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Electrical Switching In Potassium-Boro-Vanadate-Iron Glasses

Harshvadan R. PANCHAL, Dinesh K. KANCHAN
Physics Department, Faculty of science, M.S. University,
390 002, Baroda-INDIA



Abstract: Electrical switching has been observed in $20K_2O : (75-y)V_2O_5 : yB_2O_3 : 5Fe_2O_3$ glasses which were prepared by a splat quenching method. To investigate switching phenomenon, glass samples of the same dimension from as quenched material were examined for their I-V characteristics at various ambient temperatures. The exponential decrease of switching voltage is observed with increasing ambient temperature indicating the cause of switching due to Joule's heating. It is also observed that the switching voltage can be controlled by varying the ambient temperature and switching temperature by changing the voltage. The dependence of switching temperature on the amount of V_2O_5 has also been observed. An increase in V_2O_5 enhances the conductivity of these glasses which requires less input power and lower ambient temperature to induce switching in these glasses. When the applied voltage approaches the switching voltage, the sample temperature has been found to be higher than the ambient temperature. The radiation loss from the sample is expected to be a function of input power $P= I.V$. The switching behaviour in these semiconducting glasses is found to be temperature dependent which may be understood in terms of Joule's heating. The present glass system may be used as voltage as well as thermal switching.

Key Words: Electrical Conduction, Electrical Switching, Switching Voltage, Radiation loss

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