Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION XI
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 18-20. September 2023.

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Book title: Serbian Ceramic Society Conference - ADVANCED CERAMICS AND APPLICATION XI Program and the Book of Abstracts

Publisher:
Serbian Ceramic Society

Editors:
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Technical Editors:
Dr. Adriana Peleš Tadić
Dr. Jelena Živojinović

Printing:
Serbian Ceramic Society, Belgrade, 2023.

Edition:
120 copies

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

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

SRPSKO keramičko društvo. Conference Advanced Ceramics and Application : New Frontiers in Multifunctional Material Science and Processing (11 ; 2023 ; Beograd)

Program ; and the Book of abstracts / Serbian Ceramic Society Conference Advanced Ceramics and Application XI New Frontiers in Multifunctional Material Science and Processing, Serbian Academy of Sciences and Art Serbia, Belgrade,18-20.September 2023. ; [editors Nina Obradović, Lidija Mančić]. - Belgrade : Serbian Ceramic Society, 2023 (Belgrade : Serbian Ceramic Society). - 90 str. : ilustr. ; 30 cm

Tiraž 120.

ISBN 978-86-905714-0-6

а) Керамика -- Апстракти б) Наука о материјалима -- Апстракти

COBISS.SR-ID 122849545

technique (DPC). Thus, in this work we use DPC to determine the Li, Mn and O atomic positions, thus providing a novel insight into the structure of $LiMn_2O_4$. Our results show local regions depleted in Li and the existence of Mn atoms in tetrahedral sites occupying a typical Li atom position, or occupying a free octahedral site in the same column, in agreement with the Mn disproportionation reaction reported for such compound.

PL13

The role of epitaxial layer of oxides on surface of hydrogen evolution electrocatalyst

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Catalysts can be successfully prepared by a simple electrochemical process. Their surface composition distinguishes catalytic activity toward hydrogen or oxygen evolution reactions. In this work, uniform Co-Ni cones were synthesized using the one-step method from an electrolyte containing a crystal modifier. Electrodeposited layers were oxidized and/or reduced in the furnace at 100°C. Freshly electrodeposited coating was stored in air atmosphere for seven days. This results in an epitaxial oxide layer forming on the surface of the catalyst. Changes in the surface composition, confirmed by the XPS method, strongly influenced the wettability, catalytic performance, and size of evolved hydrogen bubbles. The conical Co-Ni surface with epitaxial oxides layer formed in a controlled way possesses the best catalytic activity towards hydrogen and oxygen evolution. Conversely, the spontaneously formed oxide layer decreases the catalytic performance in mentioned reactions compared with the fresh sample. That open an possibility to control electrocatalytical activity of material by proper grow of thin layer of oxides. The proper storage of synthesized samples is also essential due to their desired catalytic applications. Proposed controlled oxidation can be an accessible way to increase nanomaterials catalytic performance.

PL14

Structural analysis using the powder diffraction method of different structures from the calcium phosphate group of materials

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Calcium-phosphate materials consist of ions that are stable in physiological conditions, which makes them extremely biocompatible, showing exceptional resistance to microbiological influences, changes in the pH of the environment, and having a very low solubility product in physiological conditions. One of the basic methods of structural investigation of materials is the X-ray diffraction method on a polycrystalline sample, where, depending on the need, different crystallographic programs can be used to calculate structural parameters.The aim of this work is to present the ten-year results of the structural characteristics of doped and pure calcium phosphate materials with reference to the use of different crystallographic programs

and crystallographical databases for determining the required and specified structural and phase characteristics. All materials were synthesized with reference to the principles of green chemistry, where acetate solutions were used, unlike nitrates, from which these materials are mainly obtained by the precipitation method. Results show that PDXL2 software is preferably usedin the case of nanocrystalline materials, while for materials with micro grain size, the powder cellsoftware should be used. For quick and efficient determination of the unit cell parameter, it is good to use the Wincell program. For detailed refinement of structure, the Full Prof program should be used. It is recommended to use the Vesta program for displaying crystal structures due to its extremely simple use.

PL15
Research of transparent ceramics for optical and photonic applications

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Transparent ceramics are highly promising materials, with some properties exceeding that of single crystal and amorphous materials in a wide range of optics and photonics applications. To develop high quality transparent ceramic materials for such applications, it is essential to study the fundamental science aspects involved in the synthesis and processing of the materials, in order to achieve the required transparency and microstructures. Furthermore, processing transparent optical materials with anisotropic crystal structures presents additional significant challenges, due to the inherent characteristics of optical anisotropy in polycrystals. In an attempt to process transparent non-cubic ceramics to achieve nanostructure grain size, a field-assisted sintering method is studied in which the ceramic samples can be quickly densified without significant grain growth. Transparent ceramics can be made by dry and wet forming techniques. The gel-casting is a near-net shaping process for simple and complex shapes of ceramic fabrication. A newly developed gelling system has been investigated to develop transparent complex-shaped ceramics, which is promising to fabricate large-size and complex-shaped transparent ceramics for optical and photonic applications. Additionally, digital processing through additive manufacturing has great potential as a new method for fabricating optical materials.