particles are in spherical shapes in the order of 150 to 200 nm. From the thermal analysis studies, it has been found that these phosphors are quite stable. A systematic study has therefore resulted in the formulation of Gd$_{0.95}$PO$_4$; Eu$^{3+}_{0.05}$, La$_{0.95}$PO$_4$; Tb$^{3+}_{0.05}$ and La$_{0.95}$PO$_4$; Ce$^{3+}_{0.05}$ phosphors to observe brighter orangish-red, green and UV-emission respectively. The results of this part have been presented in a National Conference (National Laser Symposium) during Dec. 15-17, 1999, Central University of Hyderabad, (India) and also as an extended paper in:

**EMISSION SPECTRA OF Eu$^{3+}$, Tb$^{3+}$ AND Ce$^{3+}$-DOPED LANTHANIDE PHOSPHATE POWDER PHOSPHORS**

*J. Solid State Chemistry (USA) (2000) (accepted)*

Part-B compiles the results on luminescence spectra of LnPO$_4$; Tb$^{3+}$ (Ln=Y,La & Gd) powder phosphors with an optimised concentration (0.05 mol) of Tb. The following are the four emission transitions of Tb$^{3+}$: phosphors: $^5$D$_4$ - $^7$F$_6$ (483-483 nm); $^7$F$_5$ (540-536 nm); $^7$F$_4$ (584-571 nm) and $^7$F$_3$ (616-607 nm). Of these, $^5$D$_4$ - $^7$F$_5$ is the prominent green emission peak. Here, three combinations of host matrices, such as (La, Gd),(Gd, Y) and (La, Y) phosphate based phosphors have also been undertaken. In the set of (La,Gd)PO$_4$; Tb$^{3+}$ phosphors it has been observed that the relative fluorescence intensity ratios (R) increase with La-content upto 0.75 mol beyond that which is found to decrease. In other two sets of phosphors also, the ratios (R) are noticed to change significantly with host matrix. From the computed colour co-ordinates ($X$, $Y$), it is quite clear that (Gd$_{0.25}$, Y$_{0.75}$)PO$_4$; Tb$^{3+}$ possesses a higher $X$-coordinate value, which indicates intense green emission. In the pertinent FT-IR spectra, two bunches of prominent absorption bands have been observed in the wavenumber region of 1107-900 cm$^{-1}$, which are attributable to M-OPO$_3$ (M=Y,La,Gd,Tb) bonds. There is a noticeable shift in the absorption frequencies depending upon the host matrix. SEM images of samples are exhibiting porously agglomerated particles with the grain size in the range of 1.51 to 1.72 μm. The qualitative analysis of the elements of Y, La, Gd, Tb, O and P has been performed by an EDAX technique. The fluorescence lifetimes of four emission transitions $^5$D$_4$ - $^7$F$_{6,543}$ are measured, which fall in the millisecond range. Based on the relative fluorescence intensity ratios (R), emission level peak positions and other measured
fluorescent colour. The profiles of the fluorescence spectra of these Eu$^{3+}$ phosphors have shown the following emission transitions $^5D_0 \rightarrow ^7F_{0,1,2,3,4}$, $^7F_1 \& ^7F_0$. The intensity of the hypersensitive transition ($^5D_0 \rightarrow ^7F_2$) has been increasing with an increment of the yttrium content. In addition, the peak positions have shown a shift by 5 nm towards the higher wavelength side. The relative fluorescence intensity ratios (R) have been calculated and found to be increasing with the change in yttrium content. From the computed colour co-ordinates ($X$, $Y$), it has been found that the $X$-co-ordinate value has been increasing with the change in the yttrium content. Structural studies of these materials have been done by performing XRD, FT-IR and SEM measurements. From the FT-IR spectral measurements of these five Eu$^{3+}$:phosphors, two prominent IR peaks were observed due to VO$^{3-}$ vibrations. Besides this, it was also found that the IR peak positions have been found to be changing significantly at 435.7-449.6 cm$^{-1}$ depending upon the chemical composition of these phosphors. From the thermogravimetry of these phosphors, significant weight loss in TGA and the absence of noticeable peaks found in the DTA mode, which indicates the thermal stability with respect to chemical and crystalline phase transformation changes. From the SEM image of YVO$_4$:Eu$^{3+}$ phosphor, it is noticed that agglomerated particles are in the sizes of 500 nm to 2 $\mu$m in pebble shapes. In the case of LaVO$_4$:Eu$^{3+}$ and (La$_{0.9}$Y$_{0.1}$)VO$_4$:Eu$^{3+}$ the morphological features show that the particles are in the size of 2-3 $\mu$m loosely bound in spinel shaped porous agglomerations and the YVO$_4$:Eu$^{3+}$ has been a promising material and these results have been accepted for publication in:

**FLUORESCENCE SPECTRA OF Eu$^{3+}$ - DOPED LnVO$_4$(Ln=La & Y) POWDER PHOSPHORS**

In the measured excitation spectrum, a strong excitation band has been obtained at 400 nm and assigned to a transition of \( ^{6}H_{4/2} \rightarrow ^{4}P_{5/2} \), which is found shifted to a higher wavelength side in all dual lanthanide phosphates phosphors. In addition to this, the intensity of the excitation band has significantly been changing depending upon the host matrix type. From the recorded fluorescence spectra, the following emission transitions have been identified: \( ^{4}G_{5/2} \rightarrow ^{6}H_{5/2} \), \( ^{4}G_{5/2} \rightarrow ^{6}H_{7/2} \) & \( ^{4}G_{5/2} \rightarrow ^{6}H_{9/2} \). Here, the transition \( ^{4}G_{5/2} \rightarrow ^{6}H_{9/2} \) is a magnetic dipole (MD) transition and has not been that sensitive to the site symmetry while the transition \( ^{4}G_{5/2} \rightarrow ^{6}H_{9/2} \) is an electric dipole (ED) transition and its intensity increases, as environment becomes more asymmetrical. Thus, the ratio (ED/MD) was used as a measure of the symmetry of the \( \text{Sm}^{3+} \)-environment. The observed ratio (ED/MD) was changed significantly with the host matrix. The relative fluorescence intensity ratio (R) is found to be maximum for \( (\text{La}_{0.75}, \text{Y}_{0.25})\text{PO}_4 : \text{Sm}^{3+} \) phosphor system. From the computed colour co-ordinates \( (X, Y) \) it is evident that colour co-ordinate \( (X) \) value has decreased with an increase in the Yttrium-content up to 0.75 mol, but \( \text{YPO}_4 : \text{Sm}^{3+} \) has been formulated as an optimum concentration for rich orange colour emission. In the measured FT-IR spectra, a number of absorption bands have been observed in the wavenumber region 370-1400 cm\(^{-1} \), which are attributed to \( \text{M-OPO}_4 \) \( \text{(M=La, Y, Sm)} \) bonds. From the SEM images of all \( (\text{La}, \text{Y})\text{PO}_4 : \text{Sm}^{3+} \) phosphors, it has been noticed that the spinel shaped particles with average grain size in the range 2.34 to 34.34 \( \mu \text{m} \) exist and tend to increase with the increase of yttrium content. From the thermal analysis, total weight loss of 1.68%, 8.48% and 9.28% has been observed from \( \text{YPO}_4 : \text{Sm}^{3+} \), \( \text{LaPO}_4 : \text{Sm}^{3+} \) and \( (\text{La}_{0.25}, \text{Y}_{0.75})\text{PO}_4 : \text{Sm}^{3+} \) powder phosphors, respectively. From the above investigations, depending upon their optical properties, the phosphor \( \text{YPO}_4 : \text{Sm}^{3+} \) and \( (\text{La}_{0.75}, \text{Y}_{0.25})\text{PO}_4 : \text{Sm}^{3+} \) could be suggested as promising materials of bright orange-red colour emission and these results are recently communicated to:

**OPTICAL PROPERTIES OF**

\( (\text{La, Y})\text{PO}_4 : \text{Sm}^{3+} \) **POWDER PHOSPHORS**

*European J. Solid State and Inorganic Chemistry (France) (2000)*

*(under consideration for publication)*

*Seventh Chapter* presents the preparation and the emission spectra of \( \text{Eu}^{3+} \) doped \( \text{LaVO}_4 \), \( (\text{La}_{0.70}, \text{Y}_{0.30})\text{VO}_4 \), \( (\text{La}_{0.50}, \text{Y}_{0.50})\text{VO}_4 \), \( (\text{La}_{0.25}, \text{Y}_{0.75})\text{VO}_4 \) and \( \text{YVO}_4 \) powder phosphors. Under an UV- source these phosphors have been showing bright red