

List of Figure

Figure 1.1	Energy level diagram of doped inorganic luminescent material.	6
Figure 1.2	Different mechanism for absorption and emission processes takes place in luminescent material.	6
Figure 1.3	Formation of basic pyrophosphate “the basic condensed phosphates”.	9
Figure 2.1	Published articles in each year according to Web of Science, August, 2016.	30
Figure 2.2	Different steps of combustion synthesis method adopted for synthesis of Rare earth doped $\text{Sr}_2\text{P}_2\text{O}_7$.	32
Figure 3.1	Bruker D8 advance x-ray diffractometer.	43
Figure 3.2	JASCO – 4600 Fourier Transform Infra-Red spectrometer.	45
Figure 3.3	“JSM-7500F” filed emission scanning electron microscope (SEM).	47
Figure 3.4	XRD patterns of pure $\text{Sr}_2\text{P}_2\text{O}_7$ and JCPDS: 24-1011.	49
Figure 3.5	XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$ analysed using powderX software.	49
Figure 3.6	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Ce^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	50
Figure 3.7	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Eu^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	51
Figure 3.8	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Tb^{3+} (x = 0.5, 2.5 and 5.0 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	52
Figure 3.9	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Dy^{3+} (x = 0.5, 1.5 and 2.5 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	53
Figure 3.10	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Er^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	54
Figure 3.11	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: x Gd^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%) phosphor and JCPDs Card No. 24-1011. (B) Magnified XRD patterns.	55
Figure 3.12	Williamson-Hall plot: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Ce^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Eu^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Tb^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Dy^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Er^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5% Gd^{3+} phosphor.	56

Figure 3.13	(A) XRD patterns of $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Ce^{3+} , 1.0 mol% RE (RE = Eu^{3+} , Tb^{3+} , Dy^{3+} , Er^{3+} , Gd^{3+} , Sm^{3+} , Nd^{3+}) phosphor and JCPDs Card No. 24-1011; (B) Magnified XRD patterns.	64
Figure 3.14	Williamson-Hall plot: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Eu^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Tb^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Dy^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Er^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Gd^{3+} ; (F) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0% Ce^{3+} , 1.0% Sm^{3+} phosphor.	65
Figure 3.15	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Ce^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%).	67
Figure 3.16	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Eu^{3+} (x = 0.1, 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%).	68
Figure 3.17	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Tb^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%).	68
Figure 3.18	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Dy^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%).	69
Figure 3.19	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Er^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%).	69
Figure 3.20	FTIR spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Gd^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%).	70
Figure 3.21	FTIR Spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Ce^{3+} , 1.0 mol% RE (RE = Eu^{3+} , Tb^{3+} , Dy^{3+} , Er^{3+} , Gd^{3+} and Sm^{3+}).	70
Figure 3.22	SEM images; (A), (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Ce^{3+} ; (C), (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Ce^{3+} .	71
Figure 3.23	SEM images; (A), (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Eu^{3+} ; (C), (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Eu^{3+} .	72
Figure 3.24	SEM images; (A), (B), (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Tb^{3+} ; (D), (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Tb^{3+} .	73-74
Figure 4.1	Jablonski energy level diagram for the photoluminescence mechanism.	82
Figure 4.2	Shimadzu spectrofluorophotometer for PL measurements.	84
Figure 4.3	Three types of white LEDs manufactured by different methods; (A) Red + Green + Blue LEDs. (B) UV LED + RGB phosphor. (C) Blue LED + Yellow phosphor.	85
Figure 4.4	Working of fluorescence lamp; (A) Hg Discharge, (B) Emission of visible light.	86

Figure 4.5	Eight of the most relevant up-conversion processes: (A) anti-Stokes Raman emission, (B) 2-photon excitation, (C) second harmonic generation, (D) cooperative luminescence, (E) cooperative sensitization, (F) excited state absorption, (G) energy transfer up-conversion, and (H) sensitized energy transfer up-conversion.	88
Figure 4.6	PL excitation spectra of Ce^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	89
Figure 4.7	PL emission spectra: (A) $\lambda_{\text{Excitation}} = 254 \text{ nm}$; (B) $\lambda_{\text{Excitation}} = 268 \text{ nm}$; (C) $\lambda_{\text{Excitation}} = 310 \text{ nm}$ of $\text{Sr}_2\text{P}_2\text{O}_7$: x% Ce^{3+} (x = 0.5, 1.0, 1.5, 2.0 and 2.5 mol%) phosphor.	91-92
Figure 4.8	Plot of PL emission intensity (I) \rightarrow Concentration of Ce^{3+} in $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	93
Figure 4.9	Plot of PL emission intensity (I) \rightarrow Crystallite Size of Ce^{3+} in $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	94
Figure 4.10	Excitation spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x Eu^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%) phosphor.	95
Figure 4.11	PL emission spectra: (A) $\lambda_{\text{Excitation}} = 266 \text{ nm}$; (B) $\lambda_{\text{Excitation}} = 396 \text{ nm}$; (B) $\lambda_{\text{Excitation}} = 466 \text{ nm}$, of $\text{Sr}_2\text{P}_2\text{O}_7$: x Eu^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 and 5.0 mol%) phosphor.	96-97
Figure 4.12	The decay curves of $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0% Eu^{3+} phosphor: (A) Excited at 266 nm, Monitored at 618 nm; (B) Excited at 396 nm, Monitored at 617 nm; (C) Excited at 466 nm, Monitored at 618 nm.	99-100
Figure 4.13	CIE chromaticity coordinate diagram of $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0% Eu^{3+} phosphor.	101
Figure 4.14	PL emission intensity (I) \rightarrow Concentration of Eu^{3+} graph of Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	103
Figure 4.15	Plot of PL emission intensity (I) \rightarrow Crystallite Size of Eu^{3+} in $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	103
Figure 4.16	PL excitation spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 % Tb^{3+} phosphor for $\lambda_{\text{Emission}} = 545 \text{ nm}$.	104
Figure 4.17	PL emission spectra of $\text{Sr}_2\text{P}_2\text{O}_7$: x% Tb^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5, 5.0) phosphor for $\lambda_{\text{Excitation}} = 232 \text{ nm}$.	105
Figure 4.18	Plot of PL emission intensity (I) \rightarrow Crystallite Size of Tb^{3+} in $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	106
Figure 4.19	Energy level diagram of $\text{Sr}_2\text{P}_2\text{O}_7$: Tb^{3+} phosphor.	107
Figure 4.20	CIE chromaticity coordinate diagram of $\text{Sr}_2\text{P}_2\text{O}_7$: x% Tb^{3+} phosphor.	108
Figure 4.21	PL emission intensity (I) \rightarrow Concentration of Tb^{3+} in $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	109
Figure 4.22	PL excitation spectra of 0.1mol% Ce^{3+} , 0.1mol% Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	111

Figure 4.23	PL emission spectra of 1.0mol% Ce^{3+} , 1.0mol% Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	111
Figure 4.24	CIE chromaticity coordinate diagram of 0.1mol% Ce^{3+} , 0.1mol% Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	112
Figure 4.25	PL excitation spectra of 1.0mol% Ce^{3+} , 1.0mol% Tb^{3+} co-doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	113
Figure 4.26	PL emission spectra of 0.1mol% Ce^{3+} , 0.1mol% Tb^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	114
Figure 4.27	CIE chromaticity coordinate diagram of 0.1mol% Ce^{3+} , 0.1mol% Tb^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	115
Figure 4.28	PL excitation spectra of 0.1mol% Ce^{3+} , 0.1mol% Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	116
Figure 4.29	PL emission spectra of 1.0 mol% Ce^{3+} , 1.0mol% Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	116
Figure 4.30	CIE chromaticity coordinate diagram of 0.1mol% Ce^{3+} , 0.1mol% Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	117
Figure 4.31	PL excitation spectra of 0.1mol% Ce^{3+} , 0.1mol% Sm^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	118
Figure 4.32	PL emission Spectra of 0.1mol% Ce^{3+} , 0.1mol% Sm^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	119
Figure 4.33	CIE chromaticity coordinate diagram of 0.1mol% Ce^{3+} , 0.1mol% Sm^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	119
Figure 4.34	PL excitation Spectra of 0.1mol% Ce^{3+} , 0.1mol% Er^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	121
Figure 4.35	PL emission spectra of 0.1mol% Ce^{3+} , 0.1mol% Er^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	121
Figure 4.36	PL emission spectra of 0.1mol% Ce^{3+} , 0.1mol% Gd^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	122
Figure 4.37	PL emission spectra of 0.1mol% Ce^{3+} , 0.1mol% Gd^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor.	123
Figure 5.1	Energy levels diagram of an insulator and semiconductor at absolute zero temperature.	138
Figure 5.2	(a) Energy-level diagram of the energy storage stage for TL processes; (b) Energy-level diagram of the energy release stage for TL processes.	140
Figure 5.3	Block diagram of the TL Reader.	147
Figure 5.4	PC controlled TL reader type TL1009 manufactured by Nucleonix.	148
Figure. 5.5	Chart of applications of TL in different research disciplines.	149
Figure 5.6	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: x Ce^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 mol%) phosphors irradiated by β -radiation for 5 minute of 0.48 Gy dose.	153

Figure 5.7	TL glow curves for various time of β -irradiation: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Ce^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Ce^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Ce^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Ce^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Ce^{3+} .	155
Figure 5.8	GCD fitting of TL glow curve of 2.5 mol% Ce^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ irradiated by β - radiation for 5 minute of 0.48 Gy dose.	156
Figure 5.9	Maximum TL intensity ' I_M ' vs β -irradiation time ' t ' graph of Ce^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$.	158
Figure 5.10	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Ce^{3+} phosphor irradiated by β -radiation for 5 minute of 0.48 Gy dose.	158
Figure 5.11	Maximum TL intensity ' I_M ' vs Fading time ' t ' graph of $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Ce^{3+} phosphor irradiated by β - radiation for 5 minute of 0.48 Gy dose.	159
Figure 5.12	TL intensity vs Number of cycles of uses for $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Ce^{3+} .	160
Figure 5.13	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: x Tb^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5, 5.0 mol%) phosphors irradiated by β -radiation for 5 minute of 0.48 Gy dose.	161
Figure 5.14	TL glow curve for various time of β -irradiation: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Tb^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Tb^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Tb^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Tb^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Tb^{3+} ; (F) $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0 mol% Tb^{3+} .	162
Figure 5.15	GCD fitting of TL glow curves of (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Tb^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Tb^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Tb^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Tb^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Tb^{3+} ; (F) $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0 mol% Tb^{3+} .	163
Figure 5.16	Maximum TL intensity ' I_M ' vs β -irradiation time ' t ' graph of Tb^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$.	167
Figure 5.17	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0 mol% Tb^{3+} phosphor irradiated by β -radiation for 5 minute of 0.48 Gy dose.	167
Figure 5.18	Maximum TL intensity ' I_M ' vs Fading time ' t ' graph of 5.0 mol% Tb^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ irradiated by β -radiation for 5 minute of 0.48 Gy dose.	168
Figure 5.19	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: x Eu^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5, 5.0 mol%) phosphors irradiated by β -radiation for 5 minute of 0.48 Gy dose.	169
Figure 5.20	TL glow curve for various time of β -irradiation: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Eu^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Eu^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Eu^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Eu^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Eu^{3+} ; (F) $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0 mol% Eu^{3+} .	170

Figure 5.21	GCD fitting of TL glow curves of (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Eu^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Eu^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Eu^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Eu^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Eu^{3+} ; (F) $\text{Sr}_2\text{P}_2\text{O}_7$: 5.0 mol% Eu^{3+} .	171
Figure 5.22	(a) $\ln[\text{TL}/(\text{Area})^b]$ vs $1/kT$; (b) Residue $\ln[\text{TL}/(\text{Area})^b]$ vs $1/kT$ graphs of $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Eu^{3+} irradiated by β -radiation for 5 minute of 0.48 Gy dose.	172
Figure 5.23	(a) $\ln(I)$ vs $1/kT$; (b) Residue $[\ln(I)]$ vs $1/kT$ graphs of $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Eu^{3+} irradiated by β -radiation for 5 minute of 0.48 Gy dose.	175
Figure 5.24	Thermoluminescence mechanism involved in Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$.	176
Figure 5.25	Maximum TL intensity ' I_M ' vs β -irradiation time ' t ' graph of Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ irradiated by β -radiation for 5 minute of 0.48 Gy dose.	177
Figure 5.26	TL glow curve of 5.0 mol% Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ for fading time irradiated by β -radiation for 5 minute of 0.48 Gy dose.	177
Figure 5.27	Maximum TL intensity ' I_M ' vs Fading time ' t ' graph of 5.0 mol% Eu^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor irradiated by β -radiation for 5 minute of 0.48 Gy dose.	178
Figure 5.28	TL glow curve of $\text{Sr}_2\text{P}_2\text{O}_7$: x Dy^{3+} (x = 0.5, 1.0, 1.5, 2.0, 2.5 mol%) phosphors irradiated by β -radiation for 5 minute of 0.48 Gy dose.	179
Figure 5.29	TL glow curve for various time of β -irradiation: (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Dy^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Dy^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Dy^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Dy^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Dy^{3+} .	180
Figure 5.30	GCD fitting of TL glow curves of (A) $\text{Sr}_2\text{P}_2\text{O}_7$: 0.5 mol% Dy^{3+} ; (B) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.0 mol% Dy^{3+} ; (C) $\text{Sr}_2\text{P}_2\text{O}_7$: 1.5 mol% Dy^{3+} ; (D) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.0 mol% Dy^{3+} ; (E) $\text{Sr}_2\text{P}_2\text{O}_7$: 2.5 mol% Dy^{3+} .	181
Figure 5.31	Maximum TL intensity ' I_M ' vs β -irradiation time ' t ' graph of Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ irradiated by β -radiation for 5 minute of 0.48 Gy dose..	183
Figure 5.32	TL glow curve of 2.5 mol% Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ for fading time irradiated by β -radiation for 5 minute of 0.48 Gy dose.	183
Figure 5.33	Maximum TL intensity ' I_M ' vs Fading time ' t ' graph of 2.5 mol% Dy^{3+} doped $\text{Sr}_2\text{P}_2\text{O}_7$ phosphor irradiated by β -radiation for 5 minute of 0.48 Gy dose.	184

