SERBIA MRS Materials Research Society of Serbia

IISS - МИНС International Institute for the Science of Sintering

Twenty-third Annual Conference

YUCOMAT 2022

&

Twelfth World Round Table Conference on Sintering

XII WRTCS

Program

and

Book of Abstracts

endorsed by

FEMS

FEDERATION OF EUROPEAN MATERIALS SOCIETIES

12th World Round Table Conference on Sintering

WRTCS 2022

International Institute for the Science of Sintering

P.S.I.E.8.
Hydrogel dressings for phage therapy of chronic wounds
E. Černá[1], L. Vacek[2], F. Růžička[2], B. Lipový[3], M. Benešík[4], T. Botka[4], R. Pantůček[4],L. Vojtová[1]
[1]Central European Institute of Technology, Brno University of Technology, Brno, Czech Republic; [2]Department of Microbiology, St. Anne's University Hospital Brno and Faculty of Medicine, Masaryk University, Brno, Czech Republic; [3]Department of Burns and Plastic Surgery, University Hospital Brno and Facultyof medicine, Masaryk University, Brno, Czech Republic; [4]Section of Genetics and Molecular Biology, Faculty of Science, Masaryk University, Brno, Czech Republic

P.S.I.E.9.
Biomechanical DMA characterization of calcium and barium alginate hydrogel scaffolds
Alexandra Zühlke[1], Ivana Banićević[2], Bojana Obradović[2], Michael Gasik[1]
[1]Aalto University Foundation, Espoo, Finland. [2]University of Belgrade, Belgrade, Serbia

P.S.I.E.10.
Hydroxyl radical scavenging activity of titanium oxide nanocrystals
Pavel Maksimchuk[1], Kateryna Hubenko[1], Vladyslav Seminko[1], Andrey Onishchenko[2], Iryna Bespalova[1], Anatolii Onishchenko[3], Volodymyr Prokopiuk[3], Anton Tkachenko[3], Svetlana Yefimova[1]
[1]Department of Nanostructured Materials, Institute for Scintillation Materials NAS of Ukraine, Kharkiv, Ukraine, [2]Department of Physics, Kharkiv National University of Radio Electronics, Kharkiv, Ukraine, [3]Research Institute of Experimental and Clinical Medicine, Kharkiv National Medical University, Kharkiv, Ukraine

P.S.I.E.11* Magnesium alloy with yttrium, gadolinium and calcium alloying elements designed for aviation applications
Jitka Stráská[1], Stanislav Šašek[1], Peter Minárik[1], Robert Král[1], Jozef Veselý[1], Jiří Kubásek[2]
[1]Charles University, Faculty of Mathematics and Physics, Department of Physics of Materials, Ke Karlovu 5, 121 16 Praha, Czech Republic, [2]University of Chemistry and Technology, Faculty of Chemical Technology, Department of Metals and Corrosion Engineering, Technická 5, 166 28 Praha, Czech Republic

P.S.I.E.12* Resonance ultrasound spectroscopy measurements of elastic modulus of biomedical Ti-based alloys prepared by SPS
Josef Stráský[a], Jiří Kozlík[a], Dalibor Preisler[a], Hanuš Seiner[b], Michaela Janovská[b], Martin Koller[b], Miloš Janeček[a]
[a]Department of Physics of Materials, Faculty of Mathematics and Physics, Charles University, Czechia, [b]Institute of Thermomechanics, Czech Academy of Sciences, Czechia

***They do not participate in the Competition for the best Poster Performance of young researchers**

10.00-10.30 **Break**

First WRTCS Plenary Session, Main Conference Hall

Session I: 10.30-14.00
Chairpersons: Eugene A. Olevsky, Suk-Joong L. Kang

10.30-11.00 **W.PL.S.I.1**
Sintering assisted additive manufacturing
Eugene A. Olevsky
San Diego State University

P.S.I.E.10.

Hydroxyl radical scavenging activity of titanium oxide nanocrystals

Pavel Maksimchuk[1], Kateryna Hubenko[1], Vladyslav Seminko[1], Andrey Onishchenko[2], Iryna Bespalova[1], Anatolii Onishchenko[3], Volodymyr Prokopiuk[3], Anton Tkachenko[3], Svetlana Yefimova[1]

[1]*Department of Nanostructured Materials, Institute for Scintillation Materials NAS of Ukraine, Kharkiv, Ukraine*

[2]*Department of Physics, Kharkiv National University of Radio Electronics, Kharkiv, Ukraine*

[3]*Research Institute of Experimental and Clinical Medicine, Kharkiv National Medical University, Kharkiv, Ukraine*

Titanium oxide nanocrystals (TiO_{2-x}) are well-known material due to its excellent photocatalytic properties. During the last years, some researchers have accidentally reported on the strong antioxidant activity of titanium oxide nanoparticles. However, the general role of titanium oxide surface defect structure in its redox activity is still a subject of discussions. In this report, we consider the role of the defect structure on redox properties of TiO_{2-x}.

Changing the amount of nitric acid as a catalyst and peptizing agent, we obtained two different types of titanium oxide nanocrystals with the same size, but different Ti^{3+}/Ti^{4+} ratio in the crystal lattice (which were confirmed by XPS measurements), and so, different reactive oxygen species scavenging properties. Both types of titanium oxide nanocrystals are characterized by quite good biocompatibility against red blood cells even at high concentration.

Electron donating properties and reactive oxygen species scavenging action of both types of titanium oxide nanocrystals against hydroxyl radicals (·OH) have been studied. Hydroxyl radicals are formed at water radiolysis during X-ray irradiation of the cell. Extremely high reactivity of ·OH radicals (average ·OH lifetime in the biological environment of only few nanoseconds) makes the task of its effective elimination by the internal systems of the living cell rather difficult. Hydroxyl radicals scavenging properties of obtained titanium oxide nanocrystals have been revealed to be directly related to Ti^{3+}/Ti^{4+} ratio being higher for the samples with higher Ti^{3+} content.

The efficiency of reactive oxygen species scavenging by titanium oxide nanocrystals in water solutions is close to that of nanoceria (CeO_{2-x} nanocrystals) of the same size suggesting that titanium oxide nanoparticles can be effective as an antioxidant in living cells as well. Moreover high biocompatibility of synthesized nanocrystals could be associated with their reactive oxygen species scavenging ability, which make them a prospective material for biomedical applications.