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High Field Conduction in Thin Films of $a-(\text{Ge}_{.20}\{\text{Se}_{0.80}\}_{1-x}\{\text{Pb}\}_x)$ Glassy Alloys

Rachna SINGH and Santosh KUMAR

Department of Physics, Christ Church College, Kanpur-208001, INDIA

e-mail: dr_santosh.kr@yahoo.com



[Keywords](#)

[Authors](#)



phys@tubitak.gov.tr

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Abstract: The present paper reports d.c. conductivity measurements at high electric fields in vacuum evaporated amorphous thin films of $(\text{Ge}_{.20}\text{Se}_{0.80})_{1-x}\text{Pb}_x$ (where $x = 0, 0.02, 0.04, 0.06$ and 0.10) glassy alloys. Current-Voltage (I-V) Characteristics have been measured at various fixed temperatures. In these samples, at low electric fields, ohmic behavior is observed. However, at high electric fields ($E \sim 10^4$ V/cm), non-ohmic behavior is observed. An analysis of the experimental data confirms the presence of space charge limited conduction (SCLC) in the glassy materials studied in the present case. From the fitting of the data to the theory of SCLC, the density of defect states (DOS) near Fermi level is calculated. It is found that the DOS is increasing with increase in concentration of Pb in pure binary $\text{Ge}_{0.20}\text{Se}_{0.80}$ glassy system. The peculiar role of third element Pb as an impurity in the pure binary $\text{Ge}_{0.20}\text{Se}_{0.80}$ glassy alloy is also discussed.

Key Words: Thin films, Chalcogenide glasses, SCLC, DOS

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