

CEEC-TACS & Medicta2019

BOOK OF ABSTRACTS

Editors:

Andrei Rotaru

Stefano Vecchio Cipriotti



**5th Central and Eastern European Conference on
Thermal Analysis and Calorimetry
&
14th Mediterranean Conference on
Calorimetry and Thermal Analysis**

**27-30 August 2019
Roma, Italy**

Book of abstracts of the 5th Central and Eastern European Conference on Thermal Analysis and Calorimetry (CEEC-TAC5) and 14th Mediterranean Conference on Calorimetry and Thermal Analysis (Medicta2019).

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27-30 August 2019

Roma

Italy

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Organizers

**The 5th Central and Eastern European Conference
on Thermal Analysis and Calorimetry**

&

**The 14th Mediterranean Conference on
Calorimetry and Thermal Analysis**

CEEC-TAC5 & Medicta2019

27-30 August 2019 – Roma, Italy

is organized by the:

**Central and Eastern European Committee for
Thermal Analysis and Calorimetry (CEEC-TAC),**

Italian Association for Calorimetry and Thermal Analysis (AICAT),

**Interdivisional Group of Calorimetry and Thermal Analysis (GICAT)
of the Italian Society of Chemistry,**

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e Applicate per l'Ingegneria Sapienza (SBAI),**

University of Craiova (UCV),

National Institute for Laser, Plasma and Radiation Physics (INFLPR),

**Institute of Physical Chemistry "Ilie G. Murgulescu" (ICF)
of the Romanian Academy**



Dear Participants at CEEC-TAC5 & Medicta2019 Conference,

Let us express our great pleasure to welcome you here in Roma - Italy, for attending the joint 5th Central and Eastern European Conference on Thermal Analysis and Calorimetry (CEEC-TAC5) and 14th Mediterranean Conference on Calorimetry and Thermal Analysis (Medicta2019) between 27th and 30th of August 2019; we thank very much to all 372 of you for joining us! Since “All Roads Lead to Roma”, it was somehow natural to meet here this time! Roma is the largest city of Italy and also its capital. It is an impressive cosmopolitan city with an artistic, architectural and cultural history that has influenced the whole world and dates back to almost 3000 years ago.

Now, the joint event CEEC-TAC5 & Medicta gathers 372 registered participants from 38 countries and of 6 continents, presenting a total number of 449 scientific works. Of those, 4 are Plenary Lectures (PL), 3 are Award Plenary Lectures (APL), 16 are Invited Lectures (IL), 4 Parallel Sessions of Oral Presentations – 108 contributions (OP) & 3 Sessions of Poster Presentation – 320 contributions (PS). An important task of CEEC-TAC5 & Medicta2019 is the continuation of 2 distinctive directions the conference follows, with 2 Workshops (WS) introducing the subjects:

1) *Advanced Functional Materials*; 2) *Kinetics & Lifetime Prediction of Materials (KLTPM)*.

At this edition, Awards will be offered to exceptional scientists: *i)* Prof. Janos Kristof from Hungary (Honorary Member of CEEC-TAC), *ii)*, Prof. Vahur Oja from Estonia (Distinguished TA&C Researcher in Central & Eastern Europe); *iii)* Prof. Kestutis Baltakys from Lithuania (Outstanding Young TA&C Researcher in Central & Eastern Europe); three *iv)* “Andrzej Malecki” 2019 Grants for Best Young Researcher from Central & Eastern Europe in the field of Thermal Analysis and Calorimetry; four *v)* “Jaroslav Sestak” 2019 Travel Grant for Best Student from Central & Eastern Europe and from Mediterranean Area in the field of Thermal Analysis and Calorimetry.

We would like to express our thanks to the people who contributed and supported the organization of this event, especially to the members of the Honorary Committee, Scientific Committee, International Organizing Committee, National Associations for Thermal Analysis and Calorimetry from Central and Eastern European countries and those from the Mediterranean area, Executive Organizing Committee, Central and Eastern European Committee for Thermal Analysis and Calorimetry, Italian Association for Calorimetry and Thermal Analysis (AICAT), Interdivisional Group of Calorimetry and Thermal Analysis (GICAT) of the Italian Chemical Society, Sapienza University of Rome (SUR) and the Department of Basic and Applied Sciences for Engineering of SUR, University of Craiova, INFLPR-National Institute for Laser, Plasma and Radiation Physics, and Institute of Physical Chemistry “Ilie Murgulescu” of the Romanian Academy. We acknowledge the great support of our Sponsors: MPstrumenti & LINSEIS, METTLER TOLEDO, RIGAKU, HITACHI, DSC CONSUMABLES (Gold Sponsors), NETZSCH (Bronze Sponsor) and our Partners: ECO Ricerche, Thorn Scientific Services Ltd. A special acknowledgement has to be addressed to the *Journal of Thermal Analysis and Calorimetry*, *Ceramics International*, *Applied Clay Science*, *Journal of Mining and Metallurgy, Section B: Metallurgy*, where one of their volumes will be dedicated to research papers of our conference, presented as oral or poster contributions.

The 4-day meeting is hosted at the Rectorate Building of the Sapienza University of Rome, which is located close to the historic centre. The official language of the conference is English.

We hope that you will enjoy the city during your stay at the CEEC-TAC5 & Medicta2019 conference, and that you will leave Roma with the same good feelings and memories as those after attending the previous conferences. We expect that this conference will give you novel scientific and practical knowledge, and enrich you with a variety of new contacts.

Looking forward to seeing you at forthcoming thermal analysis and calorimetry conferences, and hopefully in 2021 for CEEC-TAC6 and Medicta2021!

Stefano Vecchio Cipriotti & Andrei Rotaru
Chairmen of CEEC-TAC5 & Medicta2019

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General Information

The joint event “5th Central and Eastern European Conference on Thermal Analysis and Calorimetry (CEEC-TAC5) & 14th Mediterranean Conference on Calorimetry and Thermal Analysis (Medicta2019)” has gathered **372 registered participants** from **38 countries** and of **6 continents**, presenting a total number of **451 scientific works**. Of those, 4 are Plenary Lectures (**PL**), 3 are Award Plenary Lectures (**APL**), 16 are Invited Lectures (**IL**), 4 Parallel Sessions of Oral Presentations – 108 contributions (**OP**) & 3 Sessions of Poster Presentation – 320 contributions (**PS**). Each session of oral presentations is comprised of 27 works, poster session 1 and 2 include 106 works each, while poster session 3 has 108 works.

An important task of CEEC-TAC5 & Medicta2019 is the continuation of 2 distinctive directions that the first conference follows, with 2 Workshops (**WS**) introducing the subjects:

- 1) *Advanced Functional Materials*;
- 2) *Kinetics and Lifetime Prediction of Materials (KLTPM)*.

Plenary Lectures

- **Kestutis Baltakys** (Kaunas University of Technology, Lithuania)
- **Dimitrios N. Bikiaris** (Aristotle University of Thessaloniki, Greece)
- **Nobuyoshi Koga** (Hiroshima University, Japan)
- **Janos Kristof** (University of Pannonia, Hungary)
- **Vahur Oja** (Tallinn University of Technology, Estonia)
- **Crisan Popescu** (KAO European Research Laboratory, Germany)
- **Henrik Rudolph** (Applied Surface Science, Elsevier, the Netherlands)

Invited Lectures

- **Arnon Chaipanich** (Chiang Mai University, Thailand)
- **Svetlana Danilova-Tretiak** (A.V. Luikov Heat&Mass Transfer Institute, Belarus)
- **Ahmed El-Sabbagh** (Ain Shams University, Egypt)
- **Nathanael Guigo** (University of Cote d'Azur, France)
- **Tiit Kaljuvee** (Tallinn University of Technology, Estonia)
- **Dana Luca Motoc** (Transilvania University of Brasov, Romania)
- **Cheila G. Mothe** (Federal University of Rio de Janeiro, Brazil)
- **Wojciech Marczak** (Jan Dlugosz University in Czestochowa, Poland)
- **Jonjaua Ranogajec** (University of Novi Sad, Serbia)
- **Iulian Riposan** (University Politehnica of Bucharest, Romania)
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- **Kseniya Zherikova** (Nikolaev Institute of Inorganic Chemistry, Russian Federation)

Application of Thermal Methods to the Characterisation of the States of Water in Precious Opal

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Precious opal is a hydrous silica ($\text{SiO}_2 \cdot n\text{H}_2\text{O}$) that is formed through a dissolution-precipitation process forming hydrated silicas with variable water content [1]. The gemmological value of precious opal is defined by its microstructure where the prized play-of-colour (POC) observed is a result of the diffraction of visible light from an ordered arrays of silica spheres. The monodispersed colloid of silica spheres are formed through an Ostwald type ripening process. Once the colloidal particles have grown to a suitable size for Bragg diffraction of visible light (ca. 200 to 400 nm in diameter; i.e. $\lambda = 2dn\sin\theta$ where n is the refractive index of opal), aggregation occurs most likely through a homogeneous colloidal crystallisation process which results in the ordered array. Subsequently the array is solidified through precipitation of a second generation of silica which cements the array onto a solid coherent mineral specimen. The microstructure of the array can then be observed through the hydrofluoric etching of fresh fracture surfaces which reveal the ordered arrays of the monodispersed spherical particles.

As the process of opal formation occurs in solution, a hydrous silica is formed. The silica network itself can be of an amorphous nature (opal-A) or is paracrystalline (opal-CT; cristobalite containing tridymite stacking faults) and contains water in the form of molecular and silanol (bound) water. The molecular water is trapped in cages, capillary pores and interstitial voids while the silanol water is present at the surface, internal interfaces (e.g. at capillary or void surfaces) and in the silica network as isolated broken bridges. The type and amount of each of these species of water is dependent on the environment in which opal formation occurs (e.g. temperature and pH) and hence water may be used as a probe to characterise the morphology structure of opal.

Both thermal and spectroscopic methods have been used to successfully characterise the types of water present in opal and given the range of types of water, multiple characterisation techniques are required. This paper will outline the application of both thermal and spectroscopy methods in the characterisation of opal. TG data are presented to identify the total water content (molecular and silanol), low temperature DSC data is used to characterise the proportion of crystallisable water present in opal and thermoporosity based on DSC is used to determine the characteristic pore size of water filled pores. The silanol water content is determined from the ^1H -CP- ^{29}Si MAS NMR while the distribution of molecular and silanol water is also gleaned using FT-NIR. The total water content is not indicative of the origin and formation environment of opal, however, the distribution of the different types of water present in these hydrous silicas is strongly dependent on the formation environment. The distribution of species type coupled with a knowledge of the origin of the opal allows the development of a fundamental model for opal genesis.

[1] “Water in Opal – What Can It Tell Us?”, Paul Thomas, Laurie Aldrich and Anthony Smallwood, InColor Magazine, 41, Winter, 62-69, 2019.