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A novel red-emitting Eu^{3+}-doped Na_2MgSiO_4 phosphor with high intensity of $^5D_0 \rightarrow {}^7F_4$ transition

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ABSTRACT

Novel red-emitting Na_2MgSiO_4: Eu^{3+} phosphors with different Eu^{3+} contents were synthesized by sol-gel method. The crystal structure was confirmed by X-ray powder diffraction. The luminescence properties and decay curves were investigated. The optical Eu^{3+} doping concentration of Na_2MgSiO_4: Eu^{3+} is about 5 mol%. The excitation spectrum exhibits a broad band of 250-500 nm. The abnormal dominant emission peak of Na_2MgSiO_4: Eu^{3+} phosphors excited effectively by 393.5 nm (near-UV) is located at 702 nm due to the $^5D_0 \rightarrow {}^7F_4$ transition that caused by the highly polarizable chemical circumstance. The CIE chromaticity coordinate and the photoluminescence quantum yield of the Na_2MgSiO_4: $0.05Eu^{3+}$ phosphor are (0.644, 0.355) and 65.81%, respectively. The mechanism of concentration quenching can be attributed to the dipole–dipole interaction between Eu^{3+} ions and the thermal quenching might be ascribed to the competition between energy transfer and crossover process.

***Keywords*:** Silicates; phosphors; luminescence; rare earths

1. Introduction

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