Optimization of biodiesel production from waste cooking oil using waste-based CaO/Zeolite catalyst

Conference Paper · December 2021

CITATIONS
0

READS
3

3 authors:

Stefan M. Pavlović
University of Belgrade
57 PUBLICATIONS **66** CITATIONS
SEE PROFILE

Dalibor M. Marinković
University of Belgrade
37 PUBLICATIONS **344** CITATIONS
SEE PROFILE

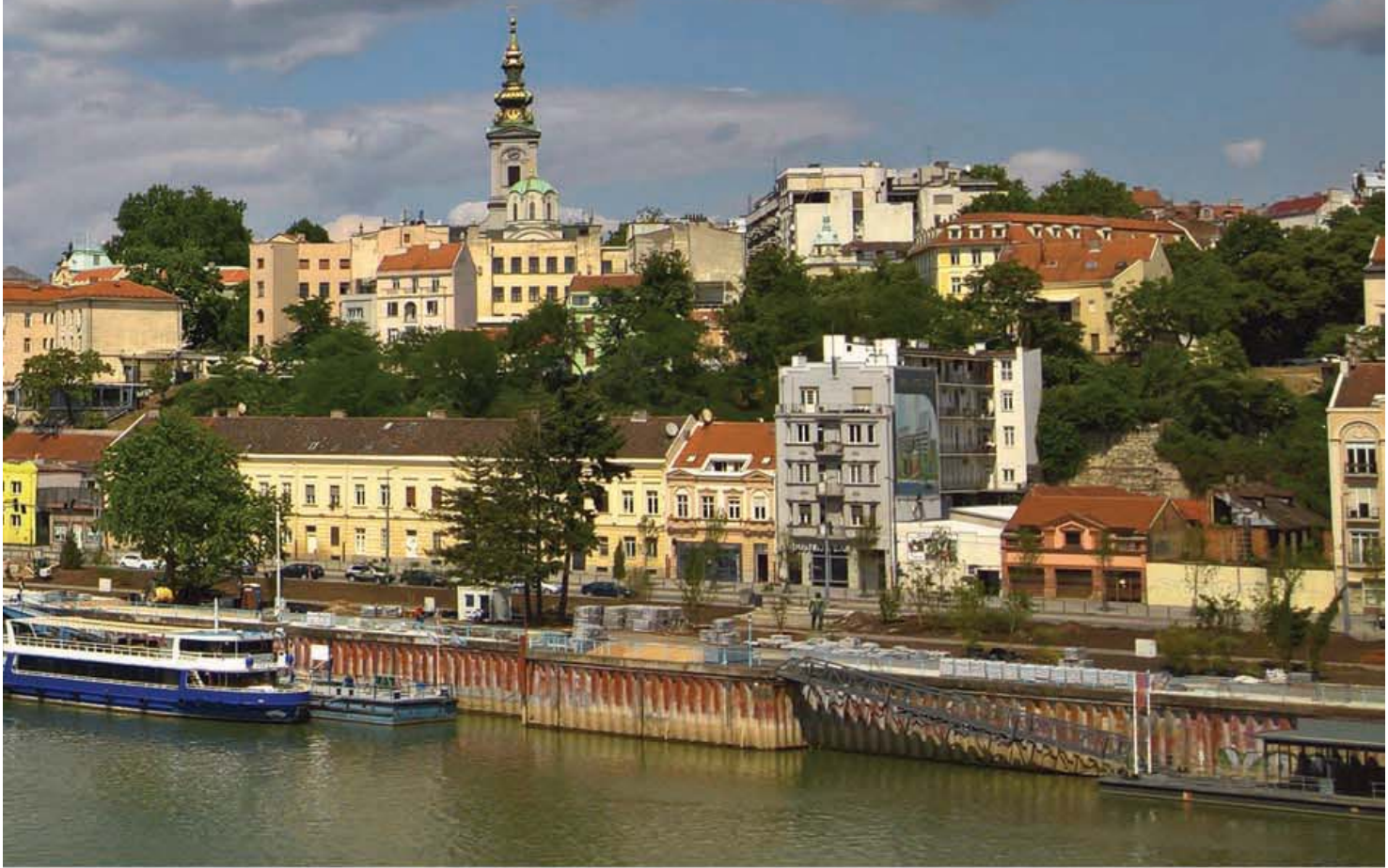
Miroslav Stankovic
University of Belgrade
84 PUBLICATIONS **602** CITATIONS
SEE PROFILE

MATERIALS RESEARCH SOCIETY OF SERBIA
INSTITUTE OF TECHNICAL SCIENCES OF SASA

Programme and the Book of Abstracts

NINETEENTH YOUNG RESEARCHERS' CONFERENCE MATERIALS SCIENCE AND ENGINEERING

Belgrade, December 1-3, 2021



NINETEENTH YOUNG RESEARCHERS' CONFERENCE

MATERIALS SCIENCE AND ENGINEERING

December 1-3, 2021, Belgrade, Serbia

Program and the Book of Abstracts

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

2021

Book title:
Nineteenth 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

Conference organizers:
Materials Research Society of Serbia, Belgrade, Serbia
Institute of Technical Sciences of SASA, Belgrade, Serbia

Editor:
Dr. Smilja Marković

Technical Editor:
Aleksandra Stojičić

Cover page: Aleksandra Stojičić and Milica Ševkušić
Cover: Milica Ševkušić

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

Publication year: 2021

Print-run:
120 copies

CIP - Каталогизација у публикацији

Народна библиотека Србије, Београд

66.017/.018(048)

YOUNG Researchers Conference Materials Sciences and Engineering (19 ; 2021 ; Beograd)

Program ; and the Book of abstracts / Nineteenth Young Researchers' Conference Materials Science and Engineering, December 1-3, 2021, 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, 2021 (Belgrade : Gama digital centar). - XVIII, 86 str. : ilustr. ; 23 cm

Tiraž 120. - Registar.

ISBN 978-86-80321-36-3

а) Наука о материјалима -- Апстракти б) Технички материјали – Апстракти

COBISS.SR-ID 51231241

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
Materials for new generation solar cells
Nanostructured materials
New synthesis and processing methods
Theoretical modelling of materials

Scientific and Organizing Committee

Ivana Stojković-Simatović	Faculty of Physical Chemistry, Belgrade, Serbia
Konrad Terpiłowski	Department of Interfacial Phenomena, Institute of Chemical Sciences, Faculty of Chemistry, Maria Curie-Skłodowska University in Lublin, Poland
Vuk Uskoković	TardigradeNano, Irvine, CA, USA
Rastko Vasilić	Faculty of Physics, Belgrade, Serbia
Ljiljana Veselinović	Institute of Technical Sciences of SASA, Belgrade, Serbia
Siniša Vučenović	Faculty of Sciences, Department of Physics, Banja Luka, B&H
Marija Vukomanović	Institute Jožef Stefan, Ljubljana, Slovenia

Conference Secretary

Aleksandra Stojičić	Institute of Technical Sciences of SASA, Belgrade, Serbia

Conference Technical Committee

Milica Ševkušić, Ivana Dinić, 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 2022.

Sponsors

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 Nineteenth Young Researchers' Conference - Materials Sciences and Engineering, held in Belgrade, Serbia.

4-2

Optimization of biodiesel production from waste cooking oil using waste-based CaO/zeolite catalyst

Stefan Pavlović, Dalibor Marinković, Miroslav Stanković
University of Belgrade, Institute of Chemistry, Technology, and Metallurgy-National Institute of Republic of Serbia, Njegoševa 12, 11000 Belgrade

Lignite coal fly ash collected from Serbian thermal power plants was converted into value-added zeolite-like material using a Teflon-lined hydrothermal reactor in an alkali activation process at 150 ºC for 24 h. The obtained material was used in the synthesis of zeolite-supported chicken eggshell calcium oxide catalyst for biodiesel synthesis from waste cooking oil using earlier established procedures. The study aimed to coupled optimization of catalyst synthesis parameters (CaO loading and calcination temperature) and biodiesel synthesis process (CaO concentration in the reaction mixture). The influence of calcination temperature in the catalyst activation stage was monitored by X-ray diffraction and FT-IR spectroscopy, whereas the reaction progress by the HPLC analysis. The analyzed calcination temperature range was within 450 ºC and 950 ºC, CaO loading in the range of 10 wt% - 50 wt%, whereas CaO concentration in the reaction mixture was within 2 wt% and 10 wt%. It is shown that calcination temperature strongly influences the final catalyst form, whereby the temperature higher than 700 ºC leads to the destruction of the initial zeolitic support and interaction of CaO with the melted glassy silicate phase making less-active or non-active calcium silicate phases. The highest fatty acid methyl esters content (>97 wt.%) was obtained using a catalyst with 44 wt.% of CaO and calcined at 523 ºC under the following reaction conditions, reaction temperature of 60 ºC, methanol to oil molar ratio of 1/12, catalyst concentration of 8.8 wt.%, and reaction time of 90 min.

Acknowledgement
This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No. Grant No: 451-03-9/2021-14/200026).