

THIRTEENTH ANNUAL CONFERENCE

YUCOMAT 2011

Herceg Novi, Montenegro, September 5–9, 2011

<http://www.mrs-serbia.org.rs>



Programme and The Book of Abstracts

Organised by:

Materials Research Society of Serbia

under the auspices of

Federation of European Materials Societies (FEMS)

and

Materials Research Society (MRS)

THIRTEENTH ANNUAL CONFERENCE

YUCOMAT 2011

Hunguest Hotel Sun Resort Herceg Novi, Montenegro,
September 5-9, 2011
<http://www.mrs-serbia.org.rs>

Programme and The Book of Abstracts

Organised by:
Materials Research Society of Serbia

under the auspices of
Federation of European Material Societies
and
Materials Research Society

Title: THE THIRTEENTH ANNUAL CONFERENCE
YUCOMAT 2011
Programme and The Book of Abstracts

Publisher: Materials Research Society of Serbia
Knez Mihailova 35/IV, 11000 Belgrade, Serbia
Phone: +381 11 2185-437; Fax: + 381 11 2185-263
<http://www.mrs-serbia.org.rs>

Editor: Prof. Dr. Dragan P. Uskoković

Technical editor: Aleksandra Stojičić

Cover page: Aleksandra Stojičić and Milica Ševkušić

Copyright © 2011 Materials Research Society of Serbia

Acknowledgment:



Printed in: Biro Konto
Sutorina bb, Igalo – Herceg Novi, Montenegro
Phones: +382-31-670123, 670025, E-mail: bkonto@t-com.me
Circulation: 250 copies. The end of printing: August 2011

TABLE OF CONTENTS

WELCOME SPEECH BY THE PRESIDENT OF MRS-SERBIA		i
GENERAL INFORMATION		iii
CONFERENCE PROGRAMME		v-liv
ORAL PRESENTATIONS:		
Plenary Session I	(PL.S.I.1.-6.)	1
Symposium A:	ADVANCED METHODS IN SYNTHESIS AND PROCESSING OF MATERIALS	
Session I	(O.S.A.1.- 13.)	6
Symposium B:	ADVANCED MATERIALS FOR HIGH TECHNOLOGY APPLICATIONS	
Session I	(O.S.B.1.-12.)	17
Plenary Session II	(PL.S.II.1.-8.)	26
Symposium C:	NANOSTRUCTURED MATERIALS	
Session I	(O.S.C.I.1.- 14.)	33
Session II	(O.S.C.II.1.-12.)	43
Plenary Session III	(PL.S.III.1.-7.)	54
Plenary Session IV	(PL.S.IV.1.-6.)	61
Symposium E:	BIOMATERIALS	
Session I	(O.S.E.1.-8.)	67
POSTER PRESENTATIONS:		
Session I (Symposium A)	(P.S.A.1.-52.)	73
Session II (Symposium B)	(P.S.B.1.-51.)	106
Session III (Symposiums C, D and E)	(P.S.C.1.-19.)	140
	(P.S.D.1.-10.)	153
	(P.S.E.1.-23.)	158
AUTHORS INDEX		177-197

WELCOME SPEECH BY THE PRESIDENT OF MRS-SERBIA

My Esteemed Colleagues,



I will start with one simple Welcome to the XIII YUCOMAT! Let me express my hopes that this will be yet another YUCOMAT where thoughts on science and technology will be mingled with and fertilized by an inspiring, summery ambiance and where new generations of scientific thinkers will coalesce with the elderly and experienced ones.

Intensive communication between the developing countries and the developed ones is of crucial importance for the progress of both. For, affluent social islands surrounded by all but prosperous milieus have been over and over again shown as unsustainable. To ensure the thriving of the developed world, therefore, its eyes should be kept on assisting the small ones in their progress. On the other hand, some of the most remarkable scientific discoveries are known to have stemmed from miniscule funding, as pointed out these days by historians of science. Modest research environments, such as those existing in many small countries, are thus often thought to be fertile grounds for the invention of simple and yet extraordinarily efficient and eco-friendly methods and approaches. YUCOMAT, in fact, originated from the idea that a scientific community of a small country - such as all former Yugoslav countries were in 1995 and still are - would greatly benefit from a meeting whereat local and worldly renowned researchers would present their exciting findings side by side. Today, sixteen years later we witness this idea to still flourish in reality as we have gathered here now for the 13th time for one such occasion.

This year's YUCOMAT is nowhere different from the previous years' ones in terms of its size, with 155 posters and 86 lectures that are scheduled to be presented by participants from more than 30 countries of the world during the 5 days of the conference. Presentations are divided to 5 symposia and, also, number of lectures that are to be held by 26 plenary lecturers this year is more than we had any time before.

Just as every year before, this year as well we offer you a similar program both inside and outside of the lecture and exhibition halls. There is one major new thing, however, as some of you must have noticed: namely, the venue that hosts the conference. Instead of Hotel Plaza in the past, this year it is Hunguest Sun Resort. Aside from it, the welcome cocktail will again be held on Monday, that is, later in the day; poster sessions will take place during the evening hours from Tuesday to Thursday; an organized excursion to Dubrovnik is on Wednesday afternoon; a boat-trip around the Bay on Thursday afternoon, and a plenty of coffee breaks will be scattered throughout the days as an opportunity to relax, network and socialize. During this Opening Ceremony we will recognize the winners of the best PhD and Master of Science theses defended between this and the previous YUCOMAT, while during the Closing Ceremony we will also announce the best oral and poster presenters. In the back of the lecture hall also a small exhibition fair will be held throughout the course of the conference.

The topics presented on during this year's YUCOMAT are the same ones that are considered "hot" in the circles of international experts in the field. A rigorous selection of abstracts has been implemented and invitations for plenary lectures were sent to carefully chosen and recommended scientists who have done a great deal of research in their fields so as to keep the program of this year's YUCOMAT concordant with the latest trends. Like every other aspect of

the scientific and social world of ours, materials science has undergone a tremendous change in trends over the course of time. What was all the rage two decades ago might be only a minor, sideway field at this point of time. To keep abreast with this process of change, the scientists have to be constantly updated with the cutting-edge research that takes place in quite often distant places on the globe. Scientific journals and Internet presentations nowadays do offer a glimpse into exciting new research; however, the chance to meet in person the presenters who are experts in their fields, ranging from nanomaterials to bioengineering to soft matter to semiconductors and photonics, and feel their science from a very intimate angle is still the privilege of participants of conferences of this nature.

To wrap things up, on behalf of the MRS-Serbia Officers, the Organizing Committee, the International Advisory Board and Sasha, our Conference Secretary, which I all greatly acknowledge for their efforts in putting up this entire meeting, I would like to express delight over the great amount of interest in participation at this year's YUCOMAT. From a conference organized for the first time in a country falling apart under the pressure of the civil war to one used in international circles as a model for a successful small country's scientific meeting, it has undergone a tremendous change for better over years. We wish to continue this trend of success and sustain in our mission, which, as I mentioned earlier, is to connect the scientific body of a small and developing country with those of developed ones for the benefit of the entire planet. Having the YUCOMAT happen year after year reminds me that we are making the steps to better the world by our sciences and this is the reward for not only us, the organizers, but all the more for you, the attendees of this wonderful meeting.

I wish you a splendid time during these YUCOMAT days!

Dragan Uskokovic

MRS-Serbia

President: Dragan Uskoković

Vice-presidents: Slobodan Milonjić, Velimir Radmilović, Dejan Raković

General Secretary: Jovan Nedeljković

Members: Snežana Bošković, Milorad Davidović, Vera Dondur, Nenad Ignjatović, Djuro Koruga, Nedeljko Krstajić, Slavko Mentus, Zoran Petrović, Milenko Plavšić, Zoran Popović, Vladimir Srdić, Momčilo Stevanović, Jovan Štrajčić, Miodrag Zlatanović

International Advisory Board

Chair: Robert Sinclair (USA)

Members: Fritz Aldinger (Germany), Rostislav A. Andrievski (Russia), Aline Auroux (France), Djamilia Bahloul-Hourlier (France), Xavier Batlle (Spain), Serena Best (UK), Ivan Božović (USA), Philippe Colomban (France), Uli Dahmen (USA), Miha Drogenik (Slovenia), Michel Fedoroff (France), Mauro Ferrari (USA), Horst Hahn (Germany), Paul Harrison (UK), Felix T. Hong (USA), Robert Hull (USA), Wolfgang Jaeger (Germany), Thomas Jung (Switzerland), Josè M. Kenny (Italy), Alexander H. King (USA), Vladimir Krstić (Canada), Toshiaki Makabe (Japan), Egon Matijević (USA), Amelia Montone (Italy), Eiji Osawa (Japan), Zoran S. Petrović (USA), Robert Ritchie (USA), Frances Ross (USA), Richard W. Siegel (USA), Mamoru Senna (Japan), Valeriy V. Skorohod (Ukraine), Danilo Suvorov (Slovenia), Enrico Traversa (Italy), Jose A. Varela (Brazil), Gordana Vunjak Novaković (USA)

Conference Organising Committee

Chairperson: Mira Vukčević

Members: Nikola Cvjetičanin, Kemal Delijić, Branko Matović, Jovan Mirković, Nebojša Mitrović, Željka Nikitović, Nebojša Romčević, Edin Suljovrujić, Ljiljana Živković

Conference Secretary: Aleksandra Stojičić

HISTORY:

Materials science and engineering incorporate acquiring of knowledge on synthesis and processing of materials, their composition and structure, properties and behaviour, functions and potentialities as well as application of that knowledge to various final products. Economic prosperity, life quality, and healthy environment are tightly connected with the improvements in the existing and the development of new materials and processing technologies. These improvements and development can contribute greatly to the national priorities: energy saving, environment and health protection, information and communication, infrastructure, transportation, etc.

The First Conference on materials science and engineering, including physics, physical chemistry, condensed matter chemistry, and technology in general, was held in September 1995, in Herceg Novi. An initiative to establish Yugoslav Materials Research Society was born at the conference and, similar to other MR societies in the world, the programme was made and objectives determined. The Yugoslav Materials Research Society (Yu-MRS), a non-government and non-profit scientific association, was founded in 1997 to promote multidisciplinary goal-oriented research in materials science and engineering. Main task and objective of the Society is to encourage creativity in materials research and engineering to reach a harmonic coordination between achievements in this field in our country and analogous activities in the world with an aim to include our country into the global international projects. Until 2003, Conferences were held every second year and then they grew into Annual Conferences that were traditionally held in Herceg Novi in September of every year. Following the political separation between Serbia and Montenegro, in 2007 Yu-MRS formed two new MRS: MRS-Serbia (official successor of Yu-MRS) and MRS-Montenegro (in founding). In 2008 MRS-Serbia became a member of FEMS (Federation of European Materials Societies).

GENERAL INFORMATION

DATE AND VENUE: The conference will be held on September 5-9, 2011, at the Hunguest Hotel Sun Resort, in Herceg Novi, Montenegro. Participants will also be accommodated there. The conference will begin on Monday, September 5, at 09.00 and end on Friday, September 9th, 2011, at 11.30.

REGISTRATION: Registration, registration fee payment, conference materials distribution, etc, will take place at the conference desk (Conference Secretariat) open on Sunday, September 4, Monday, September 5, and Tuesday, September 6, from 8.00 to 19.00, on Wednesday and Thursday 8.00-13.00 and 19.00-20.00, and on Friday from 8.00 to 12.00. At registration, the participants are requested to submit a proof of their advance registration fee payment and their registration form.

INSTRUCTION FOR AUTHORS: The conference will feature plenary sessions, oral sessions, poster sessions, and an Exhibition of synthesis and characterization equipment.

Time of papers' presentations to be given in **ORAL SESSIONS** is limited. Time available for delivery is 30 min for plenary and 15 min for other papers including discussion (5-10 min). Video-beam is available. PowerPoint presentations, recorded on CD or memo-stick, should be given at registration.

In **POSTER SESSIONS**, the authors are requested to display their papers minimum two hours before the session and to be present beside their posters during the session. Poster sessions are held in Children Play Center (by the pool) which is open Tuesday to Thursday 18.00-22.00.

CONFERENCE AWARDS: Materials Research Society of Serbia will award the authors (preferable young members under 35) of the best oral and poster presentation at the conference, and also the authors of highly rated PhD and MSc theses defended between two conferences. Awarded researchers are granted free registration at the next YUCOMAT Conference.

ADDITIONAL ACTIVITIES: An Exhibition of synthesis and characterization equipment will be held during the Conference. Traditional Cocktail Party on Monday evening and excursions on Wednesday afternoon to Dubrovnik (Croatia) and Thursday afternoon (boat trip around Boka Kotorska Bay) will be organized again.

P.S.B.48.

DETERMINATION OF THERMAL CONDUCTIVITY OF THE INSULATION MATERIALS USING NUMERICAL CALCULATION OF THE PRESSURE INCREASE

M. Prvulović, M. Ristić, M. Prokolab, M. Kočić, A. Alil, Z. Milutinović, S. Budimir
Institute Goša, Belgrade, Serbia

In the paper is presented the possibility of determination thermal conductivity for the insulation materials, which are used in the tanks for liquid carbon dioxide, in situ. For this purpose, was developed the mathematical model for description of the pressure changes in function of the ambient conditions and storage time. The application software was developed also for computation of the pressure increase two-phase mixture in tank, relating to the time, and the thermal conductivity determination of the insulating material. Verification of the program was done in function of exploitation incoming data. The numerical simulations of the pressure increase are done for various decrease of tank compliance. The influence of the ambient conditions is expressed by the heat transfer fluid in tank and the environment. Used incoming data are the temperature profile and sun heat flux characteristic for Serbia, in summer time.

P.S.B.49.

CHARACTERIZATION OF DIVERSE BIO-COMPOSITE MATERIALS BY INDENTATION, SIMULATION AND INVERSE ANALYSIS

V. Buljak, I. Balać, M. Milovančević
Faculty of Mechanical Engineering, University of Belgrade, Belgrade, Serbia

Knowing the mechanical properties of bio-composite materials is very important especially when it is used as load carrying element as substitute for natural bone. For instance, properties of thermoplastic polymers (such as PLLA), usually used as matrix in bio-composites, in its solid state are strongly affected by processing conditions (i.e. temperature, pressure, etc.). This circumstance suggests that, the mechanical properties should be assessed after the processing is finished. This paper presents some preliminary results of a novel approach that uses in situ nano-indentation experiment for the purposes of material characterization. In the approach adopted here, the experiment is performed in order to collect data in the form of so-called indentation curve, namely the curve that correlates applied force during the experiment with achieved penetration into the material specimen. The same experiment is further simulated by the use of finite element method, where appropriate material constitutive model is adopted. In such way, simulated response becomes a function of the unknown material properties. The discrepancy function is then formed which quantifies the difference between measured and computed response. This function represents an objective function to be minimized in a subsequent step of the proposed strategy, by the use of appropriate non-linear mathematical programming algorithm. With the adopted approach it is possible to perform characterization of mechanical properties in more accurate way with respect to, for example traditional methods based on semi-empirical formulae (e.g. Oliver and Pharr formula). The accuracy of assessed parameters can be a posteriori verified by the finite element simulation of the experiments on different scales.