

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



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&
Institute of Technical Sciences of SASA**

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Program and the Book of Abstracts

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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

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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



ANALYSIS
LABORATORY EQUIPMENT

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Application of supercritical carbon dioxide for making perovskite photodiode

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Perovskite solar cells reached high efficiency in a short period. When perovskite was applied for the first time as photovoltaics, power conversion efficiency (PCE) was less than 3 %. Up to now, PCE is over 29 %. In perovskite solar cells, the perovskite layer is an active layer that absorbs the visible part of the spectrum. To reduce the recombination of charge carriers, the construction of solar cells requires the existence of layers for holes and electrons. TiO₂ is usually used as an inorganic electron transport layer because its conduction band (CB) lies under the CB of perovskite, so electrons could diffuse from CB of perovskite to CB of TiO₂. For these experiments, TiO₂ nanotubular structure was used due to its advantages compared to nanoparticulate TiO₂. TiO₂ nanotubes provide a one-dimensional transmission channel for the charge carriers which will reduce the recombination of the carriers and provide a fast carrier transport. The TiO₂ nanotubes were synthesized by anodization of Ti foil after which they were annealed at 450 °C for 1 h. Their inner diameter was $\sim 103 \pm 17$ nm while the length was ~ 350 nm. Methylammonium lead bromide perovskite (MAPbBr₃) was deposited on TiO₂ nanotubes from the solution in dimethylformamide (DMF) by application of supercritical carbon dioxide at 35 °C and different pressures (100, 200, and 300 bar). It has been observed that supercritical CO₂ improves the filling of nanotubes by the perovskite due to its stronger solubilizing power at higher pressures. A perovskite photodiode with an improved contact surface between TiO₂ and perovskite was made, which is the basis for future solar cell construction. I-V characteristics show that the highest value of photocurrent under visible light reached 400 μ A for the sample which was obtained at 35 °C and 300 bar for 1 h. The absorption edge of prepared TiO₂ nanotubes/MAPbBr₃, determined by diffuse reflectance spectroscopy, was extended to the visible range. FESEM and XRD analyses also were done.