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Effect of annealing on optical constants of Se₇₅S₂₅-xCd_x chalcogenide thin films

(2009) *Physica B: Condensed Matter*, 404 (8-11), pp. 1354-1358.

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Abstract

The optical band gap and optical constants of as deposited and annealed thin films with thickness 3000 Å prepared by thermal evaporation technique of Se₇₅S₂₅-xCd_x (where x=0, 2, and 4) chalcogenide glasses have been investigated as a function of photon energy in the wavelength region 400-1000 nm. Thin films were thermally annealed for one hour at three different temperatures chosen from the region in between their glass transition and crystallization temperatures. The glass transition and crystallization temperatures were measured by using non-isothermal DSC measurements. The absorption coefficient and optical band gap was found to increase with the increase in annealing temperatures, while the values of refractive index (n) and the extinction coefficient (k) decreases with the increase in annealing temperature. dc Conductivity measurements on thin films of Se₇₅S₂₅-xCd_x are also reported in the temperature range 303-375 K. It has been observed that the conduction is due to thermally assisted tunneling of the carriers in the localized states near the band edges. The dc conductivity and activation energy were observed to increase on adding cadmium concentration in the present system. © 2009 Elsevier B.V. All rights reserved.

Author Keywords

Absorption coefficient; Activation energy; Annealing; Chalcogenide glasses; dc Conductivity; Optical band gap

ISSN: 09214526