

MATERIALS RESEARCH SOCIETY OF SERBIA
INSTITUTE OF TECHNICAL SCIENCES OF SASA

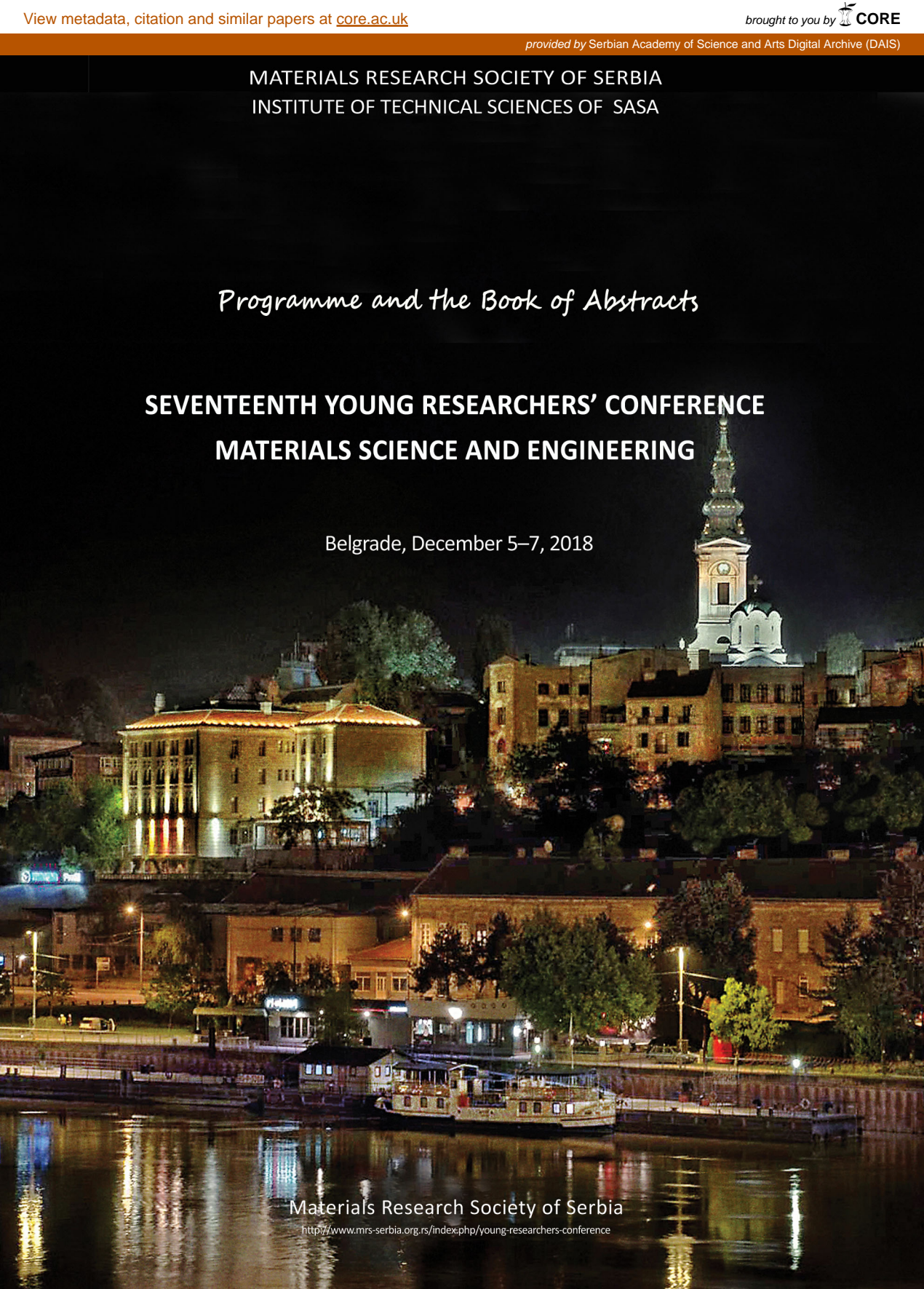
Programme and the Book of Abstracts

**SEVENTEENTH YOUNG RESEARCHERS' CONFERENCE
MATERIALS SCIENCE AND ENGINEERING**

Belgrade, December 5–7, 2018

Materials Research Society of Serbia

<http://www.mrs-serbia.org.rs/index.php/young-researchers-conference>



**SEVENTEENTH YOUNG RESEARCHERS' CONFERENCE
MATERIALS SCIENCE AND ENGINEERING**

December 5-7, 2018, Belgrade, Serbia

Program and the Book of Abstracts

**Materials Research Society of Serbia
&
Institute of Technical Sciences of SASA**

November 2018, Belgrade, Serbia

Book title:

Seventeenth Young Researchers' Conference - Materials Science and Engineering:
Program and the Book of Abstracts

Publisher:

Institute of Technical Sciences of SASA
Knez Mihailova 35/IV, 11000 Belgrade, Serbia
Tel: +381-11-2636994, 2185263, <http://www.itn.sanu.ac.rs>

Editor:

Dr. Smilja Marković

Technical Editor:

Aleksandra Stojičić

Cover page: Aleksandra Stojičić and Milica Ševkušić

Cover: Modified Photo by Dani Lavi 0007; Wikimedia Commons

(https://commons.wikimedia.org/wiki/File:Belgrade_at_night.jpg); CC BY-SA
4.0

Printer:

Gama digital centar
Autoput No. 6, 11070 Belgrade, Serbia
Tel: +381-11-6306992, 6306962
<http://www.gdc.rs>

Edition:

130 copies

CIP - Каталогизacija у публикацији - Народна библиотека Србије, Београд
66.017/.018(048)

YOUNG Researchers Conference Materials Sciences and Engineering (17 ; 2018; Beograd)

Program ; and the Book of Abstracts / Seventeenth Young Researchers' Conference
Materials Sciences and Engineering, December 5-7, 2018, Belgrade, Serbia ; [organized by]
Materials Research Society of Serbia & Institute of Technical Sciences of SASA ; [editor
Smilja Marković]. -Belgrade : Institute of Technical Sciences of SASA, 2018 (Beograd :
Gama digital centar). - XX, 100 str. ; 23 cm

Tiraž 130. - Registar.
ISBN 978-86-80321-34-9

1. Društvo za istraživanje materijala Srbije (Beograd) 2. Institut
tehničkih nauka SANU (Beograd)

a) Наука о материјалима - Апстракти b) Технички материјали - Апстракти
COBISS.SR-ID 270509836

Aim of the Conference

Main aim of the conference is to enable young researchers (post-graduate, master or doctoral student, or a PhD holder younger than 35) working in the field of materials science and engineering, to meet their colleagues and exchange experiences about their research.

Topics

Biomaterials
Environmental science
Materials for high-technology applications
Nanostructured materials
New synthesis and processing methods
Theoretical modelling of materials

Scientific and Organizing Committee

Committee President

Smilja Marković Institute of Technical Sciences of SASA, Belgrade, Serbia

Vice-presidents

Dragana Jugović Institute of Technical Sciences of SASA, Belgrade, Serbia

Magdalena Stevanović Institute of Technical Sciences of SASA, Belgrade, Serbia

Dorđe Veljović Faculty of Technology and Metallurgy, Belgrade, Serbia

Members

Nadica Abazović Institute of Nuclear Sciences “Vinča”, Belgrade, Serbia
Jasmina Dostanić Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia

Branka Hadžić Institute of Physics, Belgrade, Serbia
Ivana Jevremović Norwegian University of Science and Technology, Trondheim, Norway

Sonja Jovanović Institute of Nuclear Sciences “Vinča”, Belgrade, Serbia;
Institute Jožef Stefan, Ljubljana, Slovenia

Ralph Kraehnert Technical University of Berlin, Germany
Snežana Lazić Universidad Autónoma de Madrid, Spain
Miodrag Lukić Institute of Technical Sciences of SASA, Belgrade, Serbia
Lidija Mančić Institute of Technical Sciences of SASA, Belgrade, Serbia
Marija Milanović Faculty of Technology, Novi Sad, Serbia
Nebojša Mitrović Faculty of Technical Sciences, Čačak, Serbia
Irena Nikolić Faculty of Metallurgy and Technology, Podgorica, Montenegro
Marko Opačić Institute of Physics, Belgrade, Serbia
Rafał Poręba Institute of Macromolecular Chemistry AS CR, v.v.i., Prague 6, Czech Republic

Vuk Radmilović Faculty of Technology and Metallurgy, Belgrade, Serbia

Srečo Škapin Institute Jožef Stefan, Ljubljana, Slovenia

Boban Stojanović Faculty of Sciences, Kragujevac, Serbia

Ivana Stojković-Simatović Faculty of Physical Chemistry, Belgrade, Serbia

Vuk Uskoković
Rastko Vasilic
Siniša Vučenović
Marija Vukomanović

Chapman University, Irvine, CA, USA
Faculty of Physics, Belgrade, Serbia
Faculty of Sciences, Department of Physics, Banja Luka, B&H
Institute Jožef Stefan, Ljubljana, Slovenia

Conference Secretary

Aleksandra Stojičić

Institute of Technical Sciences of SASA, Belgrade, Serbia

Conference Technical Committee

Milica Ševkušić, Miloš Milović, Ivana Dinić, Vladimir Rajić, Marina Vuković, Vukašin Ugrinović, Tamara Matić

Results of the Conference

Beside printed «Program and the Book of Abstracts», which is disseminated to all conference participants, selected and awarded peer-reviewed papers will be published in journal “Tehnika – Novi Materijali”. The best presented papers, suggested by Session Chairpersons and selected by Awards Committee, will be proclaimed at the Closing Ceremony. Part of the award is free-of-charge conference fee at YUCOMAT 2019.

Sponsors



ANALYSIS
LABORATORY EQUIPMENT

Туристичка
организација
Београда



Tourist
Organization
of Belgrade

Acknowledgement

The editor and the publisher of the Book of abstracts are grateful to the Ministry of Education, Sciences and Technological Development of the Republic of Serbia for its financial support of this book and The Seventeenth Young Researchers' Conference - Materials Sciences and Engineering, held in Belgrade, Serbia.

7-5

Synthesis and characterization of $\text{Na}_{0.4}\text{MnO}_2$ as cathode material for aqueous sodium-ion batteries

Lazar Rakočević¹, Mirjana Novaković², Jelena Potočnik²,
Dragana Jugović³, Ivana Stojković Simatović¹

¹University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia, ²University of Belgrade, Vinča Institute of Nuclear Sciences, Serbia, ³Institute of Technical Sciences of SASA, Belgrade, Serbia

The application of rechargeable batteries is growing significantly and there is a need for developing cheaper batteries with good performances. Sodium-ion batteries could be a viable option due to higher abundance of sodium against lithium mineral resources, its low price and similar principles intercalate Na^+ ions as Li^+ ions in lithium-ion batteries. Different materials as manganese oxides and vanadium oxide are used as electrode materials in sodium batteries. $\text{Na}_{0.44}\text{MnO}_2$ was regarded as one of the most promising cathode materials for sodium-ion batteries due to its high specific capacity and good cyclability.

In this work, $\text{Na}_{0.4}\text{MnO}_2$ was synthesized using glycine-nitrate method (GNM). The structure of synthesized powder was characterized by X-Ray Diffraction (XRD), while the particles morphology was examined by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The elemental mapping was performed by energy-dispersive X-ray spectroscopy (EDS). XRD results showed that the phase structure of $\text{Na}_{0.4}\text{MnO}_2$ was orthorhombic with tunnel structure. TEM and SEM micrographs of obtained powder material showed uniformed rod-like shape particles with the average lengths and widths of 300 nm and 80 nm, respectively and EDS analysis confirmed that the sample contains Na, Mn, and O in an appropriate ration. The electrochemical behavior of $\text{Na}_{0.4}\text{MnO}_2$ was investigated by cyclic voltammetry (CV) in a saturated aqueous solution of NaNO_3 at scan rates from 20 to 400 $\text{mV}\cdot\text{s}^{-1}$. The initial discharge capacity of $\text{Na}_{0.4}\text{MnO}_2$ in NaNO_3 solution was 50 $\text{mA}\cdot\text{h}\cdot\text{g}^{-1}$, while after 15 cycles its value increased for 9%. while the efficiency (the ratio of the capacity charge and discharge) was amounting to $\sim 95\%$. This indicates that material synthesized by GNM can be used as cathode material in aqueous sodium-ion batteries