

Abstract

Thermoluminescence (TL) is a thermally stimulated emission of light following a previous absorption of energy from radiation. Three essential ingredients are necessary to produce TL. Firstly, the material must be an insulator or a semiconductor. Secondly, the material must have at some time absorbed energy during exposure to ionising radiation such as beta rays, X-rays and gamma rays. The absorption of radiant energy results in ionisation of valence electrons, producing energetic electrons and holes which will, after thermalisation, produce free electrons in the conduction band and free holes in the valence band. These charge carriers may be trapped in defects within the band gap. Thirdly, the luminescence emission is triggered by heating the material. Upon stimulation by heat, the charge carrier migrates through the conduction band of the solid crystal until it undergoes recombination at recombination centre with emission of light quanta, i.e., thermoluminescence.

This presentation is 3-fold: (1) I will highlight the basic concepts of thermoluminescence based on a simple model also known as one-trap one-recombination centre model (OTOR); (2) I will present the analytical methods used to extract kinetic parameters that are characteristics of traps in the band gap. These parameters include the activation energy or the trap depth E , energy needed to release an electron from the trap to the conduction band, the frequency factor or attempt to escape s , proportional to the frequency of the collisions of the electron with the lattice phonons and the order of kinetics b ; (3) I will eventually share some results on thermoluminescent materials I have investigated.