

Accepted Manuscript

Title: The influence of grain size and vanadium concentration on the spectroscopic properties of YAG:V³⁺, V⁵⁺ and YAG: V, Ln³⁺ (Ln³⁺=Eu³⁺, Dy³⁺, Nd³⁺) nanocrystalline luminescent thermometers

Authors: K. Kniec, L. Marciniak

PII: S0925-4005(18)30477-5
DOI: <https://doi.org/10.1016/j.snb.2018.02.189>
Reference: SNB 24284

To appear in: *Sensors and Actuators B*

Received date: 19-1-2018
Revised date: 27-2-2018
Accepted date: 28-2-2018

Please cite this article as: K.Kniec, L.Marciniak, The influence of grain size and vanadium concentration on the spectroscopic properties of YAG:V³⁺, V⁵⁺ and YAG: V, Ln³⁺ (Ln³⁺=Eu³⁺, Dy³⁺, Nd³⁺) nanocrystalline luminescent thermometers, *Sensors and Actuators B: Chemical* <https://doi.org/10.1016/j.snb.2018.02.189>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



The influence of grain size and vanadium concentration on the spectroscopic properties of YAG:V³⁺,V⁵⁺ and YAG: V, Ln³⁺ (Ln³⁺=Eu³⁺, Dy³⁺, Nd³⁺) nanocrystalline luminescent thermometers

K. Kniec, L. Marciniak*

¹Institute of Low Temperature and Structure Research, Polish Academy of Sciences, Okólna 2, 50-422 Wrocław, Poland

* corresponding author: *l.marciniak@int.pan.wroc.pl*

Highlights

- The first demonstration of using V-based phosphor as a luminescent temperature sensor is presented.
- The influence of dopant concentration and size of the nanocrystals on the emission color output of the YAG:V³⁺, V⁵⁺ was analyzed
- The usable temperature range of this kind of thermometers can be extended by introducing lanthanide ions
- It was showed that by the appropriate choice of lanthanide co-dopants, the temperature range in which high sensitivity can be modulated

Abstract

The first demonstration of using V-based phosphor as a luminescent temperature sensor is presented. The luminescent properties of YAG:V³⁺, V⁵⁺ and YAG:V Ln³⁺ (Ln³⁺= Eu³⁺, Nd³⁺ and Dy³⁺) nanocrystals were investigated in a wide range of temperature (-150°C-300°C). The influence of dopant concentration and size of the nanocrystals on the emission color output of the YAG:V³⁺, V⁵⁺ was analyzed. The provided analysis reveals that V³⁺ and V⁵⁺ are mainly localized in octahedral sites of Al³⁺ of core part of the nanocrystals and surface tetrahedral sites of Al³⁺, respectively. The emission spectra consists of two broad emission bands, attributed to the CT emission of V⁵⁺ (at 520 nm) and ³T_{2g}→³T_{1g} electronic transition emission of V³⁺(at 820 nm). It was found that emission color output of the YAG:V³⁺, V⁵⁺ nanocrystals can be modulated either by the vanadium concentration or by the size of nanocrystals. Based on the V³⁺ to V⁵⁺ emission intensity ratio (LIR) in the temperature range from -150°C to 300°C self-reference thermometer was defined, which reveals 0.7%/°C of sensitivity at the

Download English Version:

<https://daneshyari.com/en/article/7140326>

Download Persian Version:

<https://daneshyari.com/article/7140326>

[Daneshyari.com](https://daneshyari.com)