The effect of N^{3-} substitution for O^{2-} on optical properties of YAG:Ce^{3+} phosphor.

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Streszczenie

In the present work, yttrium aluminum garnet $Y_3Al_5O_{12-x}N_{2x/x}$(YAGN) was obtained using aluminum nitride (AlN) as a source of aluminum. YAGN was doped with the Ce^{3+}ions (YAGN:Ce) in concentrations from 0.5 to 14mol%. According to XRD analysis, the crystal structure of YAG is maintained with traces of Al_2O_3. Scanning electron microscope (SEM) studies showed that the nitrogen atoms are not quite uniformly incorporated into grains, which may easily lead to the formation of a number of various Y^{3+}sites. This means that Ce^{3+}ions can also occupy sites of different nitrogen/oxygen ratios. The probability of Ce^{3+}entering different sites changes with the dopant concentration. The emission and excitation spectra of Ce^{3+}exhibit concentration dependence. For concentrations in the range 0.5-7% emission bands are extended to longer and shorter wavelengths in comparison to the typical emission of Ce^{3+}in YAG. With the increase in the concentration of active ions (10-14mol%) excitation bands show further widening, and the emission bands shift gradually toward longer wavelengths, reaching the value of 45nm for 14mol%. The usefulness of these phosphors for application in white LED technology is discussed on the basis of the quantum efficiency of the emissions, luminescence decay times, and thermal quenching of the Ce^{3+}emission.

Słowa kluczowe

Oxonitride phosphor, YAG:Ce, Garnet, White LED, luminescence

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