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„International Conference of Experimental and Numerical Investigations and New Technologies“

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Programme

and

The Book of Abstracts

29 June – 02 July 2021

Zlatibor, Serbia

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EFFECTS OF SYNTHESIS PARAMETERS ON STRUCTURE AND PROPERTIES OF THE CERAMIC/POLYMER FILMS BASED ON BACTERIAL CELLULOSE

Aleksandra Sknepnek[1*], Suzana Filipovic[2], Pavle Maskovic[3], Miljana Mirkovic[4], Dunja Miletic[1], Miomir Niksic[1], Vladimir B. Pavlovic[5]

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Abstract

Cellulose, as the main constituent of plants, is the most common natural material that is widely used. Bacterial cellulose (BC) is a polymer of β-1,4-glucan chains, extracellularly attached to bacterial cells. It possesses the same structure as plant cellulose but its application has many advantages. BC has tinner threads, better crystallinity, mechanical strength and higher purity. By the means of micro- and nano-pores in the structure, it is possible to retain nano particles and enhance the application of obtained nanostructures. BC lacks antibacterial and antioxidative activity, conductivity and magnetic properties, which lowers the possibility of its application in biomedicine and electronics. To overcome previously mentioned deficiency, it is possible to apply bioactive polymers, nanomaterials or solid particles into the structure. High biocidal potential of TiO_2 originates from its photocatalytic properties, and the generation of reactive oxygen species (ROS). At the first site of action, they cause cell membrane damage and afterwards, they attack intracellular components causing cell death. Hydroxyapatite (HAp) is capable to act synergistically with TiO_2 and to accelerate its efficiency. Having in mind all characteristics of previously mentioned components, we have investigated the structure, morphology, mechanical properties and antimicrobial activity of advanced ceramics/polymer films. The influence of synthesis duration on BC structure, produced by Komagataeibacter xylinus species, was investigated. Thereafter, the possibility of TiO_2/HAp ceramic nanocomposite application in BC was examined. The developed structures were analyzed by SEM and EDS analyzes, as well as XRD and FTIR spectroscopy. Mechanical properties were investigated as well.

Keywords

Bacterial cellulose, TiO_2, Hydroxyapatite, Antimicrobial activity, Acetic acid bacteria

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