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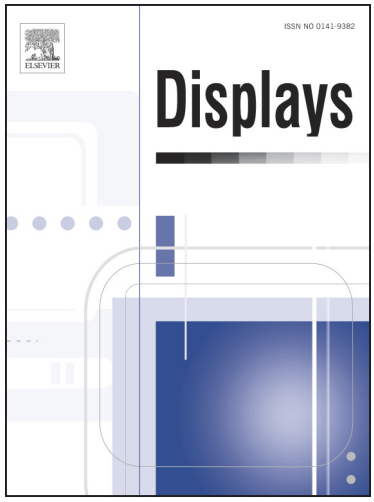

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Dysprosium Doped Di-strontium Magnesium Di-silicate White Light Emitting Phosphor by Solid State Reaction Method

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Abstract

Dysprosium doped di-strontium magnesium di-silicate namely $Sr_2MgSi_2O_7:Dy^{3+}$ phosphor was prepared by the solid state reaction method. The phase structure, particle size, surface morphology, elemental analysis was analyzed by using XRD, TEM, FESEM, EDX and FTIR techniques. The EDX and FTIR spectra confirm the present elements in $Sr_2MgSi_2O_7:Dy^{3+}$ phosphor. The optical properties of $Sr_2MgSi_2O_7:Dy^{3+}$ phosphor was investigated utilizing thermoluminescence (TL), photoluminescence (PL), long lasting phosphorescence and mechanoluminescence (ML). Under the ultraviolet excitation, the emission spectra of $Sr_2MgSi_2O_7:Dy^{3+}$ phosphor, the characteristic emission of Dy^{3+} peaking at 470 nm (blue), 575 nm (yellow) and 678 nm (red), originating from the transitions of $^4F_{9/2} \rightarrow {}^6H_{15/2}$, $^4F_{9/2} \rightarrow {}^6H_{13/2}$ and $^4F_{9/2} \rightarrow {}^6H_{11/2}$. CIE color coordinates of $Sr_2MgSi_2O_7:Dy^{3+}$ are suitable as white light emitting phosphor. Decay graph indicate that this phosphor also contains fast decay and slow decay process. The peak of ML intensity increases linearly with increasing impact velocity of the moving piston. The possible mechanism of this white light emitting long lasting phosphor is also investigated.