

Magnetic resonance investigation of the dynamics of F centers in LiF

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Damage caused in lithium fluoride crystals by γ -rays and electrons includes, besides other point defects, F centers and their agglomerates. We have studied the paramagnetic F centers created by radiation doses that vary by several orders of magnitude. We measured the electronic spin relaxation time T_{1e} of the F centers at low temperatures by the recovery of the magnetic circular dichroism of absorption (MCDA) as well as the temperature dependence of the ^{19}F and ^7Li nuclear spin relaxation (NSR) times, T_{1n} . Our results indicate that the nuclear spin relaxation is dominated by spin-diffusion limited paramagnetic relaxation. The electron spin correlation function is determined by the electronic spin-lattice relaxation. In the studied temperature range from 4 to 300 K, the electron spin-lattice relaxation time T_{1e} is long compared to the nuclear Larmor period, $\omega L T_{1e} \gg 1$ (ωL : nuclear Larmor frequency). The temperature variation of T_{1n} indicates that the electron spin-lattice relaxation is dominated by phonon-F center interactions. At temperatures T greater than 360 K, an annealing process takes place that eliminates the F centers and their agglomerates.