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A ratiometric optical thermometer with high sensitivity and superior signal discriminability based on $\text{Na}_3\text{Sc}_2\text{P}_3\text{O}_{12}:\text{Eu}^{2+}, \text{Mn}^{2+}$ thermochromic phosphor

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A ratiometric optical thermometer with high sensitivity and superior signal discriminability based on $\text{Na}_3\text{Sc}_2\text{P}_3\text{O}_{12}:\text{Eu}^{2+}, \text{Mn}^{2+}$ thermochromic phosphor

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Abstract

Dual-emitting and thermochromic $\text{Eu}^{2+}, \text{Mn}^{2+}$ co-doped $\text{Na}_3\text{Sc}_2\text{P}_3\text{O}_{12}$ (NSPO) phosphor was synthesized by a modified solid-state method. Its crystal structure and luminescent properties, especially temperature-dependent fluorescence properties are discussed in detail. $\text{Na}_3\text{Sc}_2\text{P}_3\text{O}_{12}:\text{Eu}^{2+}, \text{Mn}^{2+}$ simultaneously exhibits two broad bands under single UV excitation, i.e. Eu^{2+} blue emission band centered at 460 nm and Mn^{2+} red emission band centered at 600 nm with quantum efficiency of > 90 %. The dual emissions in $\text{Na}_3\text{Sc}_2\text{P}_3\text{O}_{12}:\text{Eu}^{2+}, \text{Mn}^{2+}$ have different thermal responses due to the competition between trap-to-activator energy transfer and thermal quenching,

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