



The role of Ti in charge carriers trapping in the red-emitting $\text{Lu}_2\text{O}_3\text{:Pr,Ti}$ phosphor.

Autorzy

Paulina Bolek

Dagmara Kulesza

Adrie J. J. Bos

Eugeniusz Zych

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Streszczenie

$\text{Lu}_2\text{O}_3\text{:Pr,Ti}$ storage phosphors were prepared by means of high temperature (1700 °C) sintering both in a reducing atmosphere of the $\text{N}_2\text{-H}_2$ mixture (3:1 by volume) and in ambient air. Their thermoluminescent (TL) properties were presented and discussed. Pr singly-doped material showed only very inefficient TL. Ti co-doping boosted the TL efficacy, and the most potent TL was observed for ceramics containing 0.05 mol% of Pr and 0.007 mol% of Ti and made in the reducing atmosphere. Samples prepared in air produced noticeably less intense TL. The glow curves of both materials consisted of one broad asymmetric band with the maximum around 357 °C for the heating rate of 4.7 °C/s. The glow peaks could be fitted with three (reduced samples) or two (air-sintered) components. The latter lacked the high-temperature part of TL compared to the former. $T_{\text{max}}\text{-}T_{\text{stop}}$ experiments indicated that the TL is connected with continuous distribution of trap depths, which were estimated to cover the range of ~ 1.7 to 2.3 eV, and their specific values were slightly dependent on the methodology. Anomalous dependence of the TL intensity on the heating rate made the semi-localized transition the likely mechanism affecting the TL properties of $\text{Lu}_2\text{O}_3\text{:Pr,Ti}$ ceramics. The collected data allowed to construct vacuum referred binding energy (VRBE) level scheme with Pr^{3+} and $\text{Ti}^{3+/4+}$ energy levels in the band gap of Lu_2O_3 host that could explain the TL mechanism in $\text{Lu}_2\text{O}_3\text{:Pr,Ti}$ ceramics.

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