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Photoluminescence Properties of Lu1.98Er0.02Ti2O7 Pyrochlore (A2B2O7) Phosphor

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Abstract : Pyrochlores, having compounds of the general formula, A2B2O7 (A and B are metals/rare earths) are important class of materials thanks to having technological applications like in luminescence, ionic conductivity, nuclear waste immobilization etc. The rare earths included pyrochlore compounds have also potential photoluminescence characteristics. In this context, Er3+-activated Lu2Ti2O7 pyrochlore was chosen and synthesized through a high-temperature solid-state reaction route that was sintered under the open atmosphere in this study. The optimal reaction conditions to obtain expected single phase system, the thermal analysis (DTA/TG) were carried out. The X-ray powder diffraction (XRD) was used to determine phase properties of the sample. The photoluminescence (PL) results were done to obtain excitation, emission and decay time properties by a PL spectrometer under room temperature. According to the PL, there are excitation bands at 352 nm, 388 nm, 423 nm and 453 nm that are due to 4I15/2 → 2G7/2, 4I15/2 → 4G11/2 and 4I15/2 → 4F5/2 transitions of Er3+ ions, respectively. The emission bands are placed at 582 nm, 677 nm and 762 nm that are associated with 2H11/2, 4S3/2 → 4I15/2, 4F9/2 → 4I15/2, 4I9/2 → 4I15/2 transitions of Er3+ ions, respectively.

Keywords : Er3+, Lu2Ti2O7, photoluminescence, pyrochlore, rare-earths
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