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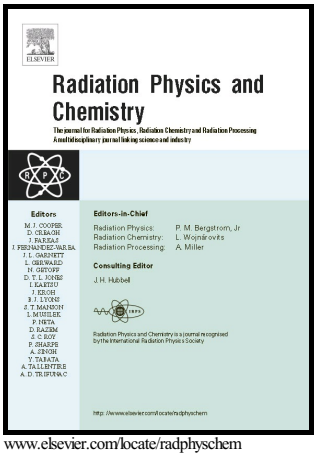

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Abstract

We report high dose gamma-ray (γ-ray) induced modifications incurred by polycrystalline cadmium selenide (CdSe) nanowires of 80 nm diameter. The nanowires have been synthesized using polycarbonate template assisted electro-deposition technique. The samples were irradiated with ^{60}Co γ-radiation at a dose rate of 4.533 kGy/h for different time intervals with doses varying from 0 to 400 kGy. The effects of γ rays on the structural, morphological, optical and electrical properties of nanowires are discussed. XRD patterns of as-synthesized and gamma irradiated CdSe nanowires did not show any phase transformations but the variation in relative intensity was observed. The crystallite size evaluated using Scherrer's formula was found to vary. The optical parameters were obtained using UV-Vis spectrometer measurements of absorption. Band gap was found to decrease with γ irradiation up to a dose of 300 kGy after which it was seen to increase. Refractive index and optical dielectric constants were also evaluated. Subjection of γ-radiation also brings about key changes in the electrical properties of CdSe nanowires. The attained data shows that the electrical conductivity varies with absorbed dose. The variations in the properties of CdSe nanowires can be considered as a consequence of ionization process, defect production and its annihilation.

Keywords: CdSe Nanowires; Electro-deposition; Gamma Irradiation; Structural Properties; Optical Properties; Transport Properties

1. Introduction

One dimensional nanostructure of II-VI semiconductor compounds, such as CdSe, CdTe and CdS, represent an extensive class of materials [1]. Recent advancements in semiconductor nanowires (SNW's) have attracted much attention and stimulated great opportunities for nanoscale device applications in various research fields such as microelectronics, energy storage, medical sensing, drug delivery, communications, computation technology etc [2-4]. Hexagonal cadmium selenide (CdSe) is a significant II–VI semiconductor with a direct band gap of 1.75 eV at room temperature and often possesses n-type conductivity [5].