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Effect of Ag incorporation on electrical and optical properties of Se-S chalcogenide thin films

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Abstract

The dc electrical conductivity of as evaporated thin films of $\text{Se}_{75}\text{S}_{25-x}\text{Ag}_x$, grown by vacuum evaporation technique is measured as a function of temperature (294-383 K). It is observed that the dc conductivity decreases at all the temperatures with the increase of silver content in the binary system. The experimental data suggests that the conduction is due to thermally assisted tunneling of the carriers in the localized states near the band edges. The extracted value of activation energy is found to increase on incorporation of silver contents in the Se-S system. Compositional dependence of the optical properties of as deposited $\text{Se}_{75}\text{S}_{25-x}\text{Ag}_x$ thin films of thickness 300 nm have also been studied in the spectral range from 400 to 1000 nm. It has been found that the optical band gap increases on incorporation of silver contents in Se-S system. The values of absorption coefficient (α) and extinction coefficient (k) increases with increasing photon energy and silver concentration. The results are interpreted in terms of the change in concentration of localized states due to the shift in Fermi level. © 2009 Elsevier B.V. All rights reserved.

Author Keywords

Absorption coefficient; Activation energy optical band gap; Chalcogenide glasses; dc Conductivity; Thin films

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