

Polycrystalline Yb³⁺-Er³⁺-co-doped YAG: fabrication, TEM-EDX characterization, spectroscopic properties, and comparison with the single crystal.

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Rok wydania

2014

Czasopismo

Journal of Materials
Research

Numer woluminu

29

Strony

2288-2296

DOI

10.1557/jmr.2014.206

Streszczenie

Yttrium aluminum garnet (YAG)-based ceramics represent a valuable alternative to single crystals as active media in laser devices for specific applications. In this connection, the 1.5–1.65 μm emission channel of Er³⁺-doped YAG is of particular importance for the realization of diode pumped solid state lasers operating in the so-called ‘eye-safe’ region. A well-known drawback of this material is related to its small absorption cross section in correspondence to the diode pumping radiation at 940–980 nm. However, its emission performance can be significantly improved through sensitization with Yb³⁺ ions that can efficiently absorb the excitation radiation and transfer it to the Er³⁺ ions. This work deals with the fabrication of polycrystalline YAG co-doped with Er³⁺ and Yb³⁺ ions from oxide powders via solid state sintering in high vacuum conditions and its microstructural analysis by transmission electron microscopy–energy-dispersive x-ray spectroscopy to determine the dopants distribution and to assess their influence on the sintering process and on the spectroscopic properties. For this purpose, the absorption and emission spectra of the prepared material have been measured and compared with those of a single crystal having the same composition, appositely prepared by the micro-pulling down method. Suitable calculations have been finally carried out to verify the effective perspectives of application of the investigated ceramics as active lasing medium.

Adres publiczny

<http://dx.doi.org/10.1557/jmr.2014.206>

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Plik został wygenerowany dnia 2026-04-25 14:37:25

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/yC5IN7R>.