

Impact of temperature on excitation, emission and cross-relaxation processes of terbium ions in GGAG single crystal.

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Streszczenie

Terbium ions in $Gd_3Ga_3Al_2O_{12}$ (GGAG) single crystal exhibit strong luminescence originated in the 5D_3 and 5D_4 multiplets. The decay time of the 5D_3 state is 1072 μs and 724 μs at 5K and 300K, respectively. The time dependence of luminescence originated from the 5D_4 multiplet is consistent with single exponential decay, with lifetime values 3579 μs at low temperature and 2902 μs at 300K. The non-exponential decay curves have been fitted in the frame of Inokuti-Hirayama model, indicating that the dipole-dipole interaction plays an important role in the fluorescence quenching of the 5D_3 level. The calculated R_0 parameter values are equal to 11.56 \AA and 12.86 \AA for 5 and 300K, respectively. The positions of multiplets up to 40000cm^{-1} are determined employing the f-shell empirical programs. CIE 1931 coordinates are $x=0.298$, $y=0.664$ (green) at 5K and $x=0.360$, $y=0.538$ (yellowish green) at 300K.

Słowa kluczowe

GGAG, Garnet, New phosphor, terbium, Solid state solution, luminescence, Low temperature

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