



Contents lists available at ScienceDirect

Journal of Alloys and Compounds

journal homepage: www.elsevier.com/locate/jallcom



Effects of laser irradiation on optical properties of amorphous and annealed $\text{Ga}_{15}\text{Se}_{81}\text{In}_4$ and $\text{Ga}_{15}\text{Se}_{79}\text{In}_6$ chalcogenide thin films

A.A. Al-Ghamdi^a, Shamshad A. Khan^{a,*}, S. Al-Heniti^a, F.A. Al-Agel^a, T. Al-Harbi^a, M. Zulfequar^b

^a Department of Physics, Faculty of Science, King Abdul Aziz University, Jeddah 21589, Saudi Arabia

^b Department of Physics, Jamia Millia Islamia, New Delhi 110025, India

ARTICLE INFO

Article history:

Received 29 April 2010

Received in revised form 8 June 2010

Accepted 10 June 2010

Available online 17 June 2010

Keywords:

Annealing

Crystallization

Chalcogenide glasses

Optical band gap

Absorption coefficient

Laser irradiation

ABSTRACT

Amorphous thin films of $\text{Ga}_{15}\text{Se}_{81}\text{In}_4$ and $\text{Ga}_{15}\text{Se}_{79}\text{In}_6$ glassy alloys with thickness 3000 Å were prepared by thermal evaporation onto chemically cleaned glass substrates. The changes in optical properties due to the influence of laser radiation on amorphous and thermally annealed thin films of $\text{Ga}_{15}\text{Se}_{81}\text{In}_4$ and $\text{Ga}_{15}\text{Se}_{79}\text{In}_6$ were calculated from absorbance and reflectance spectra as a function of photon energy in the wave length region 400–1000 nm. Analysis of the optical absorption data shows that the rule of non-direct transitions predominates. The optical band gaps observed to decrease with the increase of annealing temperatures. Furthermore, exposing thin films to laser irradiation leads to a decrease in optical band gap, absorption coefficient, refractive index and extinction coefficient for both as-prepared and annealed films. The decrease in the optical band gap is explained on the basis of change in nature of films, from amorphous to polycrystalline state, with the increase of annealing temperature and by laser irradiation for 10 min exposure time. Outcomes of our study confirm that this system may be used for photovoltaic devices.