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Largely enhanced mechanoluminescence properties in $\text{Pr}^{3+}/\text{Gd}^{3+}$ co-doped LiNbO_3 phosphors

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Abstract

$\text{Pr}^{3+}/\text{Gd}^{3+}$ co-doped LiNbO_3 phosphors were prepared by a traditional solid-state reaction method and their structure, photoluminescence, mechanoluminescence and thermoluminescence were investigated. The results showed that the LiNbO_3 phase with a rhombohedral structure and an $R3c$ space group was successfully prepared. Mechanoluminescence intensity in nonstoichiometric $\text{LiNbO}_3:\text{Pr}^{3+}$ was largely increased by introducing Gd^{3+} ions. The optimal co-doped concentration of Gd^{3+} was 1mol% and the enhanced ML intensity of $\text{LiNbO}_3:0.01\text{Pr}^{3+}, 0.01\text{Gd}^{3+}$ was about 177% times compared with that of $\text{LiNbO}_3:0.01\text{Pr}^{3+}$. The effect of Gd^{3+} co-dopants on trap levels were explored through thermoluminescence curves. The enhancement of

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