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STECIŠTE NAUKE I PRAKSE U OBLASTIMA KOROZIJE, ZAŠTITE MATERIJALA I ŽIVOTNE SREDINE

MEETING POINT OF THE SCIENCE AND PRACTICE IN THE FIELDS OF CORROSION, MATERIALS AND ENVIRONMENTAL PROTECTION

PROCEEDINGS

KNJIGA RADOVA

Pod pokroviteljstvom

Under the auspicies of the

MINISTARSTVO PROSVETE, NAUKE I TEHNOLOŠKOG RAZVOJA REPUBLIKE SRBIJE

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGICAL DEVELOPMENT OF THE REPUBLIC OF SERBIA

May 21-24, 2018 : : Tara Mountain, Serbia

CIP - Каталогизација у публикацији - Народна библиотека Србије, Београд

620.193/.197(082)(0.034.2)
621.793/.795(082)(0.034.2)
667.6(082)(0.034.2)
502/504(082)(0.034.2)
66.017/.018(082)(0.034.2)

МЕЂУНАРОДНА конференција ЈУКОР (20 ; 2018 ; Тара)
Stecište nauke i prakse u oblastima korozije, zaštite materijala i životne sredine [Elektronski izvor] : knjiga radova = Meeting Point of the Science and Practice in the Fields of Corrosion, Materials and Environmental Protection : proceedings / XX YuCorr [Jugoslovenska korozija] Međunarodna konferencija = XX YuCorr International Conference, May 21-24, 2018, Tara Mountain, Serbia ; [organizatori Udruženje inženjera Srbije za koroziju i zaštitu materijala ... [et al.] = [organized by] Serbian Society of Corrosion and Materials Protection ... [et al.] ; urednici, editors Miomir Pavlović, Miroslav Pavlović]. - Beograd : Udruženje inženjera Srbije za koroziju i zaštitu materijala UISKOZAM, 2018 (Beograd : Udruženje inženjera Srbije). - 1 elektronski optički disk (CD-ROM) ; 12 cm

Sistemski zahtevi: Nisu navedeni. - Nasl. sa naslovne strane dokumenta. - Tiraž 200. - Bibliografija uz većinu radova. - Abstracts. - Registar.

ISBN 978-86-82343-26-4
1. Удружење инжењера Србије за корозију и заштиту материјала (Београд)
a) Премази, антикорозиони - Зборници b) Превлаке, антикорозионе - Зборници c) Антикорозиона заштита - Зборници d) Животна средина - Заштита - Зборници e) Наука о материјалима - Зборници
COBISS.SR-ID 263766284

XX YUCORR – Međunarodna konferencija | *International Conference*

IZDAVAČ |PUBLISHED BY
UDRUŽENJE INŽENJERA SRBIJE ZA KORZIJU I ZAŠTITU MATERIJALA (UISKOZAM),
SERBIAN SOCIETY OF CORROSION AND MATERIALS PROTECTION (UISKOZAM)
Kneza Miloša 7a/II, 11000 Beograd, Srebija, tel/fax: +381 11 3230 028, office@sitzam.org.rs; www.sitzam.org.rs

ZA IZDAVAČA | FOR PUBLISHER: *Prof. dr MIOMIR PAVLOVIĆ, predsednik UISKOZAM*

OBLAST | *SCIENTIFIC AREA:* KOROZIJA I ZAŠTITA MATERIJALA / *CORROSION AND MATERIALS PROTECTION*

KOMPJUTERSKA OBRADA I SLOG | *PAGE LAYOUT:* *Dr Miroslav Pavlović*

TIRAŽ | *CIRCULATION:* *200 primeraka / copies*

ISBN 978-86-82343-26-4

ORGANIZATORI XX YUCORR-a
XX YUCORR IS ORGANIZED BY

UDRUŽENJE INŽENJERA SRBIJE ZA KOROZIJU
I ZAŠTITU MATERIJALA

Serbian Society of Corrosion and Materials Protection

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HEMIPRODUKT, Novi Sad

JP EPS OGRANAK DRINSKO - LMSKE HE «BAJINA BAŠTA», Bajina Bašta

SURTEC ČAČAK d.o.o., Čačak

INSTITUT ZA PREVENTIVU d.o.o., Novi Sad

SZR “GALVA”, Kragujevac

NOVOHEM d.o.o., Šabac

Morphological characteristics of anaphoretically obtained hydroxyapatite/titanium dioxide coatings

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Abstract

Hydroxyapatite (HAP, $Ca_{10}(PO_4)_6(OH)_2$) is a main mineral constituent of hard tissue, making up 93% of human bone with stoichiometric Ca/P ratio of 1.667. It is widely used in medical applications such as tissue engineering, drug delivery and bone tissue repair. Nowadays, to enhance biocompatibility of the metallic implants, mostly based on titanium, the surface modification by deposition of bioactive and biocompatible HAP coatings has been proposed. The electrophoretic deposition (EPD) is a versatile and cost-effective technique for fabricating advanced HAP coatings. In this study, in situ synthesis of HAP/TiO_2 coating on titanium was prepared on titanium substrates via anaphoretic EPD of HAP and simultaneous anodization of Ti to strengthen the biocompatible composite coating. The prepared coatings were characterized using optical miscroscope, scanning electron microscopy, Fourier transform infrared spectroscopy and X-ray diffraction. It was found that controlling the deposition conditions it is possible to obtain HAP/anodized titanium dioxide coatings of variable thickness and porosity. Since smaller size HAP crystals with highly porous structure shows very high binding ability to various biomolecules, our coating is of excellent coverage and compactness. The obtained coating appears promising candidate for further biomedical applications with appropriate morphology for adhesion of osteoblasts.