Journal of Non-Crystalline Solids 35 & 36 (1980) 981-986

INVESTIGATION OF HOLE TRANSPORT IN VITREOUS As_2S_3

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The time-of-flight measurements of the hole drift in As_2S_3 films have shown that below 80°C the typical dispersive transport occurs. Very low drift mobility values ($\sim 10^{-10}$ cm^2/Vs at 45°C) correspond to an activation energy of 0.6 to 0.8 eV at low injection levels. At high-level injection obtained with the forward biased p-Si-As_2S_3 heterojunction the drift mobility is much greater and has the value of 10^{-5} cm^2/Vs at room temperature.

The hole transport in As_2S_3 is poorly investigated due to very low carrier drift mobility. Time-of-flight measurements at elevated temperatures recently made in our laboratory [1] yield the drift mobility $\mu_d = 10^{-10}$ cm^2/Vs at 45°C for the field $E = 2.5 \times 10^5$ V/cm. Transient current decay below T=80°C is typical for a dispersive charge transport known for several disordered solids [2]. The dispersive transport is described as a stochastic process, in which the dispersion arises from the broad distribution of event times. The microscopic nature of mechanisms responsible for the dispersion may be described in various versions of hopping or multiple trapping processes [2,3].

In this connection it appears to be useful to study the hole drift at various levels of a stationary excitation, which alters the occupation of traps. In this communication we present the results of the hole transport measurements in thin films (L=(0.6 to 6.8) μm) of As_2S_3 by the time-of-flight method made in darkness and under additional illumination distributed uniformly over the sample volume. To achieve higher levels of filling traps the carrier injection into As_2S_3 through a heterojunction p-Si-As_2S_3 was used; in this case the mobility was calculated from space-charge-limited current