CHAPTER I

INTRODUCTION

Amorphous and non-crystalline solids are synonymous. Thus we can structurally classify materials either crystalline or non-crystalline (amorphous). A crystal is defined as a substance consisting of atoms arranged in a pattern that repeats periodically in three dimensions[1]. Any material which does not meet this criterion of periodically repeated pattern of atoms is non - crystalline. The amorphous material can be classified into:-

a-Complete disordered materials.

B-Oxide glasses.

c-Metallic glasses.

D-Chalcogenide glasses.

Chlacogenide glasses are these materials which contain one or more of the elements Se,Te,or S. The non-crystalline materials can be prepared generally either by condensation from vapour on cold substrate,cathod sputtering,rapid quenching or by slow cooling materials from the melt.

The so called amorphous or glassy state is obtained by rapid quenching from the melt. The short range order which characterizes a particular glass or liquid may be discribed in terms of an atomic centered coordination system and is frequently represented in terms of radial distriburion function.

The non-crystalline semiconductors may be grouped into three major categories as follow :-

1- Covalent Non-crystalline solids

A.Tetrahedral Amorphous films

Si,Ge,InSb,GaAs,Gasb.....

B.Tetrahedral Glasses, $A^{II}B^{IV}C_2^{V}$

$CdGe_x\ As_2$, $Cdsi_xp_2$, $ZnSi_xp_2$, $CdSn_xAs_2$ .....

C.Lone pair semiconductors

(i) elements and compounds

Se,S,Te, As_2Se_3, As_2S_3 .....

(ii) Cross-linked networks

Ge-sb-se	Si-Ge-As-Te
Ge-As-Se	As_2Se_3 As_2Te
As-Se-Te	Tl_2Se-As_2Te_3
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D.Others

B,As, $(Cu_{1-x}Au_x)Te_2$ ----------

2.Semiconducting oxide Glasses

V_2O_5-P_2O_5	MnO-Al_2O_3-SiO_2
V_2O_5-P_2O_5-BaO	CoO-Al_2O_3-SiO_2
V_2O_5-GeO_2-BaO	FeO-Al_2O_3-SiO_2
V_2O_5-PbO-Fe_2O_3	TiO_2-B_2O_3-BaO
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3.Dielectric films

SiO_x, Al_2O_3, ZrO_2, TA_2O_3, Si_3N_4, BN,.....

The first contains the covalent bonded non-crystalline semiconductors which contain :-

a-The tetrahedral semiconductor which only be prepared by thin film deposition.

b-Tetrahedral glasses.

c-Lone pair semiconductor.

The second main group contains the oxide glasses which have strong ionic bonds and hence have been reviewed by Mackenzie[2] and Owen[3].

The third group are the dielectric films , mentioned above, which sensitive to disorder as their electronic conduction relies on deviation from stoichiometry and the presence of defects center which acts as donors and acceptors.These materials have been reviwed by Scher[4] and Hill[5].

Upon cooling a liquid below its melting point it will be either crystalline or glass(Tauc)[6]. During crystallization the viscosity ,entropy and the internal energy change discontinuously and the transformation is first order.

In glass formation, however, these properties change continuously although the change may be rapid in the range near the glass transition temperature(T_g).

Fig(1.1) shows the temperature dependence of the volume of a material which can either form glass or crystallize. Cohen and Turnbull[7,8] have treated in details the condition whereby