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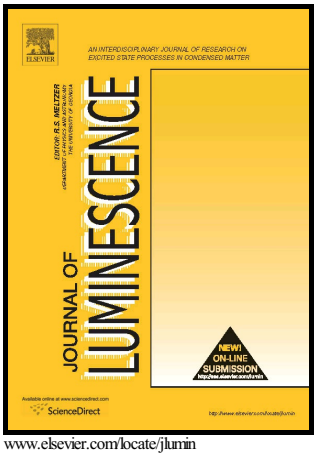

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Photoluminescence, radioluminescence, and thermoluminescence in $NaMgF_3$ activated with Ni^{2+} and Er^{3+}

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ABSTRACT

Photoluminescence (PL) and radioluminescence (RL) has been observed out to 1670 nm in $NaMgF_3$ doped with Er^{3+} or Ni^{2+}. The RL contains more emissions than seen in the PL, which is likely to be due to radiation induced excitations to higher energy excited states of the luminescent ion than are accessible during PL. Both luminescent ions have relatively long PL lifetimes and the long wavelength RL emission intensities are independent of absorbed dose history for high doses. This, coupled with the approximate radiological equivalence of $NaMgF_3$ to water are desirable properties for a dosimeter for radiotherapy applications. The Čerenkov component seen for high energy radiation sources can be reduced by monitoring the longer wavelength RL emissions, or by temporal discrimination for pulsed sources. Room temperature glow peaks are seen in the $NaMgF_3:Er^{3+}$ thermally stimulated luminescence emission that imply the RL will be temperature dependent. This is not the case for $NaMgF_3:Ni^{2+}$ where no thermoluminescence is observed, hence Ni^{2+} is preferred over Er^{3+} for radiotherapy applications.

KEYWORDS

Photoluminescence; radioluminescence; thermally stimulated luminescence; fluoroperovskite.

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