The thermoluminescent response of several phosphors to monoenergetic photon beams with energies from 275 to 2,550 eV

Ricardo Enrique Carrillo Beltran

The thermoluminescent (TL) response of LiF:Mg,Ti (TLD-100) and CaF$\sb2$:Dy (TLD-200) to monoenergetic photon beams was measured for photons with energies between 275 and 2,550 eV produced by the Aladdin synchrotron accelerator of the UW-Madison. The change of the TL response, as measured by the 130-215$\sp\circ$C integrated light output for TLD-100, the 170-250$\sp\circ$C TL interval for TLD-200 and the height of the main dosimetric peak at 200$\sp\circ$C for both phosphors as a function of total energy deposited up to saturation is described. Glow curves were determined for TLDs annealed in helium and irradiated at various photon energies. Glow curves showing the adverse effect of air annealing upon the TL sensitivity of these phosphors are presented as well. Supralinearity factors for each TLD type were calculated using the integrated TL and the main peak height and are listed for the photon energy beams employed. High surface doses were achieved with these irradiations because of the short mean free path of the photons and the even shorter range of the freed electrons, both plotted. Despite the shallower penetration of the photons in TLD-200 as compared to TLD-100, the former phosphor was found to be more suitable for routine use as a synchrotron radiation monitor because its TL properties change very little with photon energy as shown by its constant glow curve obtained. TLD-100 glow curve, either from a chip or a crystal, changed according to the photon energy employed; this adverse effect was more pronounced with the chips.