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Characterization of elpasolite $(\text{Cs,Tl})_2\text{LiLaBr}_6:\text{Ce}$ (CTLLB) crystal performance after sequential gamma irradiation exposure

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Abstract

Elpasolite scintillators show great promise for dual mode neutron-gamma radiation detection and imaging but the impact of high dose radiation on performance characteristics has not been evaluated. Crystalline $(\text{Cs,Tl})_2\text{LiLaBr}_6:\text{Ce}$ (CTLLB) materials are grown. After growth the 1-inch diameter crystals are processed and packaged. Prior to the irradiation sequence at SRNL, the detector performance of the encapsulated crystal is measured with gamma-ray check sources including ^{137}Cs and ^{152}Eu . Properties such as energy resolution, light yield, proportionality behavior, and decay times are measured. The packaged crystal is irradiated four times at dose rates of 1, 10, 100 and 1,000 Gy of absorbed dose in a ^{60}Co irradiation and the performance of the crystal is evaluated before and after each radiation treatment. Cumulative dose rates between irradiation were 1, 11, 111 and 1,111 Gy. Initial results show a decreased measured light yield after each radiation exposure, however further analysis on the packaging materials will be pursued.

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Characterization of Elpasolite $(\text{Cs,Tl})_2\text{LiLaBr}_6:\text{Ce}$ (C/TLLB) Crystal Performance after Sequential Gamma Irradiation Exposure

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