

Concentration dependence of energy transfer between Eu^{3+} ions occupying two symmetry sites in Lu_2O_3 .

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Streszczenie

A series of Lu_2O_3 samples doped with Eu was prepared in the form of sintered tablets. The activator concentration was 0.2, 1, 3, 5, 7 and 10% with respect to Lu. Emission spectra excited with light of various energies were taken at liquid nitrogen and room temperature. Excitation spectra of characteristic Eu emission lines for two different symmetry sites in Lu_2O_3 (C_2 and S_6) were also recorded. It was shown that Eu ions located in the two different symmetry sites possess characteristic excitation spectra in the regions both of the ${}^7F_0 \rightarrow {}^5D_1$ absorption and of the charge transfer transitions. In both cases the levels of the $\text{Eu}(S_6)$ ions were located above those of the $\text{Eu}(C_2)$. In both emission and excitation spectra an energy transfer from Eu ions occupying the centrosymmetric S_6 site in Lu_2O_3 to Eu ions in the noncentrosymmetric C_2 site was observed. Some indications were found that an opposite back-transfer (from Eu in C_2 to Eu in the S_6 site) also occurs. Lower temperature significantly reduces the rate of the $\text{Eu}(S_6) \rightarrow \text{Eu}(C_2)$ transfer. Decay kinetics indicated that even at room temperature the $\text{Eu}(S_6)$ emission could be further reduced if the dopant content was higher than 10%. Both at room and liquid nitrogen temperatures the decay kinetics of the $\text{Eu}(C_2)$ emissions are characterized by the time constants of about 1.0 ms for all concentrations, indicating that up to 10% of the dopant content no concentration or thermal quenching takes place. The liquid nitrogen $\text{Eu}(S_6)$ luminescence is characterized by a time constant of about 7 ms for the 0.2% specimen. At room temperature this value decreases to 5.6 ms.

Adres publiczny

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