

Synthesis and characterization of nanocrystalline Yb:Lu₂O₃ by modified Pechini method

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Abstract

Lately the research on cubic sesquioxides RE₂O₃ as an excellent laser host materials has emerged rapidly. The Yb:Lu₂O₃ exhibit higher thermal conductivity and stronger Stark splitting than Yb:YAG.

The synthesis of the RE-doped nanocrystalline materials has been a major research interest in the last years due to expectations of enhanced optical properties[1]. Recently several methods to obtain RE₂O₃ nanocrystals were developed. Yb:Lu₂O₃ ceramics based on nanocrystalline technology was successfully lased at 1079nm achieving 0.95W as output power[2].

In the present study, the modified Pechini method[3] has been used an alternative to the conventional sol-gel because of several advantages such as low temperature process, low cost and simplicity. In this method, the chelates are formed between metals ions and an α -hydroxycarboxylic acid. Later, a polyhydroxyl alcohol is added and heated to obtain a polymerization process.

Nanocrystalline Yb:Lu₂O₃ were synthesized by modified Pechini method. The differential thermal and thermogravimetric analysis were used to study the thermal evolution of the precursor powder. X-Ray powder diffraction studies indicated that the nanocrystals began to crystallize at 773K. The morphology and the size particle were determined by electronic microscopy. The spectroscopy of Yb:Lu₂O₃ nanocrystals was discussed.

[1]B.M.Tissue *Chem. Mat.* **1998**, 10, 2837 [2]K.Takaichi *et al. Phys. Stat. Sol. A* **2005**, 202, R1 [3]M.Galceran *et al. J. Sol-Gel Tech.* **2007**