

**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**  
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**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

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**Acknowledgment:**



**Printed in:** Biro Konto  
Sutorina bb, Igalo – Herceg Novi, Montenegro  
Phones: +382-31-670123, 670025, E-mail: [bkonto@t-com.me](mailto:bkonto@t-com.me)  
Circulation: 250 copies. The end of printing: August 2011

O.S.E.4.

**ANTIBACTERIAL ACTIVITY AND CYTOTOXICITY OF  
HYDROXYAPATITE/SILVER NANOCOMPOSITES SYNTHESIZED  
BY A SONOCHEMICAL APPROACH**

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Hydroxyapatite, as a major constituent of the inorganic part of natural human bones, is a natural choice and one of the most frequently applied materials for the reparation and regeneration of bone tissue. The formation of composites based on HAp, the incorporation of foreign ions within its structure and/or the functionalization of their surfaces allow improvements to the morphological, structural and surface properties. Such improvements can be utilized to increase the material quality for applications in dentistry and orthopedics as well to extend the potential applicability in other fields of biomedicine.

Hydroxyapatite/silver (HAp/Ag) nanocomposite particles were formed using the sonochemical method. Particles were formed from HAp rods with silver (present in the form of ions) incorporated within the apatite structure and/or metallic particles, embedded into apatite rods and metallic particles attached to the surfaces of these rods. The so obtained materials were tested for antibacterial activity. The presence of the bacterial growth-inhibition zone around the discs made of composite material and the fluorescence dye detection on the surface of the HAp/Ag composite (corresponding to the labeled live and dead bacteria) proved that the composite was active against both Gram-positive and Gram-negative bacteria. In addition, it was determined that the minimal inhibition concentration (MIC), i.e., the minimal concentration of HAp/Ag composite, which is able to inhibit the growth of bacteria, was higher for Gram-positive (MIC = 0.7-0.8 mg/ml) when compared to Gram-negative (MIC = 0.6-0.7 mg/ml) bacteria. The same effect was determined during the investigation of the minimal bactericidal concentration (MBC) of the HAp/Ag composite against the same representatives of Gram-positive and Gram-negative bacteria. The obtained concentrations of the HAp/Ag composite which were able to manifest the bactericidal effect were used for an investigation of the toxicity against the representatives of healthy and cancer-modified cell lines. The toxicity of a composite was investigated *in vitro* and for that purpose the IMR-90 human lung embryonic fibroblast and U-2 OS human osteosarcoma cell lines were applied.

In the presentation the antibacterial activity of the HAp/Ag composite and its toxicity against human cells will be discussed.