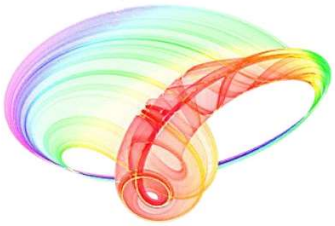
Book of abstracts



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

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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

Conference Topics

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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12. Other topics in photonics

Metal ion-implanted TiN thin films: Induced effects on structural and optical properties

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The ion implantation technique has a number of advantages over conventional methods for the improvement of thin films that offer the various possibilities of their use in different industrial and technological fields. Herein, we present the effects of metal ion implantation on the structural and optical properties of TiN thin films. TiN films of 170 nm thickness were grown by d.c. reactive sputtering on Si (100) wafers and then irradiated at 5×10^{16} ions/cm^2 with either Au, Ag, or Cu ions by using two different energies per each implanted metal. The results showed that as deposited TiN crystallizes in form of fcc cubic structure, with the crystallites preferentially oriented along the (111) plane. For all implanted layers the cubic crystallographic structure was preserved, but compared to as deposited TiN the crystallites were smaller and the lattice was contracted. Besides, the surface compositional analysis of as deposited sample showed the coexistence of TiN, TiO_2 and TiO_xN_y phases and this was related to the surface oxidation of the films due to the exposure to air. After implantation, the results were almost similar for all metals, showing an increase in TiO_2 contribution and the formation of pure metallic Au and Ag phases, while copper is in the Cu^{2+} state, which is attributed to Cu(II)-oxide and $Cu(OH)_2$. The microstructural characteristics including defect formation, changes in the crystallite size and lattice contraction, and also growth of different metallic phases during implantations were correlated with the findings of the optical characterization of the implanted films. For as deposited film we found energy gap of 2.91 eV, which was lower than the value typical for TiN. After implantation the gap was shifted to higher energies, while at the visible part of the region, additional energy levels, at photon energies below 2.9 eV were observed. Further, all implanted films showed degraded photocatalytic activity compared to as deposited TiN, among which Cu-implanted samples exhibited the best photocatalytic performances. The lower photocatalytic activity of Au and Ag-implanted films compared to Cu implantations was ascribed to larger structural defects and formation of less favorable electronic states.

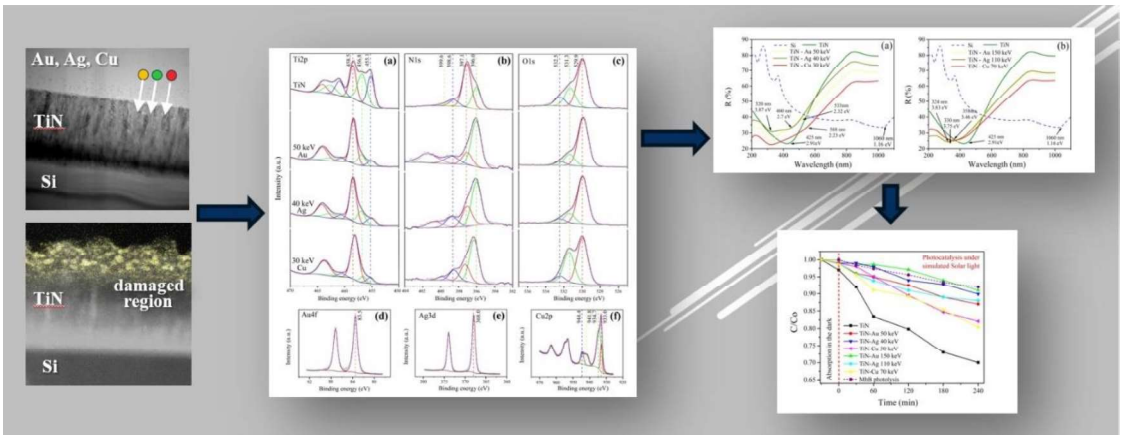

Figure 1. The results of structural, compositional and optical analyses of Au, Ag and Cu implanted TiN thin films.