

YAG:Tb@YAG:Pr Single Crystalline Dual-Layer Phosphor. An Alternative Approach to Multimodal Wide Range Luminescence Thermometry

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Streszczenie

The SC-YAG:Tb@YAG:Pr-SCF composite epitaxial structure consisting of a 1 mm thick single crystal substrate of YAG:Tb garnet and a thin (9 μm) single crystalline film of YAG:Pr garnet is fabricated, and its luminescent properties are examined toward luminescence thermometry. The possibility to efficiently excite, individually or simultaneously, the Tb^{3+} and Pr^{3+} dopants by their intense allowed $4f \rightarrow 5d$ transitions is executed to reach relative thermal sensitivity higher than $1\% \text{ K}^{-1}$ over the range of temperatures as wide as 100–625 K and above $0.5\% \text{ K}^{-1}$ over 13–650 K. The obtained results demonstrate that using intra- and inter-configurational emission transitions of Pr^{3+} and other lanthanides makes it possible to design wide-range luminescence thermometers with high sensitivity spanning the entire operating limits.

Słowa kluczowe

composite thermometer, monocrystalline dual-layer phosphor, multimodal luminescence thermometry, Pr^{3+} luminescence, Tb^{3+} luminescence, YAG

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