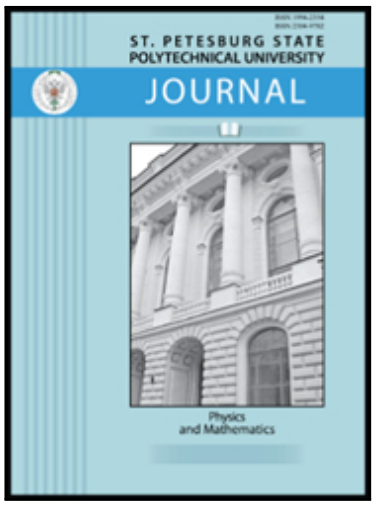

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Visible quantum cutting in green emitting BaF_2: Gd^{3+}, Tb^{3+} phosphor an approach towards mercury free lamps

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Abstract

Visible quantum cutting (QC) has been observed in green emitting BaF_2 co-doped with Gd^{3+}, Tb^{3+} phosphor via down-conversion (DC) synthesized by wet chemical method. Powder X-ray diffraction (XRD) analysis shows structural purity of synthesized phosphors. The excitation (PLE) and PL spectra in the vacuum ultraviolet (VUV) or UV region were measured with the help of 4B8-VUV spectroscopy experimental station of the Beijing Synchrotron Radiation Facility (BSRF). In the QC process, one VUV-UV photons absorbed is cuts into more than one visible photons emitted by Tb^{3+} through cross relaxation (CR) and direct energy transfer (DET) between Tb^{3+} and Tb^{3+} or Tb^{3+} and Gd^{3+}, depending on the excitation wavelength. From the emission spectra monitored at different wavelength excitation, the two-step energy transfer process is investigated and theoretically calculated quantum efficiency observed 148% and 177% at the excitation wavelength of 174 nm and 219 nm respectively.

Keywords: quantum cutting; Inorganic phosphors; cross relaxation energy transfer; quantum efficiency.

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