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Despite then any techonological advances in the past twenty years, the field of amorphous semiconductors is still relatively new and it is not too surprising that our understanding of the physics of these important materials is not yet comparable with the level reached in crystalline semiconductors. The interest in the field of amorphous semiconductors has a major quantum jump between 1967 and 1969 after Ovshinsky's work (1) on switching and memory devices based on amorphous chalcogenides and his suggestion that by controlling the structure and composition of disordered semiconductors, a variety of new thin film devices should be feasible.

In the very brief time, we have seen the development of commercial computer memories, television pick-up tubes, solar cells, X-ray mirrors, thermoelectric devices based on amorphous materials.

A year later, the concepts of mobility edges and exponential tail states were formulated in the mott, CFO models. In 1972 Spear and Lecomber demonstrated by field effect measurements the low gap states density in glow discharge a-Si. During the following years exciting new insight in to the defect chemistry of chalcogenides glasses was attained.

Solid materials can be classified as crystalline or amorphous. The concept of density of states is equally valid for crystalline and noncrystalline materials. Which is denoted by N(E) or g(E). The density of states in non-crystalline materials does not differ greatly from the corresponding form, in the crystalline, except localized states may appear in the forbidden energy range. The wave function is modified in amorphous materials. Amorphous semiconductors are not completely disordered on the atomic scale. Local chemistry provides almost rigorous bond-lenght, and to a lesser extent, bond angle constraints on the near-est neighbour environment. Amorphous semiconductors do not consist of close-packed atoms, but rather they contain covalently bonded atoms. The short range order is directly responsible for observable semiconductor properties such as activated electrical conductivities.

The two normal ways of preparing amorphous solids are 1) by evaporation, sputtering, or similar methods of deposition, 2) by cooling from a melt (quenching).

Generally speaking, most amorphous solids that can be prepared by cooling from the melt are insulators or wide gap semiconductors in which mobility gap is greater than about 1 eV. Examples include Se, SeTe, and similar chalcogenide compounds.

Gubanov 1) showed that near the edges of conduction or valence band in non crystalline materials the states are localized and the concept of localization plays an important role. This concept was first introduced by Mott (2). The band structure of amorphous semicoductors determines the electrical transport properties, such as the electrical conductivity, thermoelectric power.

The well known band models are suggested by Cohen-Fritzsche-Ovshinsky(3). and Davis-Mott (4). Thay all used the concept of localized states in the band tails. Opinions vary, however, as to the extent of this tailing.

A different approach to the understanding of the electrical properties of amorphous semiconductors has been put forward by Emin (5). He suggested that the charge carriers in some amorphous materials might be small polarons. He was able to analyze experimental data of dc conductivity, thermopower, obtained on some chalcogenide glasses. It is generally accepted that hopping of small polarons is the mechanism responsible for electrical transport in oxide glasses.

Chapter I describes the basic concepts of amorphous semiconductors such as the energy band diagram of amorphous semiconductors and various models describing the electronic density of states. Here the fundamental question arises

whether the features of the band structure of the crystalline materials are preserved when going from the crystalline to the disordered state. The amorphous structure is confirmed from diffraction pattern of an amorphous solid. The concept of localized states, mobility edge, Fermi energy are discussed while describing the structure of amorphous solids.

The important problem of electronic structure is the density of states available to electrons as they move through the disordered system. N(E), as a function of their energy E.

The nature of defects of chalcogenides, the original proposals of street (6) is discussed in detail. Chemical bond description given by Kastner et al (7) is followed by Anderson proposal.

chapter II describes electrical properties of non crystalline semiconductors. Temperature variation of dc conductivity and thermoelectric power is discussed with appropriate mathematical relations. The essential features of the Davis and Mott Model for the band structure of amorphous semiconductors leads to three basically different channels for conduction. Emin's ideas of small polaron formation in non-crystalline material is discussed. Holstein's (8) fundamental concept of "coincidence event" is

explained which characterizes the hopping mechanism.

Chapter III is concerned with experimental studies such as preparation of sample, X-ray diffraction pattern, I-V characteristics, dc conductivity and thermoelectric power. The experimental observation tables and formulae used for calculations are listed in the same chapter. In this disseration the results of I-V characteristics dc conductivity, thermoelectric power of two series of amorphous semiconductors $Se_{70}Te_{30}$, $Se_{70}Te_{30-x}Sb_x$ and $Sb_{70}Se_{30-x}Cu_x$ (where x = 1,3,5,7,9% atomic weight) for series Se-Te-Sb and (x = 5,7% atomic weight) for Sb-Se-Cu.

The electrical conductivity and thermoelectric power measurements of Se-Te have been reported by Zope. [9]. The thermoelectric power in Se-Te is reported by Edmond [10]. The field dependence of electrical conductivity of Se-Te has been reported by Mahera [11]. The dc conductivity of chalcogenide glass system, Se-Te-Sb as a function of temperature is reported by P. Nagels and Sakai [12,13]. They showed that the conductivity increases with increasing contents of Sb, and thus decrease in activation energy.

Chapter IV deals with results and discussion of above mentioned studies. The non-linear I-V behaviour is discussed on the basis of charge defect states. The difference of activation energy obtained from conducitivity and

thermoelectric measurements has been discussed on the basis of long-range electrostatic potential fluctuations.

Although we do not know what new insight will emerge over the next years, we can be confident that the study of amorphous materials will take its proper place at the forefront of Solid State Physics in the near future.

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