EXECUTIVE SUMMARY OF MINOR RESEARCH PROJECT

Name of the Principal Investigator	: **Dr. Jayaprakash Gowda**
Title of research project	**: Effect of 8MeV Electron Irradiation on Optical and Electrical properties of metal ion doped Triglycine Sulphate single crystals**
UGC Reference No.	**: MRP(S)-0124/12-13/KAMA002/UGC-SWRO dated 29-03-2013**

Triglycine sulfate (TGS) crystal is one of the interesting ferroelectric materials which finds applications in the fabrication of infrared detectors, pyroelectric vidicon tubes operating at room temperature, in the fabrication of capacitors, transducers and sensors. It has a second-order phase transition at the Curie point (49^{o}C). The defects introduced by irradiation in the materials play an important role in modifying their physical, mechanical and optical properties. The use of ion irradiation for the modification and control of the properties of a wide range of materials has revolutionized the fabrication of many systems and is being employed in an increasing number of applications.

Single crystals are mainly used in optical applications, the optical transmission range and the transparency cutoffs are important. To determine the transmission range and hence to know the suitability of TGS and doped TGS single crystals for optical application, the grown single crystals were cut in to slices of dimension around $10 \times 10 \times 1$ mm^3.

UV-Vis transmission spectroscopy was carried out using a Shimadzu UV-VIS -3600 spectrophotometer in the wavelength range 200 - 700 nm. The surrounding medium was air and all the measurements were done at room temperature. The incident unpolarized light was nearly perpendicular to the (010) plane. The samples were also exposed to electron beam of dosage 10 kGy, 20 kGy and 30 kGy and the UV-vis spectrum was recorded. From the UV-vis spectra, the shift of absorption edge was studied.

From the transmittance spectra, it is noticed that pure TGS crystal has a transmittance of more than 95 % in the visible region. A strong absorption is observed at about 230 nm for the crystal and this corresponds to the fundamental absorption and UV cutoff wavelength. Absorption in the near ultraviolet region arises from electronic transitions associated within the samples.

The cut-off wavelength of unirradiated TGS crystals doped with barium, copper, lead and manganese lies at about 225 nm. In case of electron irradiated samples the cut-off is moved slightly towards the higher wavelength region.The general level of absorption in TGS crystals increases under the influence of irradiation by electrons. This is probably due to the scattering by electron irradiation induced defects in the crystals.

For the electron irradiated crystals, the absorption peak was found to be shifted towards the lower energy region as the irradiation dose increases. This may be attributed to point defects created in the crystals during electron irradiation by direct interaction of Compton electrons with lattice atoms and by multiple collisions.

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