



Twenty-fourth Annual Conference
YUCOMAT 2023

**Program
and
Book of Abstracts**

TWENTY-FOURTH ANNUAL CONFERENCE

YUCOMAT 2023

Hunguest Hotel Sun Resort, Herceg Novi, Montenegro
September 4 - 8, 2023

Program and Book of Abstracts

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Secretary:** Jasmina R. Jevtić

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WELCOME SPEECH BY THE PRESIDENT OF MRS-SERBIA

Esteemed Colleagues, Fellow Scientists and Honored Guests,



It is my pleasure to greet you on behalf of MRS-Serbia and express a special joy that after 4 years we are now returning to the traditional system of holding the conference onsite, which used to be the standard format of YUCOMAT. The coronavirus pandemic had an effect similar to that of a devastating earthquake and the return to the previous habits will be, no doubt, gradual, while the consequences will be felt for a very long time.

The program of this year's conference includes 5 plenary sessions at which 19 invited lectures will be delivered; 4 oral sessions where 50 talks will be given; and 3 poster sessions where 102 works will be exhibited. Altogether with the lectures by the sponsors, 175 works by authors from 28 different countries will be presented. The general program, the relevance of the topics and the diversity of the institutions from which the presenters have arrived witness that we are still on an ascending path. The numbers of participants and speakers are similar to those from years prior to the pandemic, while the regional institutional representation is slowly becoming restored.

Never before did we have such a high-quality and diverse program and there are only a few conferences of this size in the world that can take pride in an equal number of high-ranked plenary speakers in terms of scientific influence measured through citations. Of the thirty highest-ranked authors from the lists that circulated in the recent years, 7 of them, that is, 25% in total, will speak at this year's YUCOMAT, and neither do other plenary speakers, according to these criteria, lag far behind them. A certain number of confirmed plenary speakers, who were announced earlier as participants, were unfortunately prevented from participating, but their invitation to present will extend to the next year's conference, which will be the anniversary, 25thone, scheduled for September 2 – 6, 2024. Many members of our Society are responsible for this success, but my gratitude first and foremost goes to the plenary lecturers whose presence here has helped YUCOMAT reach the very summit of the world's scientific meetings, not by numbers of participants or by financial profit, but by excellence. We will, of course, strive to help YUCOMAT to grow even further in the years that follow.

This year's winner of the MRS-Serbia Award for the Lasting and Outstanding Contribution to Materials Science and Engineering is Mr. Knut W. Urban, a professor at Aachen University and the former Director of the Institute of Microstructure Research at Forschungszentrum Jülich (1987-2010) as well as the former President of the German Physical Society. He is the winner of many prior awards and recognitions, including the Kavli Award for the year 2020. Prof. Urban has been a long-time member of the International Advisory Board of MRS-Serbia and plenary speaker at many YUCOMAT conferences. He is a scientist with a large contribution to our field of study and also one who has contributed greatly to our affirmation as a reputable international conference. Prof. Urban is here and will present his lecture later in the day.

More than fifty young researchers from 18 countries will compete for the 11 awards given by our Society and by the MRS-Singapore for the best doctoral dissertations defended between the two conferences and for the best poster (Tuesday, 8.00-9.45) and the best oral presentation (Wednesday, 15.00-19.00). The winners will be announced at the Closing Ceremony on Friday, September 8 at

12:00 p.m. At today's opening of the conference, awards will be given to the last year's winners. So far, there have been more than 100 young researchers who have received these awards.

Following last year's charitable campaign, the European Office of Aerospace Research (EOARD), Drexel University and MRS-Serbia have ensured the participation of 43 researchers from Ukraine, covering the cost of their stay in Herceg Novi (EOARD and Drexel) and the conference fee (MRS-Serbia). Many of them come from outside Ukraine, including countries such as Lithuania, Latvia, Poland, Germany, Slovakia, Spain and Italy, where their colleagues and institutions of the European Union have showed hospitality and/or where they participate in joint research projects. We are pleased to be a part of this support that enables them to speak at YUCOMAT, socialize with the participants of the conferences, and at least for a little while forget about the tragic events in their country. Among other topics, they will present the project titled Towards MXenes Biomedical Application by High Dimensional Immune MAP-ing (HORIZON-MSCA-2021-SE-01 project MX-MAP), which proceeds with the participation of two Ukrainian institutions and nine institutions from the European Union. This presentation will be on Wednesday, September 6 at 3:00 p.m. in the small hall.

I spoke about the history of MRS-Serbia and YUCOMAT several times at previous conferences, but it will not hurt to repeat some remarks because of the new participants. First, there are much older, tidier and more touristy coastal towns than Herceg Novi, but there are very few of them that have attracted and inspired as many artists, writers and scientists to settle here as Herceg Novi did. We have been here since 1966, when the First Yugoslav-Soviet School of Powder Metallurgy and Ceramics was organized, where the majority of Soviet participants were affiliated with Ukrainian institutions. With the input from the scientists from the USA, Europe and the Far East, this School became the nucleus for the formation of the International Institute for the Science of Sintering (www.iiss-sci.org). The first IISS conference was held in 1969 in this hotel complex, in this hall, which at the time belonged to the Nuclear Commission of Yugoslavia, where as the first YUCOMAT Conference of our MRS (www.mrs-serbia.org.rs) was held in 1995, in a Herceg Novi hotel further down the shore. Many conferences were held here in that period of time and thousands of scientists from all over the world flocked to this city to experience its beauty. Moreover, it is not a coincidence that exactly on this part of the coast, lying between Herceg Novi and Igalo, called Topla (meaning "warm") because of its unique climatic conditions, many extraordinary scholars lived and worked. This includes our greatest poet and statesman, Petar II Petrović Njegoš (1813-1851), who was educated in a small house near the Church of St. George and Savior, which is a few minutes' walk from us. He always stressed his attachment to Boka and how that period of his life helped him soften his mountainous character with the authentic Boka's warmth. Further, there is a house not far from here, on the opposite side of the hotel, which was built by the 1961 Nobel Laureate in Literature, Ivo Andrić. He lived and worked in it, and it is now converted to a museum honoring his lifework. There are other wonderful attractions too, including the Old Town, the Forte Mare Fortress, the City Port Square, the City Tavern, the 5 Danica Promenade, and others. Our current hosts and owners of this hotel respect our tradition and attachment to the city and have helped us in our effort to make the conference participants feel comfortable here and to continue being part of this remarkable history. In that name, I wish you a pleasant stay, a wonderful conference, and may you return home satisfied, remember all of this and come back to us again.

MRS-President, Dragan P. Uskoković

P.S.61.

Biodegradable mulch films obtained from unique combinations of cellulose, polycaprolactone, keratin and calcium carbonate

Aleksandra Ivanovska¹, Dušica Stojanović², Nemanja Barać¹, Katarina Dimić-Mišić³,
Mirjana Kostić², Vesna Radojević², Petar Uskoković², Đorđe Janačković^{1,2},
Ernesto Barcelo³, Patrick Gane^{1,3}

¹University of Belgrade, Innovation Center of the Faculty of Technology and Metallurgy in Belgrade Ltd., Belgrade, Serbia, ²University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia, ³Aalto University, Department of Bioproducts and Biosystems, School of Chemical Engineering, Aalto, Helsinki, Finland

Biodegradable mulch films from cellulose (CELL), cellulose/polycaprolactone (CELL/PCL), cellulose/polycaprolactone/keratin (CELL/PCL/KER) and cellulose/polycaprolactone/keratin/ground calcium carbonate (CELL/PCL/KER/GCC) were prepared using Ionic liquid as a green solvent. Pure cellulose biopolymer is characterised by better mechanical properties (tensile strength - force per unit cross-sectional area at breakage - of 75.3 MPa and modulus of elasticity of 944.4 MPa) than the other studied samples which is attributed to the formation of partially miscible polymer blends. Among samples containing PCL, CELL/PCL/KER/GCC has the highest tensile strength and modulus of elasticity. The addition of KER or KER/GCC to CELL/PCL films resulted in an increment in melting temperature and an improvement of sample crystallinity. The light transmittance of all films was >60 %. The incorporation of KER enhanced the biodegradability of the biocomposites, while KER/GCC addition slightly inhibited degradation due to an increased hydrophobicity and crystallisation growth of semi-crystalline biopolymers. The reported method for mulch film preparation is green and recyclable, and, when including a readily available source of KER, such as by extraction from waste chicken feathers, enables conversion to organic biofertiliser. The findings of this study contributed to sustainable agriculture by providing nutrients that enhance the growth speed of the plant, and hence food production, and reduce environmental pressure. Inclusion of GCC additionally provides not only Ca²⁺ for plant consumption but also soil pH control.

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