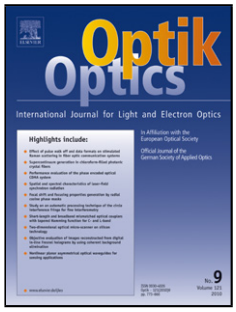

Title: Dual-wavelength laser of heavily Yb^{3+}-doped $NaGd(WO_4)_2$ crystals

Authors: Houping Xia, Qian Ma, Lei Zhao, Qiang Xu

PII: S0030-4026(17)30331-5
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2017.03.065
Reference: IJLEO 58988

To appear in:

Received date: 15-12-2016
Accepted date: 17-3-2017

Please cite this article as: Houping Xia, Qian Ma, Lei Zhao, Qiang Xu, Dual-wavelength laser of heavily Yb3+-doped NaGd(WO4)2 crystals, Optik - International Journal for Light and Electron Opticshttp://dx.doi.org/10.1016/j.ijleo.2017.03.065

Dual-wavelength laser of heavily Yb^{3+}-doped $NaGd(WO_4)_2$ crystals

Houping Xia[a,b]*, Qian Ma[a, b], Lei Zhao[a, b], Qiang Xu[a, b]

a College of Physics and Optoelectronics Technology, Baoji University of Arts and Sciences, Baoji, Shaanxi 721016, PR China

b Baoji Research Center of Ultrafast lasers and Advanced Materials Science and Technology, Baoji, Shaanxi 721016, PR China

* Corresponding author:
E-mail: hpxia6688@163.com

Abstract

$NaGd(WO_4)_2$ crystals with 10 at%, 15 at%, 20 at% and 30 at% Yb^{3+}-doped concentrations have been grown by the Czochralski method. The spectroscopic properties of Yb^{3+}: $NaGd(WO_4)_2$ with different Yb^{3+} concentrations have been studied detailed in this paper. We found that the emission cross sections and the lifetime increased with the increase of Yb^{3+} concentration. However, by comparing their laser output power, 10 at% Yb^{3+}: $NaGd(WO_4)$ is more appropriate for laser operation. Finally, the orthogonally polarized dual-wavelength laser operation of 10% Yb^{3+}: $NaGd(WO_4)_2$ crystal was realized. The maximum output power of the dual-wavelength laser is 1.86 W with T= 3.0 %, which is calculated with the 1000 Hz, 0.3 duty ratio pulses. The dual-polarization and dual-wavelength laser oscillated at 1046 nm in σ polarization and 1053 nm in π polarization. For T= 2, 5, 7 %, the gaps of dual-wavelength are all about 5 nm.

Keywords: Yb^{3+}: $NaGd(WO_4)_2$; Czochralski Method; Spectroscopic Properties; Polarized Dual-wavelength

1. Introduction

Yb^{3+} ion has attracted enormous attention for a few years in the field of laser materials due to its excellent properties. The simple two-state electronic structure ($^2F_{7/2}$ and $^2F_{5/2}$) of Yb^{3+} ion can reduce the excited state absorption and concentration quenching. In addition, the Yb^{3+}-doped crystals exhibit