VIS-VUV spectroscopy of heavily Tb and Eu doped gadolinium aluminum borate (GAB) crystal

Autorzy

Piotr Solarz

Marcin Sobczyk

Elena Beregi

Radosław Lisiecki

Krisztián Lengyel

László Kovács

Witold Ryba-Romanowski

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Streszczenie

$GdAl_3(BO_3)_4$ (GAB) compound doped with Tb^{3+} and Eu^{3+} was synthetized. The excited states of these lanthanide ions were analyzed up to VUV range 125 000 cm^{-1} (80 nm). VUV multiplets of Tb^{3+} and Eu^{3+} has been determined. The Eg has been estimated to be 7.15 eV and it was assigned to the O 2p → B 2p, 2s transitions within the isolated BO^{3-} groups. The strong and effective coupling between terbium and europium was observed and examined. The efficient impact of temperature on inter-ionic energy transfer was found and examined. The yields of energy transfer (η) at room temperature were determined to be: ca. 20% and 60% for GAB: 20 at.%Tb, 3 at.%Eu and GAB: 20 at.%Tb, 20 at.%Eu, respectively. When the europium $^5D_0$ multiplet is excited via terbium multiplets, the decay curve becomes non-exponential with build-up part maximum situated at ca. 0.7 ms after initial pulses. Based on the low- and room temperature excitation and luminescence spectra, experimental free-ion levels, located between 0 and 35 000 cm^{-1}, were determined and used for the free-ion analysis.

Słowa kluczowe

Energy-transfer, GAB, LnM3(BO3)4, Phase transition, Tb–Eu, VUV

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