

LIST OF FIGURES

- Figure 1.1:** Unit cell of different TiO₂ structures (a) Anatase, (b) Rutile and (c) Brookite
- Figure 1.2:** (a) Cubic ZrO₂, (b) Tetragonal ZrO₂, (c) Monoclinic ZrO₂
- Figure 2.1:** One of the first X-ray diffraction patterns obtained by Laue and his collaborators using some crystals of the mineral Blende
- Figure 2.2:** Diffraction of X-rays by two successive atomic planes
- Figure 2.3:** Actual image of the instrument GNR APD 2000 PRO XRD
- Figure 2.4:** Actual image of Energy Dispersive X-ray Spectroscopy (EDS)
- Figure 2.5:** Actual image of Malvern Nano ZS Particle Size Analyzer
- Figure 2.6:** (a) In 1981, the IR-435, a dispersive instrument featured an integrated microcomputer and room for optional ROM memory; accurate spectrum recordings of rapid reaction processes and automatic peak detection became possible, (b) In 1984 Shimadzu's first Fourier Transform Infrared Spectrophotometer was launched
- Figure 2.7:** Analytical information of FTIR spectrometer
- Figure 2.8:** Actual image of the instrument JASCO FT/IR-4700 spectrometer
- Figure 2.9:** Principle of photoluminescence spectroscopy
- Figure 2.10:** Block diagram of fluorescence spectrometer
- Figure 2.11:** Actual image of the instrument JASCO FP-6500 spectrofluorometer
- Figure 2.12:** A simple view of essential components of UV-Vis spectrometer
- Figure 2.13:** Absorption spectra and their corresponding Tauc's Plot
- Figure 2.14:** Actual image of the instrument Shimadzu UV-3600 spectrometer
- Figure 3.1:** Illustration of the doctor blade method
- Figure 3.2:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TCe1
- Figure 3.3:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TDy1
- Figure 3.4:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TEr1

Figure 3.5: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TEu1

Figure 3.6: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TPr1

Figure 3.7: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TTb1

Figure 3.8: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TTm1

Figure 3.9: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TCe2

Figure 3.10: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TDy2

Figure 3.11: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TEr2

Figure 3.12: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TEu2

Figure 3.13: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TPr2

Figure 3.14: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TTb2

Figure 3.15: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of TTm2

Figure 3.16: FTIR spectra of pure PAA

Figure 3.17: FTIR spectra of PTCe1 sample

Figure 3.18: FTIR spectra of PTDy1 sample

Figure 3.19: FTIR spectra of PTEr1 sample

Figure 3.20: FTIR spectra of PTEu1 sample

Figure 3.21: FTIR spectra of PTPr1 sample

Figure 3.22: FTIR spectra of PTTb1 sample

Figure 3.23: FTIR spectra of PTTm1 sample

Figure 3.24: FTIR spectra of PTCe2 sample

Figure 3.25: FTIR spectra of PTDy2 sample

Figure 3.26: FTIR spectra of PTEr2 sample

Figure 3.27: FTIR spectra of PTEu2 sample

Figure 3.28: FTIR spectra of PTPr2 sample

Figure 3.29: FTIR spectra of PTTb2 sample

- Figure 3.30:** FTIR spectra of PTTm2 sample
- Figure 3.31:** PL spectra of PTRE1 (RE= Ce, Dy, Er, Eu, Pr, Tb, Tm) samples
- Figure 3.32:** PL spectra of PTRE2 (RE= Ce, Dy, Er, Eu, Pr, Tb, Tm) samples
- Figure 3.33:** UV-Vis absorption spectra and Tauc's plot of pure PAA
- Figure 3.34:** UV-Vis absorption spectra and Tauc's plot of PTCe1 sample
- Figure 3.35:** UV-Vis absorption spectra and Tauc's plot of PTDy1 sample
- Figure 3.36:** UV-Vis absorption spectra and Tauc's plot of PTEr1 sample
- Figure 3.37:** UV-Vis absorption spectra and Tauc's plot of PTEu1 sample
- Figure 3.38:** UV-Vis absorption spectra and Tauc's plot of PTPr1 sample
- Figure 3.39:** UV-Vis absorption spectra and Tauc's plot of PTTb1 sample
- Figure 3.40:** UV-Vis absorption spectra and Tauc's plot of PTTm1 sample
- Figure 3.41:** Variation of Absorption coefficient with wavelength for PTRE1
- Figure 3.42:** Variation of Extinction coefficient with wavelength for PTRE1
- Figure 3.43:** UV-Vis absorption spectra and Tauc's plot of PTCe2 sample
- Figure 3.44:** UV-Vis absorption spectra and Tauc's plot of PTDy2 sample
- Figure 3.45:** UV-Vis absorption spectra and Tauc's plot of PTEr2 sample
- Figure 3.46:** UV-Vis absorption spectra and Tauc's plot of PTEu2 sample
- Figure 3.47:** UV-Vis absorption spectra and Tauc's plot of PTPr2 sample
- Figure 3.48:** UV-Vis absorption spectra and Tauc's plot of PTTb2 sample
- Figure 3.49:** UV-Vis absorption spectra and Tauc's plot of PTTm2 sample
- Figure 3.50:** Variation of Absorption coefficient with wavelength for PTRE2
- Figure 3.51:** Variation of Extinction coefficient with wavelength for PTRE2
- Figure 4.1:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZCe1
- Figure 4.2:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZDy1
- Figure 4.3:** XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZEr1

Figure 4.4: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZEu1

Figure 4.5: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZPr1

Figure 4.6: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZTb1

Figure 4.7: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZTm1

Figure 4.8: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZCe2

Figure 4.9: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZDy2

Figure 4.10: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZEr2

Figure 4.11: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZEu2

Figure 4.12: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZPr2

Figure 4.13: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZTb2

Figure 4.14: XRD pattern (a), EDS spectra (b) and DLS pattern (c) of ZTm2

Figure 4.15: FTIR spectra of pure PAA

Figure 4.16: FTIR spectra of PZCe1 sample

Figure 4.17: FTIR spectra of PZDy1 sample

Figure 4.18: FTIR spectra of PZEr1 sample

Figure 4.19: FTIR spectra of PZEu1 sample

Figure 4.20: FTIR spectra of PZPr1 sample

Figure 4.21: FTIR spectra of PZTb1 sample

Figure 4.22: FTIR spectra of PZTm1 sample

Figure 4.23: FTIR spectra of PZCe2 sample

Figure 4.24: FTIR spectra of PZDy2 sample

Figure 4.25: FTIR spectra of PZEr2 sample

Figure 4.26: FTIR spectra of PZEu2 sample

Figure 4.27: FTIR spectra of PZPr2 sample

Figure 4.28: FTIR spectra of PZTb2 sample

- Figure 4.29:** FTIR spectra of PZTm2 sample
- Figure 4.30:** PL spectra of PZRE1 (RE= Ce, Dy, Er, Eu, Pr, Tb, Tm) samples
- Figure 4.31:** PL spectra of PZRE2 (RE= Ce, Dy, Er, Eu, Pr, Tb, Tm) samples
- Figure 4.32:** UV-Vis absorption spectra and Tauc's plot of pure PAA
- Figure 4.33:** UV-Vis absorption spectra and Tauc's plot of PZCe1 sample
- Figure 4.34:** UV-Vis absorption spectra and Tauc's plot of PZDy1 sample
- Figure 4.35:** UV-Vis absorption spectra and Tauc's plot of PZEr1 sample
- Figure 4.36:** UV-Vis absorption spectra and Tauc's plot of PZEu1 sample
- Figure 4.37:** UV-Vis absorption spectra and Tauc's plot of PZPr1 sample
- Figure 4.38:** UV-Vis absorption spectra and Tauc's plot of PZTb1 sample
- Figure 4.39:** UV-Vis absorption spectra and Tauc's plot of PZTm1 sample
- Figure 4.40:** Variation of Absorption coefficient with wavelength for PZRE1
- Figure 4.41:** Variation of Extinction coefficient with wavelength for PZRE1
- Figure 4.42:** UV-Vis absorption spectra and Tauc's plot of PZCe2 sample
- Figure 4.43:** UV-Vis absorption spectra and Tauc's plot of PZDy2 sample
- Figure 4.44:** UV-Vis absorption spectra and Tauc's plot of PZEr2 sample
- Figure 4.45:** UV-Vis absorption spectra and Tauc's plot of PZEu2 sample
- Figure 4.46:** UV-Vis absorption spectra and Tauc's plot of PZPr2 sample
- Figure 4.47:** UV-Vis absorption spectra and Tauc's plot of PZTb2 sample
- Figure 4.48:** UV-Vis absorption spectra and Tauc's plot of PZTm2 sample
- Figure 4.49:** Variation of Absorption coefficient with wavelength for PZRE2
- Figure 4.50:** Variation of Extinction coefficient with wavelength for PZRE2
- Figure 5.1:** Spectrum of Sunlight
- Figure 5.2:** Image of small sample box
- Figure 5.3:** Actual image of experimental setup for UV irradiation

Figure 5.4: Bar diagram for Current measurement