ABSTRACT

LiF powder (TLD-100) was given single exposures up to 2.5×10^6R of ^{137}Cs γ-rays and 60 keV effective x rays. The samples were annealed at 420°C for two hours, and then given a test exposure. The sensitivity factor, S/S_o, was determined. S is the TL response to 100R following the irradiation and annealing; and S_o is the TL response to 100R of unused material. Within experimental error S/S_o vs. absorbed dose (D) can be expressed as the sum of two exponentials.

For ^{137}Cs γ-rays:

$$S/S_o = 0.60 \exp(-0.25 \times 10^{-4} D) + 0.40 \exp(-0.26 \times 10^{-6} D)$$

For 60 keV effective x rays:

$$S/S_o = 0.51 \exp(-0.22 \times 10^{-4} D) + 0.49 \exp(-0.22 \times 10^{-6} D)$$

Multiple exposures of radiation to LiF causes greater radiation damage than predicted by the above equations for single exposures.

A possible interpretation of the double exponential form of the data is that the first exponential is due to radiation damage to unfilled traps and the second to radiation damage to filled traps. This would qualitatively explain the increased damage due to repeated exposures.

If, following the single exposures, the LiF is annealed at 280°C instead of 420°C then S/S_o increases to about six for ^{137}Cs exposures and to about five for 60 keV effective x rays, and decreases for exposures greater then 10^5R.