School of Electrical, Computer and Energy Engineering

M.S. Final Oral Defense
Radiation sensing using chalcogenide glass materials

by
Ankitha Chandran
11/20/2012
3:30 P.M
GWC 409

Committee:
Dr. Michael N Kozicki (chair)
Dr. Hugh Barnaby
Dr. Keith Holbert

Abstract
Chalcogenide glasses have gained popularity by their use in new non volatile memory technologies. The incorporation of silver ions into the material changes the resistivity of the material by a great extent. The incorporation process can be the result of ultra violet light or thermal processes. This property of chalcogenide glasses has been exploited in their use as radiation sensors.

Test structures were designed and process flow was developed for their fabrication. They were designed such that sensitivity to radiation could be studied focusing on the effect of gamma rays on germanium selenide (Ge30Se70) chalcogenide glass. The test structures were electrically characterized prior to and post irradiation by performing current voltage sweeps on them. A change in resistance was observed post irradiation. This change was found to be dependent on the radiation dose. The structures were also characterized using atomic force microscopy and roughness measurements were made prior to and post irradiation. The experiment was also carried out for ultra violet light. The change in resistance brought about by radiation was explained using atomic force microscopy. A change in roughness of silver films on Ge30Se70 was observed. This
indicated the loss of continuity of the film which causes the drop in resistive post irradiation. Recovery of initial resistance in the structures was also noticed and explained when the radiation stress was removed.

The results prove chalcogenide based radiation sensing to be successful and the sensitivity is dependent on the radiation dose. The structure cross-section has an important role to play in determining the initial resistance level. The change in resistance with radiation was explained.