Influence of ion-implantation on thermoluminescence of synthetic quartz

Nsengiyumva Schadrack*†[1], Luc Pichon[2], and Makaiko Chithambo[1]

[1]Rhodes University – Department of Physics and Electronics, Rhodes University, Grahamstown 6140, South Africa, South Africa

[2]Institut Pprime (PPRIME) – CNRS : UPR3346, Université de Poitiers, ENSMA – France

Abstract

Thermoluminescence of synthetic quartz exposed to beta irradiation following implantation with 60 keV N+ ions at fluences ranging between 1x1014 and 5x1015 ions/cm2 is reported. The glow curve measured at
5 oC/s consists of the main peak at 110 oC, studied in this work, and minor glow-peaks at 180 oC and
230 oC. The thermoluminescence intensity decreases as the fluence is increased, independently of the heating rate. However for a particular sample and fluence, the thermoluminescence signal is enhanced with increase in the heating rate except for the unimplanted sample where the intensity decreases with heating rate probably due to thermal quenching. This mechanism which can be described by the Mott-Seitz model is attributable to two competing transitions, i.e. radiative and nonradiative transitions taking place within the recombination centers.

Keywords: thermoluminescence, ion implantation, fluence, synthetic quartz

*Speaker

†Corresponding author: s.nsengiyumva@ru.ac.za