

Investigation of Physical Properties of CNT-Se bi-layer system Mixed by 70 MeV Ni⁷⁺ ions and by Pulsed Laser Irradiation

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ABSTRACT

Thin films of multi-walled carbon nanotubes (MWCNTs) were grown on glass substrate by spin coating technique from dispersed solution contains 0.05 mg of carbon nanotubes in 5 ml DMF solution. Thin films of selenium has been deposited by thermal evaporation technique above the MWCNTs layer. The investigated thin films of CNT-Se bi-layer system were irradiated by 70 MeV Ni⁷⁺ ions and by pulsed laser irradiation for mixing the bi-layer system. The surface morphological analysis was carried out by FESEM which clearly shows covering of selenium nanoparticles above carbon nanotubes. The surface morphology also shows selenium layer is embedded into the MWCNTs layer after irradiation. Raman analysis displays the presence of characteristic bands in the CNT-Se bi-layer system before and after irradiation. Electrical analysis shows an enhancement of electrical conductivity and reduction of an activation energy after irradiation. The electrical conductivity of the irradiated thin films of CNT-Se bi-layer system lies in between the conductivity's of thin films of isolated Selenium and MWCNT's.

Keywords: *Thin films; Laser-irradiation; Swift Heavy Ion Irradiation; Electrical Properties.*

1. INTRODUCTION

Compound semiconductors have potential applications in optoelectronic fields such as displays, sensors, microwave communication, solar cells, optical communication and radiation detector [1-4] etc. They provide a wide variety of energy gaps and mobility's, so that materials are available with properties that meet specific requirements, which is the major advantage of the compound semiconductors over elemental semiconductors like silicon and germanium. Selenium based compound semiconductors have been extensively studied over the past decades because they are the promising materials receiving attention in view of the fabrication of various solid state devices. This study describes the physical properties of CNT-Se bi-layer system (compound semiconductor) mixed by irradiation techniques for property modification. Because (multi-walled carbon nanotubes) MWCNTs have the features like tunable band gap, high absorption coefficient, and high intrinsic