Enhancement of CdSiO₃: Tb³⁺ green long-lasting phosphors by co-doping with Re³⁺ (Re³⁺ = Gd³⁺, Y³⁺, La³⁺) ions

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1. Introduction

Solar energy is one of the most abundant forms of energy, and how to make full use of it to satisfy our ever-growing requirement is more and more concerned. One of the proposals is to absorb and save the sunlight energy in daytime and then emit slowly in nighttime for illumination purposes through the long-lasting phosphorescence (LLP). The LLP is assumed to be due to the night-time for illumination purposes through the long-lasting phosphorescence (LLP). The LLP is assumed to be due to the

2. Experimental

The investigated samples in this study were synthesized through the high temperature solid-state method with CdO (A. R.), SiO₂ (A. R.), Tb₄O₇ (99.99%) and Re₂O₃ (99.99%) as raw materials. Starting material was ground in an agate crucibles and sintered at 1080 °C for 10 h under ambient atmosphere in an electric muffle furnace. All the phase structures of samples were characterized by powder X-ray diffraction (XRD) using a Rigaku diffractometer with Ni-filtered Cu Kα radiation at a scanning step of 0.02° in the 2θ range from 10° to 60°. The photoluminescence (PL) excitation and emission spectra were obtained by a FLS-920T fluorescence spectrophotometer with Xe 900 (450 W xenon arc lamp) as the light source. The afterglow decay curves were recorded using a PR305 long afterglow instrument after the samples were irradiated by artificial light (1000 ± 5% lux) for 10 min. The thermoluminescence (TL) curves were measured by a FJ-427A1 meter (Beijing Nuclear Instrument Factory) with a heating rate of 1 K/s. Before the measurement, the samples were irradiated by ultraviolet (UV) light 254 nm for 10 min. All the data were measured at room temperature except for the TL curves.