

THIRTEENTH ANNUAL CONFERENCE

YUCOMAT 2011

Hunguest Hotel Sun Resort Herceg Novi, Montenegro, September 5-9, 2011 http://www.mrs-serbia.org.rs

Programme and The Book of Abstracts

Organised by: **Materials Research Society of Serbia**

under the auspices of
Federation of European Material Societies
and
Materials Research Society

Title: THE THIRTEENTH ANNUAL CONFERENCE

YUCOMAT 2011

Programme and The Book of Abstracts

Publisher: Materials Research Society of Serbia

Knez Mihailova 35/IV, 11000 Belgrade, Serbia Phone: +381 11 2185-437; Fax: +381 11 2185-263

http://www.mrs-serbia.org.rs

Editor: Prof. Dr. Dragan P. Uskoković

Technical editor: Aleksandra Stojičić

Cover page: Aleksandra Stojičić and Milica Ševkušić

Copyright © 2011 Materials Research Society of Serbia

Acknowledgment:



Printed in: Biro Konto

Sutorina bb, Igalo – Herceg Novi, Montenegro

Phones: +382-31-670123, 670025, E-mail: bkonto@t-com.me Circulation: 250 copies. The end of printing: August 2011

THIRTEENTH ANNUAL CONFERENCE YUCOMAT 2011 Herceg Novi, September 5-9, 2011

P.S.B.3.

ELECTRON STRUCTURE AND OPTICAL PROPERTICS OF $Gd_3Ga_5O_{12}$ GARNET DOPED WITH Tb

I.D. Shcherba^{1,2}, L. Kostyk², D. Uskoković³, O. Tsvetkova², A. Stosyk², B. Jatsyk⁴, R. Kokosza¹ Institute of Techniques, University of Pedagogy, Krakow, Poland, ²Lviv National University by Ivan Franko, Lviv, Ukraine, ³Institute of Technical Sciences of SASA, Belgrade, Serbia, ⁴University of Forestry and Wood Technology, Lviv, Ukraine

Rare-earth doped gadolinium gallium garnet (Gd₃Ga₅O₁₂) has attracted much attention as important material for application in many optical devices. Recently, the nanostructure materials are considered as potentially useful for many technological applications. This paper presents the results of electron structure and spectral-luminescent properties of pure and Tb³⁺ doped Gd₃Ga₅O₁₂ nanopowders prepared by a co-precipitation method. Analysis of diffractograms of the nanopowders showed that the minimum calcinations temperature that allowed getting a single garnet phase is $T \sim 750^{\circ}$ C. An average crystalline size of powders is about 35-47 nm. The surface microstructure was observed by using an atomic force microscope Solver P47H-PRO. The luminescence transition ${}^5D_4 \rightarrow {}^7F_i$ (green emission) is dominated at the X-ray and photo excitation of nanosized $Gd_3Ga_5O_{12}$ doped with Tb^{3+} . The influence of the crystalline size and preparing condition on the luminescence properties of Gd₃Ga₅O₁₂ is discussed. High-energy spectroscopy has been used to study the electron structure of the investigated rare-earth doped gadolinium gallium garnet (Gd₃Ga₅O₁₂). The calculations of electron energy bands E(k) and partial DOS for compounds were performed by the semi relativistic linear muffin-tin orbital method without considerations of spin-orbit interactions. Effective filling numbers of electrons in different bands of components in garnet Gd₃Ga₅O₁₂ been calculated. Between the experimental and calculated X-ray emission spectra garnet Gd₃Ga₅O₁₂ good agreement has been obtained.