



# COIN2022

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**CONTEMPORARY BATTERIES  
AND SUPERCAPACITORS**  
INTERNATIONAL SYMPOSIUM  
BELGRADE 2022

**PROGRAM AND  
BOOK OF  
ABSTRACTS**

June 1-2, 2022,  
Serbian Academy of Sciences and Arts  
Belgrade, Serbia

**COIN2022**

**CONTEMPORARY BATTERIES AND  
SUPERCAPACITORS**

INTERNATIONAL SYMPOSIUM BELGRADE 2022

**Program and Book of Abstracts**

June 1-2, 2022, Serbian Academy of Sciences and Arts  
Belgrade, Serbia

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## SCOPE

Serbian Academy of Sciences and Arts will host world-renowned professors and their collaborators to share their activities and achievements in the energy storage and conversion field, thus shedding light on future opportunities. Besides, Alumni of University of Belgrade will present their ongoing research activities.

The conference will cover different research and industrial perspectives in Europe and also educational activities within the prestigious MESC+ study program. Students will get acquainted with possibilities of upgrading their skills and knowledge through postgraduate studies in the best European and world institutions.

## FOCUS

- Advances and challenges of contemporary batteries and supercapacitors
- Interactive opportunities for students within MESC+ activities.  
<https://mesc-plus.eu>
- Future perspectives on battery research within Battery 2030+ initiative.  
<https://battery2030.eu>
- Future industrial battery developments in Serbia
- Activities within research projects in Europe and especially those in Serbia and Montenegro funded by Science Fund of the Republic of Serbia and NATO Science for Peace and Security Programme

## RESEARCH TOPICS

- Battery and supercapacitor systems
- Metal-ion (Li-, Na-...) batteries
- Metal-air batteries
- Multivalent charge storage systems
- Materials for energy storage and conversion

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# Agenda

## Wednesday, June 1, 2022

13.00-18.45

**Registration**

14.00-14.20

**Symposium opening and welcome speeches**

Main Hall of Serbian Academy of Sciences and Arts  
*Academicians Zoran Popović, Slavko Mentus,  
 Dr. Milica Vujković, Prof. Dr. Robert Dominko*

**Session 1**

Chair: Dragana Jugović

14.20-14.55

**Christian Masquelier**, Sunky Park, Jean-Noël Chotard, Dany Carlier,  
 Laurence Croguennec, François Fauth, Pieremanuele Canepa  
**Crystal Chemistry of Advanced Polyanionic Positive Electrodes  
 for Na-Ion Batteries**

14.55-15.30

**Patrice Simon**

**Electrochemistry At the Nanoscale: Application to Materials for  
 Energy Storage**

15.30-16.05

**Robert Dominko**

**From Lithium Sulfur to Multivalent Sulfur Batteries**

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### 16.05 - 17.25 coffee break/catering & poster sessions

**Session2**

Chair: Dragana Jugović

17.25-17.45

**Milica J. Vujković**, Aleksandra Gezović, Danica Bajuk-Bogdanović,  
 Veselinka Grudić, Slavko Mentus  
**Towards alternative Li-free Electrode Materials: Synthesis and Phase  
 Composition Interrelation**

17.45-18.05

**Jana Mišurović**, Gordana Ćirić-Marjanović

**Comparison of Charge Storage Ability of Polyaniline and Poly(p-  
 aminodiphenylamine)**

18.05-18.25

**Zoran Jovanović**, Danica Bajuk-Bogdanović, Milica Vujković, Željko  
 Mravik, Sonja Jovanović, Smilja Marković, Milica Pejčić, Ivanka  
 Holclajtner-Antunović

**The Role of Surface Chemistry, Structure and Interactions in the  
 Electrochemical Charge Storage Properties of Graphene Oxide and 12-  
 tungstophosphoric Acid Nanocomposites**

18.25-18.45

**Nemanja Mikać**

**ElevenEs - The First LFP Gigafactory in Europe**

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19.30

**Dinner (Restaurant " Dva Jelena" in Skadarlija)**

## Thursday, June 2, 2022

08.00-13.25 **Registration**

### Session 1

Chair: Robert Dominko

9.00-09.35 **Kristina Edström**  
How BATTERY 2030+ Could Animate the Research Efforts in Europe

09.35-10.10 **Isidora Cekić-Lasković**  
(Multi)-Functional Electrolytes for Lithium-Based Batteries:  
From Synthesis to Interfacial Electrochemistry

10.10-10.45 **Nagore Ortiz Vitoriano**  
Electrochemical Storage at CIC energiGUNE: Across Energy Storage  
Value Chain

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### *10.45 - 12.05 coffee break/catering & poster sessions*

### Session 2

Chair: Robert Dominko

12.05-12.25 Aleksandra S. Popović, **Branimir Grgur**  
Polypyrrole-silver Chloride Composite as Energy Storage Materials

12.25-12.45 **Zoran Mandić**  
Importance of the Simultaneous Testing of Positive and Negative  
Electrodes in Batteries and Supercapacitors

12.45-13.05 **Olivera Lužanin**, Jože Moškon, Jan Bitenc, Robert Dominko  
Organic Cathodes for Multivalent Metal Batteries – Prospects and  
Challenges

13.05-13.25 **Daniel M. Mijailović**, Uroš Č. Lačnjevac, Vladimir D. Jović, Dušica B.  
Stojanović, Vuk V. Radmilović, Velimir R. Radmilović and Petar S.  
Uskoković  
Mesoporous Electrodes Based on Carbon Nanofibers and Transition  
Metal Oxides for High-performance Supercapacitors

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*13.25-13.30 Closing remarks*

*13.30 Catering/refreshment*



## Posters Agenda

| Poster session I, June 1, 2022 |   |
|--------------------------------|---|
| I.1.                           | Electrochemical Formation and Behavior of Silver and Lead Chlorides as Potential Cathodes for Rechargeable Magnesium Seawater Battery<br><a href="#">Aleksandra S. Popović</a> , Branimir N. Grgur  |
| I.2.                           | Synthesis and Characterization of Cathode Material $\text{MgCr}_{0.15}\text{Mn}_{1.85}\text{O}_4$ for Magnesium Ion Batteries<br><a href="#">Nikolina Jokić</a> , Ivana Stojković-Simatović   |
| I.3.                           | Comparative Study of Li-ion Intercalation into $\text{LiCr}_{0.15}\text{Mn}_{1.85}\text{O}_4$ from Aqueous and Organic Electrolyte<br><a href="#">Latas Nemanja</a> , Cvjetičanin Nikola  |
| I.4.                           | Catalysts Toward Highly Efficient Rechargeable Metal-air Batteries: Polyoxometalates with Reduced Graphene Oxide<br><a href="#">Teodora Đurić</a> , Filipe M. B. Gusmão, Jadranka Milikić, Sara Knežević, Dalibor Stanković, Kristina Radinović, Diogo M. F. Santos, Nemanja Gavrilov and Biljana Šljukić |
| I.5.                           | Carbon encapsulated Fe-species as Anodes in Alkaline Batteries<br><a href="#">Jelena Rugar</a> , Nemanja Gavrilov, Maja Milojević-Rakić and Aleksandra Janošević Ležaić   |
| I.6.                           | Challenges in Sustainable Use of Lithium for Highly Innovative Final Products Created and Made in Serbia with EU Environmental Standards<br><a href="#">Ilija Batas Bjelić</a> , Uros Andjelkovic, Boban Stojanović and Milosav Georgijević   |
| I.7.                           | Layered $\text{CaV}_2\text{O}_6$ as Promising Electrode Material for Aqueous Calcium-ion Batteries<br><a href="#">Tamara Petrović</a> , Danica Bajuk-Bogdanović and Milica Vujković   |
| I.8.                           | Synthesis of Zinc Doped Phosphate Tungsten Bronzes and its Redox Activity in Aqueous Solution of $\text{LiNO}_3$<br><a href="#">Jovana Acković</a> , Zoran Nedić, Tamara Petrović and Ružica Micić  |
| I.9.                           | Cyclic Stability of Sodium-pillared Vanadium Oxides-carbon Composite in Aqueous Electrolytes<br><a href="#">Dušan Mladenović</a> , Tamara Petrović, Danica Bajuk-Bogdanović, Biljana Šljukić Paunković, Slavko Mentus and Milica J. Vujković  |
| I.10.                          | Electrochemical Properties of Active Carbon Materials Obtained from Biowaste<br><a href="#">Vladimir Dodevski</a> , Milan Kragović, Milena Rosić, Sanja Krstić, Maria Čebela, Marija Stojmenović and Jelena Gulicovski  |
| I.11.                          | Characterization and Application of Activated Carbon Materials Obtained from Sucrose by Chemical Activation Process<br><a href="#">Sanja Krstić</a> , Branka Kaluđerović, Vladimir Dodevski, Maria Čebela, Milica Košević, Aleksandar Devečerski, Đorđe Petrović  |

|       |   |
|-------|---|
| I.12. | Enhancement of Supercapacitors Energy Density Using Manganese Modified Carbon Electrode and Mixture of Multivalent Ions Electrolyte<br><a href="#">Nikola Zdolšek</a> , Ivana Perović, Snežana Brković, Mina Seović, Slavko Dimović and Milica Vujković |
| I.13. | Al-ion Charge Storage Ability of Vine Shoots-derived Carbon<br><a href="#">Aleksandra Gezović</a> , Jana Mišurović, Jugoslav Krstić, Nikola Simović, Veselinka Grudić, Robert Dominko, Slavko Mentus, Milica J. Vujković                                |
| I.14. | Al-ions Charge Storage Ability of the Conductive Polyaniline Emeraldine Salt<br><a href="#">Bojana Kuzmanović</a> , Katarina Batalović, Bojana Paskaš Mamula, Mirjana Medić Ilić, Milica Vujković   |

### Poster session II, June 2, 2022

|       |  |
|-------|--|
| II.1. | The Influence of Reduced Graphene Oxide on the Pseudocapacitive Properties of a Conductive Polymer Layer for Supercapacitor Applications<br>Gabrijela Ljubek and <a href="#">Marijana Kraljić Roković</a>  |
| II.2. | Preparation of flexible free-standing reduced graphene oxide paper containing Zn and V <sub>2</sub> O <sub>5</sub> for battery and hybrid supercapacitor application<br>Dora Lovrenčić, Josipa Romić, Željka Petrović, Ivana Stojković-Simatović, <a href="#">Marijana Kraljić Roković</a> |
| II.3. | Thermally Treated and Ion Beam Irradiated Graphene Oxide for Supercapacitor Application<br><a href="#">Željko Mravik</a> , Milica Pejčić, Danica Bajuk-Bogdanović, Jelena Rmuš, Marko Jelić, Marija Grujić, Maria Vesna Nikolić, Nemanja Gavrilov and Zoran Jovanović                      |
| II.4. | The Effect of Chemical Titration and Thermal Treatment on Oxygen Functional Groups of GO and GO/WPA Nanocomposites<br><a href="#">Milica Pejčić</a> , Željko Mravik, Danica Bajuk-Bogdanović, Snežana Uskoković-Marković, Bojana Nedić Vasiljević, Sonja Jovanović, Zoran Jovanović        |
| II.5. | The Synthesis and Characterization of Yb <sup>3+</sup> and Ho <sup>3+</sup> Doped SrGd <sub>2</sub> O <sub>4</sub><br>Tijana Stamenković, Maria Čebela, <a href="#">Vesna Lojpur</a>   |
| II.6. | Synthesis, Structural and Morphological Properties of Multiferroics<br><a href="#">Maria Čebela</a> , Milena Rosić, Vesna Lojpur, Vladimir Dodevski, Sanja Krstić  |
| II.7. | Complex Metal Oxide Oxidation State Changes Monitoring by TGA and Dilatometric Means<br><a href="#">Nebojša Labus</a> , Milena Rosić, Maria Čebela   |
| II.8. | Experimental Investigation of Octahedral Tilting and Related Effects of Ca <sub>1-x</sub> Gd <sub>x</sub> MnO <sub>3</sub> (x = 0.05, 0.1, 0.15, 0.2) Compound<br><a href="#">Milena Rosić</a> , Maria Čebela, Nebojša Labus   |

|        |  |
|--------|--|
| II.9.  | A Series of Magnesium Vanadium Oxide Materials Potentially Applicable for Aqueous RMBs<br><a href="#">Milica M. Vasić</a> , Milica Vujković  |
| II.10. | A Comparison of the Capacities of $ZnMn_2O_4$ and $ZnCr_{0.15}Mn_{1.85}O_4$ in Aqueous Media<br><a href="#">Jelena Senćanski</a> , Nenad Nikolić and Ivana Stojković-Simatović                                   |
| II.11. | Mixed Ni-Mg Spinel Ferrites Used as Materials for Charge Storage Electrodes<br><a href="#">Milena Dojcinovic</a> , Zorka Z. Vasiljevic, Vera P. Pavlovic, Jelena Vujancevic, Nenad B. Tadic, Maria Vesna Nikolic |
| II.12. | $Al^{3+}$ Cation Interaction with Pristine and Defective Graphene Using Microsolvated Cluster Model: DFT Study<br><a href="#">Branislav Milovanović</a> , Milica J. Vujković and Mihajlo Etinski                 |
| II.13. | Data-driven Design of New Mg-based Hydride Materials – A Synergy of Experiments and DFT<br><a href="#">Katarina Batalović</a> , Jana Radaković, Bojana Kuzmanović, Mirjana Medić Ilić, Bojana Paskaš Mamula      |
| II.14. | Electron Trapping and Energy Density in Polymers at Low Electric Field<br><a href="#">Duško Dudić</a>  |

## Challenges in Sustainable Use of Lithium for Highly Innovative Final Products Created and Made in Serbia with EU Environmental Standards

Ilija Batas Bjelić<sup>1</sup>, Uros Andjelkovic<sup>2</sup>, Boban Stojanović<sup>3</sup> and Milosav Georgijević<sup>4</sup>

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Energy systems of the future should enable transition to clean energy and reduction of CO<sub>2</sub> emission. Various options are under consideration and research. One direction of development are photovoltaic, and rechargeable batteries used to store the electricity needed for vehicles and stationary systems (1,2). At the current technological level and market attractiveness among rechargeable batteries significant group are those based on lithium. EU production of raw materials for all batteries is about 1%. Growing demand for lithium are expected in 2050 to be 10-50 times higher than 2018. A lithium deficit in the market is expected (3,4). The companies are searching new locations for lithium mining and production facilities in order to compensate for the deficit.

The mineral named Jadarit found in Serbia, contains lithium, sodium, boron and silica. Estimated reserves of Jadarit are of low significance for World production of lithium, but may be significant at EU level and for Serbian economy. Certain companies are interested to enter the production chain from Jadarit. These companies present the possibility for future industrial battery development in Serbia, which may lead innovative final products. They claim optimistic 3-15% increase of GDP (5).

Public debate provided argumented shortcomings of currently proposed technology for lithium extraction from Jadarit (6). Major concerns are regarding permanent devastation of lush ecosystem, fertile soil, drinking water, air pollution. These non-monetary assets and their contribution to GDP should be monetized as *sine qua non* for objective cost-benefit analysis. Therefore, instead of polarization, public debate that identifies key critical points in technology of lithium extraction and its effects on human health and environment provides basis for future research that will develop new technologies capable to protect environment.

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