



Spectroscopy and structural characteristic of Yb³⁺ and Nd³⁺ ions doped nanostructured Lu₂O₃ and sol-gel derived silica host materials.

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$\text{Lu}_2\text{O}_3:\text{Ln}^{3+}$ (Nd^{3+} , Yb^{3+}) nanophosphors have been obtained by the solution combustion synthesis using a mixture of glutamic acid and glycine as a fuel. The average size of the crystallites, according to the X-ray diffraction, has covered the range 8–15 nm. $\text{Lu}_2\text{O}_3:\text{Yb}^{3+}$ samples have been prepared as a tablet by applying the pressure and sintering at 1200 °C in air and hydrogen atmospheres. The spectra have been measured at 10 K under X-ray excitation. The sample thermally treated in hydrogen exhibits complex broadband emission and, most probably, charge transfer luminescence. No $^2\text{F}_{5/2} \rightarrow ^2\text{F}_{7/2}$ emission, even though the presence of the Yb^{3+} ions has been confirmed by absorption electron spectroscopy has been observed. For the samples sintered in air both charge transfer and f–f luminescence have been recorded. The possible mechanisms of quenching f–f emission of the Yb^{3+} ions will be presented and correlated with the spectroscopic data. Two kinds of sol–gel derived silica ceramics doped with Nd^{3+} ions have been obtained. The first one contains $\text{Lu}_2\text{O}_3:\text{Nd}^{3+}$ nanocrystallites and has been thermally treated up to 1300 °C. It has been found that, contrary to the data reported until now, the sample heated up to 1000 °C exhibits almost the same emissive properties as compared to the dopant. Above this temperature nanocrystallites of the dopant undergo sintering with the silica matrix to crystalline $\text{Lu}_2\text{Si}_2\text{O}_7:\text{Nd}^{3+}$. At 1300 °C the reaction of forming disilicate is completed and no other crystalline form containing lanthanide ions has been detected. The second type of samples has been obtained using NaNdWO_4 ($\text{WoCCl}_3\text{CONPO}(\text{OCH}_3)_2$) complex as a lanthanide precursor. Creation of the nanometer-range crystallites has been confirmed both by spectroscopic and transmission electron microscopy methods. It has been proved that the Nd^{3+} ions are present in two different spectroscopic positions. One of them is not created in the sample of lower concentration of the dopant.

Słowa kluczowe

Nanocrystalline $\text{Lu}_2\text{O}_3:(\text{Nd}^{3+}, \text{Yb}^{3+})$, Nanocrystalline $\text{Lu}_2\text{Si}_2\text{O}_7:\text{Nd}^{3+}$, Charge transfer luminescence, Silica sol–gel

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