

Ce³⁺ to Mn²⁺ energy transfer in Sr₃Y₂Ge₃O₁₂:Ce³⁺, Mn²⁺ garnet phosphor.

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Streszczenie

Ce³⁺ and Mn²⁺ singly doped and co-doped Sr₃Y₂Ge₃O₁₂ phosphors were synthesized by the solid-state reaction. In these phosphors Ce³⁺ ions occupy exclusively the Sr²⁺ site while Mn²⁺ ions mostly the Y³⁺ site with some traces in the Sr²⁺ site. Under excitation at 430 nm into the Ce³⁺ absorption band the Sr₃Y₂Ge₃O₁₂: Ce³⁺, Mn²⁺ phosphor emits green light from Ce³⁺ (530 nm) and red light from Mn²⁺ (630 nm) due to the Ce³⁺ → Mn²⁺ energy transfer. By appropriate ratio of the active ion concentrations the Ce³⁺ and Mn²⁺ co-doped Sr₃Y₂Ge₃O₁₂ phosphor can generate lights from green to orange region. We showed that the mechanism of energy transfer from Ce³⁺ to Mn²⁺ is of the resonance type and it occurs via an electric dipole-dipole interaction. Furthermore, we calculated the critical distance for Ce³⁺ → Mn²⁺ energy transfer to be 16.90 Å by concentration quenching methods.

Słowa kluczowe

Garnet structure, Ce³⁺, Mn²⁺, energy transfer, white LEDs

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