



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل



*Ain Shams University
Faculty of Education
Physics Department*

A Study of Some Transport Properties of a Ge-Se-Tl Chalcogenide Glass System.

THESIS

*Submitted for the Degree of doctor of
Philosophy for the Teacher Preparation
in Science (Physics)*

By

Essam Gamal El-Metwally

*B.Sc. and Education, Gen. Diploma and Spec. Diploma,
Master Degree of Teacher Preparation in Physics*

To

*Physics Department
Faculty of Education
Ain Shams University*

2001

B 01/20

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Approval

DEGREE: Doctor of Philosophy for the Teacher Preparation in Science (Physics).

TITLE: A Study of Some Transport Properties of a Ge-Se-Tl Chalcogenide Glass System.

CANDIDATE: Essam Gamal El-Metwally

Approved

Prof. Dr. Maher Ata Abd El-Moez Afifi
Professor of Physics, Faculty of Education
Ain Shams University

M. A. Afifi

Prof. Dr. Hasan Hamed Ahmed Labib
Professor of Physics, Faculty of Education
Ain Shams University

H. H. Labib

Prof. Dr. Madeha Fadel Abd El-Aal
Professor of Physics, Faculty of Education
Ain Shams University

M. Fadel

Dr. Mamdoh Mohamed Abd El-Aziz
Teacher of Physics, Faculty of Education
Ain Shams University

M. M. Abd ElAziz

Cairo, Egypt

Date:...../...../2001

Prof. Dr. Atef Rizk
Head of the Physics Department
Faculty of Education
Ain Shams University

Contents

	Page
List of Figures	1
List of Tables	9
Abstract	10
 Introduction	 11
Chapter I: Theoretical Background and Literature Review.	16
I. Semiconducting materials.	16
I.1. Classification of semiconductors.	16
I.2. Amorphous semiconductors.	17
I.3. Structure band models of amorphous semiconductors.	18
I.4. Defect states.	22
I.5. Electrical conduction in amorphous semiconductors.	28
1.5.1 Dc conduction in chalcogenide glasses.	28
1.5.2. Ac conduction in chalcogenide glasses.	31
1.5.3. Dielectric properties of chalcogenide glasses.	39
1.5.4. Dielectric loss of chalcogenide glasses.	42
I.6. Switching phenomenon in amorphous semiconductors.	43
I.7. Optical properties of amorphous semiconductors.	50
Previous work on some glassy semiconductors	56
 Chapter II: Experimental Techniques.	 62
II.1. Synthesis of bulk Ge-Se-Tl chalcogenide glasses.	62
II.2. Description of the used furnaces.	63
2.2.1. Oscillatory furnace:	63
2.2.2. The vertical furnace.	66
II.3. Preparation of thin film samples.	66

2.3.1 Cleaning of substrates.	66
2.3.2. Evaporation technique.	69
2.3.3. Methods for film thickness measurements.	73
II.4. Structural identification of the investigated samples.	76
2.4.1. Energy dispersive X-ray analysis (EDX) method.	76
2.4.2. X-ray diffraction (XRD) method.	76
2.4.3. Differential thermal analysis (DTA) method.	77
2.4.4. Density determination.	80
II.5. Electrical properties measurements.	81
2.5.1. dc conductivity measurements:	81
2.5.2. ac conductivity measurements:	81
II.6. Switching phenomenon measurements.	84
II.7. Optical measurements.	88
 Chapter III: Structural identification and optical properties of Ge-Se-Tl amorphous films.	 90
III.1. Structural identification of Ge-Se-Tl films.	90
3.1.1. Density of bulk glasses.	90
3.1.2. X-ray diffraction (XRD) analysis of Ge-Se-Tl films.	91
3.1.3. Differential thermal analysis (DTA) of Ge-Se-Tl system.	91
3.1.4. Energy dispersive X-ray spectroscopy (EDX) method of amorphous Ge-Se-Tl films.	91
III.2. Optical properties of Ge-Se-Tl films.	94
3.2.1. The spectral distribution of the transmittance and reflectance for amorphous Ge-Se-Tl films of different thicknesses.	95
3.2.2. The dispersion curves of refractive index (n) and absorption index (k) for amorphous Ge-Se-Tl films of different thicknesses.	95

3.2.3. The spectral distribution of the absorption coefficient (α) of amorphous Ge-Se-Tl films.	101
3.2.4. Determination of dielectric constant for amorphous Ge-Se-Tl films of different thicknesses.	108
Chapter IV: Electrical and switching properties of Ge-Se-Tl amorphous films.	114
IV.1. Electrical properties of Ge-Se-Tl system.	114
4.1.1. Effect of the composition on the dc conductivity of Ge-Se-Tl films.	114
4.1.2. Effect of film thickness on the dc conductivity for Ge-Se-Tl system films.	117
IV.2. Switching properties of Ge-Se-Tl system.	119
4.2.1. Dynamic and static I-V characteristics	119
4.2.2. Thickness dependence of the mean value of the threshold voltage $\bar{V}_{th}$.	121
4.2.3 Temperature dependence of the mean value of the threshold voltage $\bar{V}_{th}$.	123
Chapter V: ac conductivity and dielectric properties of amorphous Ge-Se-Tl system.	129
V.1. ac conductivity of Ge-Se-Tl system.	129
5.1.1. The Temperature and frequency dependence of ac conductivity for Ge-Se-Tl system.	129
V.2. Dielectric properties of Ge-Se-Tl system.	140
5.2.1. The temperature and frequency dependence of dielectric constant ϵ' for Ge-Se-Tl system.	140
5.2.2. The temperature and frequency dependence of dielectric loss ϵ'' for Ge-Se-Tl system films.	146

Conclusion	160
Summary	164
References.	168
Arabic Summary	