

Photo- and radioluminescent properties of undoped and Bi-doped Lu_2WO_6 powders at 10-300 K.

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Undoped and Bi^{3+} -doped lutetium oxytungstate (Lu_2WO_6) powder materials were prepared by a solid state reaction method at selected temperatures between 1000 and 1400 °C. The structural, radio- and photoluminescent properties of these materials were investigated. Upon Bi activation, red-shifts of both emission and excitation bands are observed. While a broad emission band characteristic of undoped Lu_2WO_6 and resulting from a charge transfer transition of the tungstate group WO_6 peaks at 450 nm, the Bi^{3+} -activated Lu_2WO_6 shows a broad band emission peaking at about 510 nm. This emission can be related to the transition between excited and ground states of a deep Bi donor. The ground state of this donor corresponds to an electron-occupied Bi-level at about 0.45 eV above the top of the valence band. Both compositions generate bright radioluminescence upon X-ray excitation at low temperatures. For $\text{Lu}_2\text{WO}_6:\text{Bi}$ the radioluminescence efficiency is roughly stable in the range between 10 and 250 K, while undoped Lu_2WO_6 suffers from moderate thermal quenching above 10 K. The fraction of total radioluminescence due to Bi contribution in $\text{Lu}_2\text{WO}_6:\text{Bi}$ increases from 0.19 at 10 K to 0.53 at room temperature. A simple configuration coordinate diagram is introduced in order to illustrate and describe the charge carrier recombination and light generation mechanism in these materials.

Słowa kluczowe

Lu_2WO_6 , Radioluminescence, Photoluminescence, Deep Bi donor

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