

**PHYSICAL AND OPTICAL ANALYSIS OF CERIUM DOPED
TELLURITE GLASS EMBEDDED WITH COPPER NANOPARTICLES**

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TABLE OF CONTENTS

	Page
DEDICATIONS	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS	xi
LIST OF SYMBOLS	xii
LIST OF APPENDICES	xiii
ABSTRACT	xiv
ABSTRAK	xv
CHAPTER 1 INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statements.....	3
1.3 Research Objectives	5
1.4 Scope of Study	6
1.5 Significance of the Study	7
CHAPTER 2 LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Theory of the Glass	8
2.2.1 Definition of the Glass	8
2.3 Glass Network.....	10
2.3.1 Network former	10
2.3.2 Network Modifier.....	11
2.3.3 Intermediate.....	11
2.4 Tellurite Glass Structure	12
2.5 Rare Earth Doped Tellurite Glass	13
2.6 Copper Nanoparticles	14
2.7 Surface Plasmon Resonance	16
2.8 X-Ray Diffraction (XRD)	17
2.9 Physical Properties.....	18
2.9.1 Density and Molar Volume.....	18
2.9.2 Oxygen Packing Density (OPD)	19
2.10 Optical Properties.....	20
2.10.1 UV-Vis-NIR Spectroscopy	20
2.10.2 Luminescence.....	22

CHAPTER 3 RESEARCH METHODOLOGY	23
3.1 Introduction	23
3.2 Glass Composition	23
3.3 Glass Preparation Using Melt Quenching Technique	25
3.4 Sample Preparation	26
3.4.1 Flowchart of Glass Preparations	26
3.5 X-ray Diffraction (XRD).....	27
3.6 Physical Properties	28
3.6.1 Glass Density	28
3.7 Optical Properties.....	29
3.7.1 Ultraviolet Visible Infrared Spectroscopy (UV-Vis-NIR) Spectroscopy	29
3.7.2 Photoluminescence Spectroscopy (PL).....	30
CHAPTER 4 RESULTS AND DISCUSSION	32
4.1 Introduction.....	32
4.2 Prepared Glass Samples	32
4.3 X-Ray Spectra	34
4.4 Physical Properties.....	35
4.5 UV-Vis-NIR Spectroscopy and Band Gap Energy	38
4.6 Surface Plasmon Resonance (SPR).....	47
4.7 Photoluminescence Spectroscopy	48
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	50
5.1 Introduction.....	50
5.2 Research Outcomes.....	51
5.3 Future Works.....	52
REFERENCES	53
APPENDIX A	56
APPENDIX B	57
APPENDIX C	58
APPENDIX D	60
CURRICULUM VITAE	62

LIST OF TABLES

Table	Caption	Page
2.1	The composition including copper nanoparticles in previous research.	16
3.1	The composition of mol % of $(85 - x) \text{TeO}_2 - 3\text{MgO} - 2\text{Li}_2\text{CO}_3 - 10\text{Na}_2\text{O} - (x) \text{CeO}_2$, where $(0 \leq x \leq 2.0 \text{ mol } \%)$.	24
3.2	The composition of mol % of $(84 - y) \text{TeO}_2 - 3\text{MgO} - 2\text{Li}_2\text{CO}_3 - 10\text{Na}_2\text{O} - 1\text{CeO}_2 - (y) \text{CuO}$, where $(0.25 \leq y \leq 1.0 \text{ mol } \%)$.	24
3.3	The composition of mol % of $84\text{TeO}_2 - 3\text{MgO} - 2\text{Li}_2\text{CO}_3 - 10\text{Na}_2\text{O} - 1\text{CuO}$ of Surface Plasmon Resonance (SPR).	24
	Glass series and their appearance.	33
4.1		36
4.2	The density (ρ), molar volume (V_m), oxygen packing density (OPD), indirect energy band gap (E_g) and Urbach energy (ΔE) of the different concentration of Ce^{3+} ions glass.	36
4.3	The density (ρ), molar volume (V_m), oxygen packing density (OPD), indirect energy band gap (E_g) and Urbach energy (ΔE) of the different concentration of CuO glass.	36

ABSTRACT

Two series of glasses with composition of $(85 - x) \text{ TeO}_2 - 3\text{MgO} - 2\text{Li}_2\text{CO}_3 - 10\text{Na}_2\text{O} - (x) \text{ CeO}_2$ where $0.0 \leq x \leq 2.0$ mol % and $(84 - y) \text{ TeO}_2 - 3\text{MgO} - 2\text{Li}_2\text{CO}_3 - 10\text{Na}_2\text{O} - 1.0\text{CeO}_2 - (y) \text{ CuO}$ where $0.25 \leq y \leq 1.0$ mol % glasses system have been studied. The samples were prepared by using conventional melt quenching techniques. The amorphous nature of glass is determined by using X-Ray Diffraction (XRD). The physical properties are measured in terms of density, molar volume and ionic packing density (OPD). Meanwhile the optical analysis is analysed by using the ultraviolet-visible-near infrared (UV-Vis-NIR) and photoluminescence (PL) spectroscopy, respectively. It is found that all glasses are amorphous in nature. The glass density and molar volume with different concentration of CeO_2 are found in the range of $(4.637 - 4.935) \text{ g cm}^{-3}$ and $(29.525 - 31.068) \text{ cm}^3 \text{ mol}^{-1}$, respectively. Whereas, the density and molar volume of the glass containing CuO NPs are found in the range of $(4.79 - 4.93) \text{ g cm}^{-3}$ and $(29.23 - 30.04) \text{ cm}^3 \text{ mol}^{-1}$ respectively. Meanwhile, UV- Vis - NIR absorption spectra shows absorption peaks centered at 356nm, 418nm and 667nm for series 1, meanwhile peaks centered at 357nm, 412nm and 720nm for series 2. The optical band gap for series 1 and series 2 glasses found ranging from 1.92 eV to 2.74 eV and from 1.71 eV to 2.29 eV respectively. Meanwhile, the Urbach energy was found varies from 1.92 eV to 2.43 eV for glass containing CeO_2 and whereas for glass containing Cu NPs ranging from 1.94 eV to 2.02 eV. The SPR revealed located at 800nm of UV-Vis spectra. Luminescence spectra under 356nm excitations between $5d \rightarrow {}^4F_1$ levels of Ce^{3+} ions revealed five peaks of emission bands of cerium doped glass which are centered at 475nm, 520nm, 550nm, 560nm and 660nm. Meanwhile glass containing CuO NPs centered at 460nm, 520nm, 550nm, 565nm and 660nm.