TL Emission Spectra Measured Using a Spectrometer Coupled to the Risoe TL/OSL Reader

Maíra Yoshizumi, Linda Caldas

Instituto de Pesquisas Energéticas e Nucleares, Comissão Nacional de Energia Nuclear (IPEN-CNEN/SP), Av. Prof. Lineu Prestes, 2242, São Paulo, 05508000, Brazil

mairaty@ipen.br

Although the use of thermoluminescence phenomena for radiation dosimetry ages from the early 1950s, the search for new dosimetric materials and for the comprehension of the thermoluminescent mechanism remains nowadays.

Thermoluminescent dosemeters are organic or inorganic crystals with defects or imperfections in their crystalline lattices. According to the energy band theory of solids, the crystal defects or imperfections give rise to energy levels localized at the forbidden gap which can trap electrons or holes created by ionizing radiation incidence. When trapped electrons or holes are stimulated, they can escape to the conduction band and recombine, emitting luminescence.

The luminescent emission wavelength depends on the recombination centre depth. The deeper the recombination centre is, the smaller the luminescence wavelength will be. The emission spectrum of luminescent materials, along with other studies, helps understanding the defects or imperfections in the crystal lattice and the kinematic phenomenon.

In this work, a Hamamatsu CCD detector with a 2-D arrangement of pixels (1044×64) based spectrometer was connected to a Risoe TL/OSL reader, model DA-20. This connection was made through an optical fibre. This spectrometer is preconfigured for the UV-VIS-NIR region (200–1100 nm). Well-known luminescent materials were used to test the spectrometric arrangement. LiF, $CaSO_4$ and Al_2O_3 are some examples of materials which emission spectra were measured in this work.