

# Book of abstracts



IX International School and Conference on Photonics

## PHOTONICA2023

with joint events:

Understanding interaction light - biological surfaces: possibility for new electronic materials and devices

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Biological and bioinspired structures for multispectral surveillance

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Quantum sensing integration within microfluidic Lab-on-a Chips for biomedical applications

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Advanced Biophysical Methods for Soil Targeted Fungi-Based Biocontrol Agents

August 28 - September 01, 2023, Belgrade, Serbia

*Editors*

Jelena Potočnik, Maja Popović, Dušan Božanić

Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade

Belgrade, 2023

ABSTRACTS OF TUTORIAL, KEYNOTE, INVITED LECTURES,  
PROGRESS REPORTS AND CONTRIBUTED PAPERS

of

IX International School and Conference on Photonics

# PHOTONICA2023

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*Publisher*

Vinča Institute of Nuclear Sciences – National Institute of the Republic of  
Serbia, University of Belgrade  
Mike Petrovića Alasa 12-14  
11351 Vinča, Belgrade, Serbia

*Printed by*

Serbian Academy of Sciences and Arts

*Number of copies*

200

ISBN 978-86-7306-165-8

ISBN 978-86-7306-168-9 (Online)



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PHOTONICA2023 is organized under auspices and with support of the Ministry of Science, Technological Development and Innovation, Republic of Serbia ([www.nitra.gov.rs](http://www.nitra.gov.rs)). PHOTONICA2023 is supported and recognized by Optica (Formerly OSA) - The Optical Society ([www.optica.org](http://www.optica.org)).



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Dear Colleagues, friends of photonics,

We are honored by your participation at our PHOTONICA 2023 and your contribution to the tradition of this event. It is our pleasure to host you in Belgrade and in Serbia. Welcome to the world of photonics.

The International School and Conference on Photonics, PHOTONICA, is a biennial event held in Belgrade since 2007. The first meeting in the series was called ISCOM (International School and Conference on Optics and Optical Materials), but it was later renamed to PHOTONICA to reflect more clearly the aims of the event as a forum for education of young scientists, exchanging new knowledge and ideas, and fostering collaboration between scientists working within emerging areas of photonic science and technology. A particular educational feature of the program is to enable students and young researchers to benefit from the event, by providing introductory lectures preceding most recent results in many topics covered by the regular talks. In other words, tutorial and keynote speakers will give lectures specifically designed for students and scientists starting in this field. Apart from the oral presentations PHOTONICA hosts vibrant poster sessions. A significant number of best posters will be selected and the authors will have opportunity to present their work through short oral presentations – contributed talks.

The wish of the organizers is to provide a platform for discussing new developments and concepts within various disciplines of photonics, by bringing together researchers from academia, government and industrial laboratories for scientific interaction, the showcasing of new results in the relevant fields and debate on future trends.

PHOTONICA 2023 will host three joint events: PhoBioS COST Action “Understanding interaction light - biological surfaces: possibility for new electronic materials and devices”, NATO Science for Peace and Security Program (grant G5618) workshop “Biological and bioinspired structures for multispectral surveillance”, workshop on “Quantum sensing integration within microfluidic Lab-on-a Chips for biomedical applications” and BioPhysFUN workshop “Advanced Biophysical Methods for Soil Targeted Fungi-Based Biocontrol Agents”. Following the official program, the participants will also have plenty of opportunities to mix and network outside of the lecture theatre with planned free time and social events.

This book contains 130 abstracts of all presentations at the IX International School and Conference on Photonics, PHOTONICA2023. Authors from all around the world, from all the continents, will present their work at this event. There will be 4 tutorial and 7 keynote lectures to the benefits of students and early stage researches. The most recent results in various research fields of photonics will be presented through 16 invited lectures and 8 progress reports of early-stage researchers. Within the poster sessions and a number of contributed talks, authors will present 95 presentations on their new results in a cozy atmosphere of the building of Serbian Academy of Science and Arts.

Belgrade, August 2023

Editors

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1. Quantum optics and ultracold systems
2. Nonlinear optics
3. Optical materials
4. Biophotonics
5. Devices and components
6. Optical communications
7. Laser spectroscopy and metrology
8. Ultrafast optical phenomena
9. Laser - material interaction
10. Optical metamaterials and plasmonics
11. Machine learning in photonics
12. Other topics in photonics

## **Joint Events**

PhoBioS COST Action - Understanding interaction light - biological surfaces: possibility for new electronic materials and devices

NATO Science for Peace and Security Program - Biological and bioinspired structures for multispectral surveillance

Workshop - Quantum sensing integration within microfluidic Lab-on-a Chips for biomedical applications

BioPhysFUN workshop - Advanced Biophysical Methods for Soil Targeted Fungi-Based Biocontrol Agents

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## Carbon quantum dots/silver based metal organic framework composites in light enhanced wound healing

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In recent years researchers have developed new strategies to enhance the effectiveness of wound healing by combining nanoparticles and infra red (IR) light. For example, some studies have shown that nanoparticles can be used to enhance the absorption of near-infrared laser (NIR) light by tissues, leading to increased healing rates [1].

The influence of NIR light on proliferation, collagen production, and wound healing was tested on: keratocytes (HaCaT) and fibroblasts (MRC-5) cells that are used as model systems of human skin equivalents that comprise an epidermal and a dermal compartment of skin. Also, these cells were treated with carbon quantum dots/silver-based metal-organic framework composites (Ag-MoFs-NCDs and Ag-MoFs-SCDs), which previously showed high antibacterial activity [2], without and with laser light.

Firstly, we have found the most convenient and effective CW laser intensity ( $16 \text{ mW/cm}^2$ ) and illumination time (3 minutes), which is not too high and short enough to influence human cells' proliferation and metabolism positively. Additional chemical treatment with Ag-MoFs-NCDs and Ag-MoFs-SCDs results in a further increase in human cell viability. Our measurements showed that the proliferation index in laser-illuminated cells and cells treated with Ag-MoFs-SCDs was at the level of the untreated control. Furthermore, Ag-MoFs-SCDs treatment and laser illumination induced a mild, insignificant increase in cellular proliferation. On the other hand, Ag-MoFs-NCDs treatment led to a more pronounced, albeit not significant increase, in cellular proliferation, while Ag-MoFs-NCDs treatment combined with laser illumination significantly increased proliferation.

Also, we have detected a mild change in collagen level estimated by hydroxyproline assay, which may indicate a positive outcome of combined laser illumination and treatment, taking into account that after 48 hours, a change in cell's response to the treatment could be noticed. Finally, based on migration assay, we observe a complete wound closure after 48 hours in fibroblast cells treated with Ag-MoFs-NCDs and near-infrared laser light, Fig. 1.

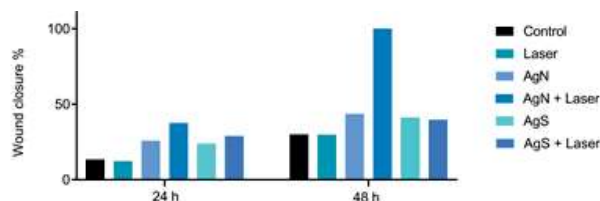


Figure 1. Percentage of wound closure after 24 hours (a) and 48 hours (b).

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