Accepted Manuscript

Fabrication of Nd:YAG transparent ceramics using powders synthesized by citrate sol-gel method

Shengquan Yu, Wei Jing, Mingjing Tang, Tao Xu, Wenlong Yin, Bin Kang

PII: S0925-8388(18)33425-X

DOI: 10.1016/j.jallcom.2018.09.184

Reference: JALCOM 47603

To appear in: *Journal of Alloys and Compounds*

Received Date: 3 July 2018

Revised Date: 13 September 2018

Accepted Date: 16 September 2018

Please cite this article as: S. Yu, W. Jing, M. Tang, T. Xu, W. Yin, B. Kang, Fabrication of Nd:YAG transparent ceramics using powders synthesized by citrate sol-gel method, *Journal of Alloys and Compounds* (2018), doi: https://doi.org/10.1016/j.jallcom.2018.09.184.

Fabrication of Nd:YAG transparent ceramics using powders synthesized by citrate sol-gel method

Shengquan Yu*, Wei Jing, Mingjing Tang, Tao Xu, Wenlong Yin*, Bin Kang

Institute of Chemical Materials, China Academy of Engineering Physics, Mianyang 621900, China

Abstract

The highly transparent Nd:YAG ceramics were prepared by using powders synthesized by citrate sol-gel method. The citrate sol-gel method could avoid defects of the solid-phase reaction method and the liquid phase co-precipitation method in preparing Nd:YAG ceramic powders with the ratio of (Nd^{3+}, Y^{3+}):Al^{3+} equal to 3:5. The dried gel was the three dimensional net-shaped porous structure. When the dried gel was calcined at 500 ^{o}C in oxygen, pure YAG phase formed directly with no intermediate phases. The Nd:YAG powders calcined at 800 ^{o}C had maximum particle size near 500 nm. These powders were not equiaxed and there were dumbbell-like and annular grains. The highly compact Nd:YAG ceramics could be well sintered at 1750 ^{o}C for 12 h in vacuum atmosphere, and these sample had the average grain size about 3.8 μm. The polished Nd:YAG ceramics was highly transparent, and the transmittances at 1064 nm and 400 nm were 83.4% and 74.2%, respectively. The fluorescence emission spectrum implied high possibility of realizing laser output at 1064 nm by pumping at 808 nm. Generally, the citrate sol-gel method was also a reliable choice for preparing high quality Nd:YAG transparent ceramics.

Keywords: ceramics; optical materials; Nd:YAG; sol-gel method

1. Introduction

Besides classical crystals and glasses, transparent ceramics are the new laser materials. And they are widely considered to have important applications in the next generation of high power solid-state lasers. Comparing with crystals, transparent ceramics have unique advantages such as the easy

*Corresponding author: Wenlong Yin,
E-mail: wlyin@caep.cn
Shengquan Yu,
E-mail: yu.s.quan@caep.cn, yu.s.quan@gmail.com