

Programme & The Book of Abstracts

Twenty-first Annual Conference

YUCOMAT 2019

&

Eleventh World Round Table Conference

on Sintering –

Science of Sintering & Its Future: Fifty Years Later

WRTCS 2019

Herceg Novi, Montenegro September 2 - 6, 2019

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Organised by:
Materials Research Society of Serbia
&
International Institute for the Science of Sintering

Hunguest Hotel Sun Resort Herceg Novi, Montenegro,
September 2-6, 2019, <http://www.mrs-serbia.org.rs>

Title: Twenty-first Annual Conference **YUCOMAT 2019** &
Eleventh World Round Table Conference on Sintering
WRTCS 2019
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Publisher: Materials Research Society of Serbia
Knez Mihailova 35/IV, P.O.Box 433, 11000 Belgrade,
Serbia
<http://www.mrs-serbia.org.rs>

Editors: Prof. Dr. Dragan P. Uskoković and Prof. Dr. Velimir R.
Radmilović

Technical editors: Maja Jovanović and Jasmina Jevtić

Cover page: Nenad L. Ignjatović

Front cover: Image is the property of MRS Serbia

Back cover: Modified Photo by Vlada Marinković; Wikimedia Commons

(https://commons.wikimedia.org/wiki/File:Belgrade_iz_balona.jpg); CC BY-SA 3.0

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Science of Sintering



Printed in: Biro Konto
Sutorina bb, Igalo – Herceg Novi, Montenegro
Phones: +382-31-670123, 670025, E-mail: bkonto@t-com.me. Circulation: 220 copies. The end of printing:
August 2019

Y.O.S.IV.7.

Hydroxyapatite nano particles doped with Gd^{3+} , Yb^{3+}/Tm^{3+} and Eu^{3+} as lumino-magnetic multimodal contrast agents

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Hydroxyapatite (HAp) has been widely used as bone reconstruction materials due to their similarity to bone tissue. The improvement of HAp properties was achieved by doping its crystal lattice with different ions. Lanthanides, i.e. Rare Earth Elements (RE) are also suitable for doping HAp. The aim of the presented research was to investigate the possibility of creating lumino-magnetic particles of HAp doped with gadolinium (Gd^{3+}) ions and co-doped with ytterbium/thulium (Yb^{3+}/Tm^{3+}) or europium (Eu^{3+}) ions for potential use in multimodal imaging (MI).

Pure HAp ($Ca_5(PO_4)_3(OH)$), magnetic HAp:Gd ($Ca_{4.85}Gd_{0.15}(PO_4)_3(OH)$), and lumino-magnetic HAp:Gd/Yb/Tm ($Ca_{4.85}Gd_{0.03}Yb_{0.1}Tm_{0.02}(PO_4)_3(OH)$) and HAp:Gd/Eu ($Ca_{4.94}Gd_{0.02}Eu_{0.04}(PO_4)_3(OH)$) particles were synthesized using emulsification process and hydrothermal processing. All synthesized particles had an elongated shape and exhibited a paramagnetic behavior. Reduction of the unit cell volume as a result of replacement of Ca^{2+} ions by ions with a smaller ionic radius (Gd^{3+} , Yb^{3+} , Tm^{3+} , Eu^{3+}) confirmed by using XRD and Rietveld refined plots. The energy band gap values of the synthesized samples range from 4.93 to 3.18 eV and decrease in the following order: HAp:Gd > HAp > HAp:Gd/Eu > HAp:Gd/Yb/Tm. The results of photoluminescence emission spectra of HAp:Gd/Yb/Tm and HAp:Gd/Eu particles showed characteristic transitions of Tm^{3+} and Eu^{3+} , respectively.

**CIP- Каталогизација у публикацији
Народна библиотека Србије**

66.017/.018(048)

621.762.5(048)

**DRUŠTVO za istraživanje materijala Srbije (Beograd). Godišnja konferencija (21 ; 2019 ;
Herceg Novi)**

Programme ; and The Book of abstracts / Twenty-first Annual Conference YUCOMAT 2019 & Eleventh World Round Table Conference on Sintering WRTCS 2019, Herceg Novi, Montenegro, September 2-6, 2019 ; organised by Materials Research Society of Serbia & International Institute for the Science of Sintering ; [editors Dragan P. Uskoković and Velimir R. Radmilović]. - Belgrade : Materials Research Society of Serbia, 2019 (Herceg Novi : Biro Konto). - XLVIII, 174 str. : ilustr. ; 23 cm

Tiraž 220. - Bibliografija uz pojedine apstrakte. - Registar.

ISBN 978-86-919111-4-0

1. World Round Table Conference on Sintering (11 ; 2019 ; Herceg Novi)

a) Наука о материјалима -- Апстракти б) Технички материјали -- Апстракти в) Синтеровање -- Апстракти

COBISS.SR-ID 278510092