Spectroscopy and efficient laser operation around 2.8 μm of Er:(Lu,Sc)2O3 sesquioxide cera

Liza Basyrova (Foreign) [1],

Pavel Loiko (Foreign) [2],

Wei Jing (Foreign) [3],

Yicheng Wang (Foreign) [4],

Hui Huang (Foreign) [5],

Elena Dunina (Foreign) [6],

Alexey Kornienko (Foreign) [7],

Liudmila Fomicheva [8],

Bruno Viana (Foreign) [9],

Uwe Griebner (Foreign) [10],

Valentin Petrov (Foreign) [11],

Magdalena Aguilo´ (Foreign) [12],

Francesc Díaz (Foreign) [13],

Xavier Mateos (Foreign) [14],

Patrice Camy (Foreign) [15]

1-7, 9-15 Foreign

8 Кафедра высшей математики, Белорусский государственный университет информатики и радиоэлектроники, г. Минск, Республика Беларусь

Keywords: Transparent ceramics, Sesquioxides, Erbium ion, Luminescence, Laser operation.

Abstract: A transparent “mixed” 7 at.% Er:$(Lu,Sc)_2O_3$ sesquioxide ceramic was fabricated by hot isostatic pressing of commercial sesquioxide powders at 1750°C/200 MPa in argon atmosphere. It exhibited a cubic bixbyite-type structure (a = 10.198 Å), a mean grain size of 5.7 μm and high low-signal transmission of 79.1% in the near-IR. The spectroscopic properties of Er^{3+} ions were studied. For the $^4I_{11/2} \rightarrow {}^4I_{13/2}$ transition, the stimulated-emission cross-section σ_{SE} is 1.30×10^{-20} cm^2 at 2719 nm, the corresponding luminescence branching ratio B(JJ’) is 19.9% and the radiative lifetime of the $^4I_{11/2}$ state is 4.80 ms, as determined using a Judd-Ofelt theory accounting for intermediate configuration interaction. The crystal-field splitting of Er^{3+} multiplets was studied at 12K. The ceramic exhibits a significant inhomogeneous broadening of spectral bands. An Er:$(Lu,Sc)_2O_3$ ceramic laser generated 342 mW at 2.71 and 2.85 μm with a high slope efficiency of 41.7% (exceeding the Stokes limit) and a laser threshold of 125 mW.

Источник публикации:

Spectroscopy and efficient laser operation around 2.8 μm of Er:(Lu,Sc)2O3 sesquioxide cera / L. Basyrova [etc all.] // Journal of Luminescence – 2021. – Vol. 240. – P. 118373-11. – https://doi.org/10.1016/j.jlumin.2021.118373.

Интернет-ссылка на статью:

https://www.sciencedirect.com/science/article/abs/pii/S0022231321004890?via%3Dihub.