The Serbian Society for Ceramic Materials
Institute for Multidisciplinary Research (IMSI), University of Belgrade
Institute of Physics, University of Belgrade
Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of Nuclear Sciences "Vinča", University of Belgrade
Faculty of Mechanical Engineering, University of Belgrade
Center of Excellence for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade
Faculty of Technology and Metallurgy, University of Belgrade

PROGRAMME and the BOOK of ABSTRACTS

7CSCS-2023

7th Conference of the Serbian Society for Ceramic Materials
June 14-16. 2023. Belgrade Serbia

Edited by:
Branko Matović
Jelena Maletaškić
Vladimir V. Srdić

Programme and Book of Abstracts of The Seventh Conference of The Serbian Society for Ceramic Materials **publishes abstracts from the field of ceramics, which are presented at international Conference.**

Editors-in-Chief
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Publisher
Institut za multidisciplinarna istraživanja
Kneza Višeslava 1, 11000 Belgrade, Serbia

For Publisher
Dr Dragica Stanković

Printing layout
Dr. Jelena Maletaškić, Vladimir V. Srdić

Press
Faculty of Technology and Metalurgy, Research and Development Centre of Printing Technology, Karnegieva 4, Belgrade, Serbia

Published: 2023

Circulation: 120 copies

CIP – Каталогизација у публикацији
Народна библиотека Србије, Београд

666.3/.7(048)
66.017/.018(048)

DRUŠTVO za keramičke materijale Srbije, Konferencija (7; 2023, Beograd)
Programme ; and the Book of Abstracts / 7th Conference of The Serbian Society for Ceramic Materials, 7CSCS-2023, June 14-16, 2023 Belgrade, Serbia ; [organizers] The Serbian Society for Ceramic Materials ... [et al.] ; edited by Branko Matović, Aleksandra Dapčević, Vladimir V. Srdić. - Belgrade :
Institut za multidisciplinarna istraživanja, 2023 (Belgrade : Faculty of technology and metalurgy, Research and development centre of printing technology). -124 str. : ilustr. ; 25 cm
Tiraž 120. – Str. 7: Welcome message / Branko Matović. - Registar.

ISBN 978-86-80109-24-4

a) Керамика -- Апстракти b) Наука о материјалима – Апстракти v) Наноматеријали -- Апстракти

COBISS.SR-ID 117544969

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THE INFLUENCE OF THERMAL ANNEALING OF Pt-BASED THIN FILMS ON ELECTRO-OXIDATION OF FORMIC ACID

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Due to their high electrocatalytic activity, Pt-based materials are widely investigated as electrocatalysts for the electro-oxidation of small organic molecules for fuel cells technology applications, contributing to the potential reduction of fossil fuel use in the near future. In addition to methanol, formic acid has also gained increasing attention as a potential fuel for direct fuel cells due to lower toxicity, non-flammability and a lower storage cost. The electro-oxidation of formic acid on Pt-based thin films is taking place predominantly via indirect pathway, through the dehydrogenation reaction of formic acid, with the formation of CO as a poisoning species. The activity of electrocatalysts is dependent both on surface structure and surface orientation in terms of the arrangement of the atoms at the surface. Controlled heat treatment led to the rearrangement of surface atoms thus enhancing the catalytic properties. In order to investigate changes in morphology before and after thermal annealing, Pt/CrNi catalysts were characterized using an atomic force microscope (AFM). The performance of all catalysts was tested in formic acid electro-oxidation reaction. The synergistic effect of individual metallic components, in the designed catalyst, resulted in high activity and exceptional stability. The approach demonstrated in this work may promote the development of new generation of high-performance catalysts for use in direct formic acid fuel cells (DFAFCs).

Keywords: Pt thin films; NiCr supports; thermal treatment; electro-oxidation; formic acid

Acknowledgments: This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (contract No 451-03-47/2023- 01/200026) and by the Science Fund of the Republic of Serbia under grant No 7739802.

ISBN 978-86-80109-24-4