ELMINA 2022

SECOND INTERNATIONAL CONFERENCE ON ELECTRON MICROSCOPY OF NANOSTRUCTURES

ДРУГА МЕЂУНАРОДНА КОНФЕРЕНЦИЈА О ЕЛЕКТРОНСКОЈ МИКРОСКОПИЈИ НАНОСТРУКТУРА

August 22nd–26th, 2022, Belgrade, Serbia
22–26. август 2022. Београд, Србија

SECOND INTERNATIONAL CONFERENCE

ELMINA 2022

Serbian Academy of Sciences and Arts, Belgrade, Serbia
August 22nd-26th, 2022
http://elmina.tmf.bg.ac.rs

Program and Book of Abstracts

Organized by:
Serbian Academy of Sciences and Arts
and
Faculty of Technology and Metallurgy, University of Belgrade

Endorsed by:
European Microscopy Society
and
Federation of European Materials Societies

Title: SECOND INTERNATIONAL CONFERENCE
ELMINA 2022
Program and Book of Abstracts

Publisher: Serbian Academy of Sciences and Arts
Knez Mihailova 35, 11000 Belgrade, Serbia
Phone: +381 11 2027200
https://www.sanu.ac.rs/en/

Editors: Velimir R. Radmilović and Vuk V. Radmilović

Technical Editor: Vuk V. Radmilović

Cover page: Raša Hindawi

Printed in: Serbian Academy of Sciences and Arts
Knez Mihailova 35, 11000 Belgrade, Serbia
Phone: +381 11 2027128
stamparija@sanu.ac.rs
Circulation: 55 copies.

At the beginning we wish you all welcome to Belgrade and ELMINA2022 International Conference organized by the Serbian Academy of Sciences and Arts and the Faculty of Technology and Metallurgy, University of Belgrade. We are delighted to have such a distinguished lineup of plenary speakers who have agreed to accept an invitation from the Serbian Academy of Sciences and Arts to come to the second electron microscopy conference: Electron Microscopy of Nanostructures, ELMINA2022. The scope of ELMINA2022 will be focused on electron microscopy, which provides structural, chemical and electronic information at atomic scale, applied to nanoscience and nanotechnology (physics, chemistry, materials science, earth and life sciences), as well as advances in experimental and theoretical approaches, essential for interpretation of experimental data and research guidance. It will highlight recent progress in instrumentation, imaging and data analysis, large data set handling, as well as time and environment dependent processes. The scientific program contains the following topics:

- Instrumentation and New Methods
- Diffraction and Crystallography
- HRTEM and Electron Holography
- Analytical Microscopy (EDS and EELS)
- Nanoscience and Nanotechnology
- Life Sciences

To put this Conference in proper prospective, we would like to remind you that everything related to nanoscience and nanotechnology started 30 to 40 years ago as a long term objective, and even then it was obvious that transmission electron microscopy (TEM) must play an important role, as it was the only method capable of analyzing objects at the nanometer scale. The reason was very simple - at that time, an electron microscope was the only instrument capable of detecting the location of atoms, making it today possible to control synthesis of objects at the nanoscale with atomic precision. Electron microscopy is also one of the most important drivers of development and innovation in the fields of nanoscience and nanotechnology relevant for many areas of research such as biology, medicine, physics, chemistry, etc. We are very proud that a large number of contributions came from young researchers and students which was one of the most important objectives of ELMINA2022, and which indicates the importance of electron microscopy in various research fields. We are happy to present this book, comprising of the Conference program and abstracts, which will be presented at ELMINA2022 International Conference. We wish you all a wonderful and enjoyable stay in Belgrade.

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GENERAL INFORMATION

DATE AND VENUE: The conference will be held August 22nd-26th, 2022 at the Serbian Academy of Sciences and Arts, Knez Mihailova 35, 11000 Belgrade, Serbia with the beginning at 8:30 AM on August 22nd 2022, in the main lecture hall.

REGISTRATION: At the registration desk, located in front of the main lecture hall of the conference venue. Registration desk working hours are: Monday, August 22nd, from 8:00 to 14:00, Tuesday, August 23rd, from 8:15 to 14:00, Wednesday, August 24th, from 8:15 to 14:00 and Thursday August 24th, from 8:15 to 12:00. Registered participants will receive a nametag and a conference bag.

INSTRUCTIONS FOR AUTHORS: The conference will feature plenary sessions, oral sessions and poster sessions as well as vendor presentations during lunch breaks. Presentations during plenary sessions will last 30 minutes each, including discussion while oral presentations will be 15 minutes each, including discussion. Standard and hands-free microphones will be on site. No A-V equipment will be provided for any poster presentations. Poster presenters must remain at their poster on their assigned day during the required poster session. Each poster will be allocated a 1180 mm high and 841 mm wide (A0 format) display area.

CONFERENCE AWARDS: Oral and poster presentations will be reviewed according to the following criteria: (a) relevance to a specific symposium, (b) scientific content, quality and innovative proposals, (c) clarity of the text, and (d) compliance with the format. During the conference, the best three (3) oral and three (3) poster presentations, selected by an award committee, will receive awards.

Morphology of Waterborne Polyurethanes Based on Poly(dimethylsiloxane)

Ivan S. Stefanović[1], Jasna V. Džunuzović[1,2], Enis S. Džunuzović[3], Andrea Basagni[4] and Carla Marega[4]

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Waterborne polyurethanes (WBPUs) represent a class of polyurethanes (PUs), in which water is used as the dispersion medium, instead hazardous organic solvents. In this manner, the emission of volatile organic compounds is decreased, leading to the environmental preservation. Poly(dimethylsiloxane) (PDMS) has a lot of useful features, such as low glass transition temperature, T_g, low surface energy, excellent biocompatibility, high thermal and oxidative stability, which is why PDMS is often used in WBPU formulations. Siloxane-modified WBPUs exhibit the properties of both, PDMS and PUs. WBPUs based on PDMS have good surface properties, such as excellent hydrophobicity, chemical resistance and low surface energy. Because of these useful features, WBPUs based on PDMS can be used as coatings, adhesives, paints, etc [1].

In this work, a series of WBPUs was synthesized *via* one-step polymerization method, without a chain extension step, using acetone and water as solvents and stannous octoate as a catalyst. The prepared WBPUs are based on *α,ω*-dihydroxypropyl poly(dimethylsiloxane) (PDMS, M_n = 725 g/mol), isophorone diisocyanate (IPDI), 2,2-bis-(hydroxymethyl)propionic acid (DMPA) and triethylamine (TEA). Three samples with different molar ratio between DMPA and PDMS (from 0.2 to 0.5) and constant –NCO/–OH molar ratio of 1.7, were synthesized [2]. WBPU samples were labeled as WBPU-0.2, WBPU-0.35, and WBPU-0.5, where the numbers represent the DMPA/PDMS molar ratio. Surface morphology was examined by SEM and AFM analyses. SEM analysis was performed on the XL30 scanning electron microscope, on the surface of the samples, at a magnification of 3k ×, previously gold coated with 5 nm thickness. For determination of the surface composition of the prepared WBPUs, SEM-EDS measurements were also conducted. AFM analysis was carried out on an Agilent 5500 SPM microscope, under ambient conditions, with tapping mode. The scan area of the WBPUs surface was 1 × 1 μm^2.

The surface morphology and surface element composition of WBPUs was analyzed by SEM and SEM-EDS analyses, respectively. According to the obtained micrographs presented in Figure 1, it can be seen that all samples have very smooth and homogenous surfaces, without some major relief irregularities. Besides that, SEM-EDS measurements show the presence of all expected elements, and also a large quantity of Si atoms (> 20 wt.%) on the surface that originates from PDMS. These results arise as a consequence of the low surface energy of PDMS, which is why it tends to migrate and cover the surfaces of the prepared WBPUs [3]. In order to examine the surface topography of WBPUs, AFM analysis was performed. In Figure 2, 3D height and 2D phase AFM images of the surface of WBPUs are presented. On the obtained 3D height AFM figures, it can be observed that surface of WBPUs becomes rougher with increasing DMPA content. Furthermore, brighter microdomains, originating from PDMS, are also visible on the surface of prepared WBPUs. 2D

phase AFM images provided more information, and revealed the presence of microphase separated morphology in these WBPUs, caused by the termodynamic incompatibility of the applied reagents. Microphase separated morphology is more pronounced in WBPUs with higher PDMS content [4].

A series of novel WBPUs based on PDMS, IPDI, DMPA and TEA was successfully prepared. SEM and AFM analysis confirmed positive surface properties, such as smooth and homogenous surface, enriched with a large amount of PDMS, and the existence of microphase separated morphology, which is responsible for good features and wide application area of the prepared WBPUs [5].

References:

[1] G Zhen, L Yunjun, Prog. Org. Coat. **76** (2013), 1522-1526.
[2] I Stefanović *et al*, Prog. Org. Coat. **161** (2021), 106474.
[3] F Yu, X Xu, N Lin, XY Liu, RSC Adv. **5** (2015), 72544-72552.
[4] E Yilgör, I Yilgör, Prog. Polym. Sci. **39** (2014) 1165-1195.

[5] This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No. 451-03-68/2022-14/200026).

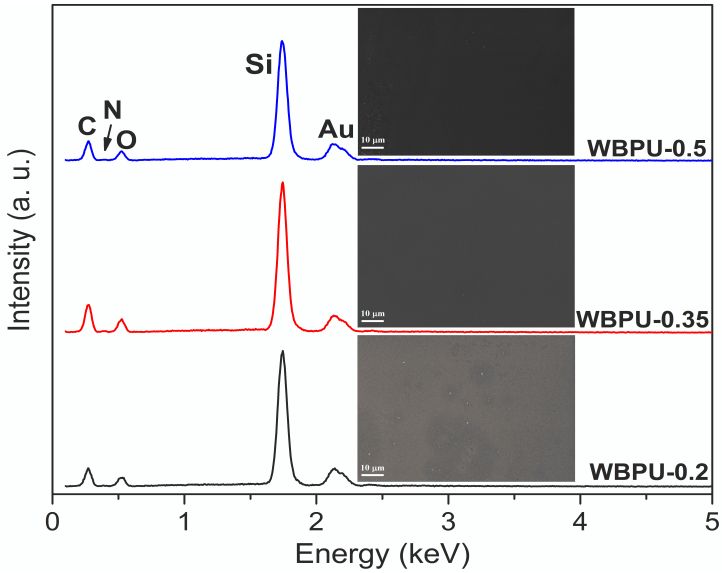

Figure 1. SEM micrographs and SEM-EDS curves of the WBPUs, magnification ×3k.

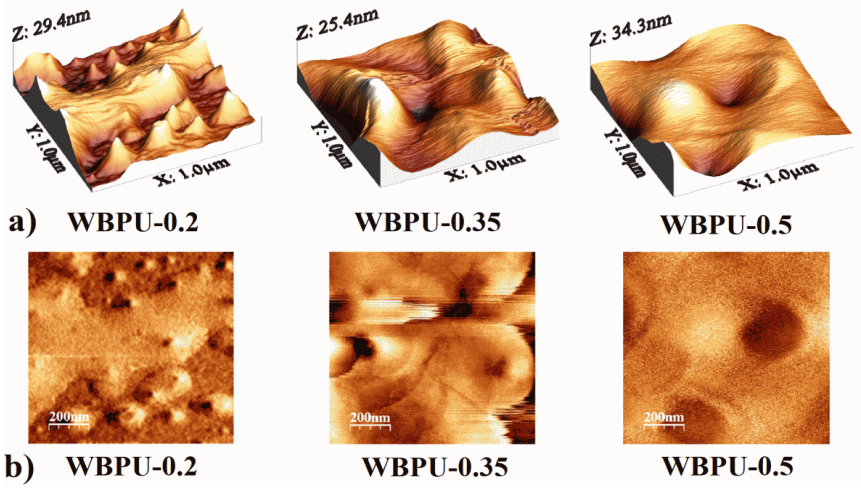

Figure 2. a) 3D height and b) 2D phase AFM images of the surface of WBPUs, scan area 1×1 μm^2.