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Investigation of Electrical Properties of CNT- $Se_{90}S_5Zn_5$ bi-layer Structure Mixed by Swift Heavy ions Irradiation

Shabir Ahmad[1], Muzzammil Ahmad Bhat[3], Mohd. Nasir[1], Hana Khan[1], Javid Ali[1], K. Asokan[2], M. Zulfequar[1*].

[1]*Department of Physics, Jamia Millia Islamia, New Delhi (India)*

[2]*Materials Science Division, Inter University Accelerator Centre, New Delhi (India)*

[3]*Department of Physics, RDVV, Jabalpur (India)*

ABSTRACT

Multi-walled carbon nanotubes (MWCNTs) thin films were grown on cleaned glass substrate by spin coating technique. The dispersed solution from which the MWCNTs thin films are grown contains 0.05 mg of carbon nanotubes in 5 ml DMF solution. $Se_{90}S_5Zn_5$ thin films has been deposited by thermal evaporation technique above the prepared MWCNTs layer. The investigated thin films of CNT- $Se_{90}S_5Zn_5$ bi-layer system were irradiated by 70 MeV Ni^{7+} ions in the fluence range of 1×10^{12} ions/cm^2 to 5×10^{13}ions/cm^2 for mixing the bi-layer system. The surface morphological analysis was carried out by FESEM which clearly shows $Se_{90}S_5Zn_5$ coating above carbon nanotubes. Temperature dependence of dc conductivity show an enhancement of the electrical conductivity and a reduction in activation energy after irradiation.

***Keywords*: Bi-layer thin film; Swift Heavy Ion Irradiation; Electrical Properties.**

I. INTRODUCTION

In the last several decades, compound semiconductors develops more interest of researchers because they have potential applications in optoelectronic fields such as displays, sensors, microwave communication, solar cells, optical communication and radiation detector [1- 7] etc. Devices based on chalcogenide compounds like CdSe, CdTe, CIGS, CZTSSe etc. show good advantages over silicon based devices because of their physical properties. This study investigated effect of SWCNTs on $Se_{90}S_5Zn_5$ compound semiconductor material for property modification. Because there are several factors like lower absorption due to lattice mismatch, lower mobility etc. which could affect the physical properties of $Se_{90}S_5Zn_5$. Here we have choose SWCNT as dopant material for $Se_{90}S_5Zn_5$ compound, because multi-walled carbon nanotubes have the features like tunable band gap, high absorption coefficient, and high intrinsic charge carrier mobility [10- 13].

II. EXPERIMENTAL STUDIES

Thermal quenching technique has been used for the preparation of bulk sample of amorphous selenium. Fine powder of pure Se, S and Zn having purity (99.999%) was put into quartz ampoule. This ampoule was sealed