



ITMO UNIVERSITY



Book of

Abstracts



International Sol-Gel Conference

Next Generation

St Petersburg, Russia
August 25-30, 2019

WELCOME TO SOL-GEL 2019!

Dear participant of the International Sol-Gel Conference, St Petersburg, August 25-30, 2019,

We are glad you are taking part in this **20th conference anniversary**, the first in Russia in this series of conferences.

For this conference we have launched several novelties:

- To keep a high level and broad scope of all lectures they are all either invited or plenary lectures, given by group leaders or broad-scope researchers.
- Selecting the invited speakers: We have asked the whole community of the members of the International Sol-Gel Society for recommendations on whom to invite. In that way we gave the community an active role in deciding on the nature and content of the conference.
- The response to our invitations for plenary and invited lectures was overwhelmingly positive, and the resulting oral program is rich and diverse with all of the frontier topics in sol-gel science and technology.
- The more specific topics, which characterize usually the work of PhD students, post-docs and early career researchers, will be presented in high quality posters.
- At our focus in this conference are these young scientists – therefore the theme of the conference is, **“The Next Generation”**.
- Plenty of special activities are devoted to **the Next Generation**, including 10 minutes slam presentations, a panel discussing their future career, various awards, participation of the younger generation in all social activities including the banquet, and substantial financial support and low or zero registration fees.
- Last but not least in the novel aspects, the local organizing committee was international, bringing in that way local expertise with long-term experience of previous conferences.

Finally, we thank the International Sol-Gel Society and particularly the Chairman Prof. Masahide Takahashi for the full support he gave us in organizing these conference with its special features.

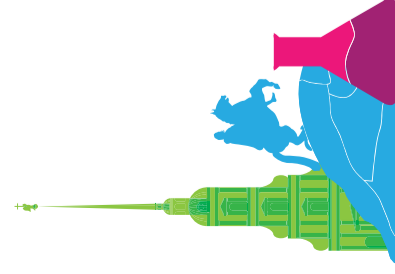
We did our best – Please, enjoy the meeting!

The local organizing committee

Vladimir Vinogradov, Vadim Kessler and David Avnir

TABLE OF CONTENTS

Welcome	3
Chairs and International Advisory Board	4
Conference timetable	5
Sponsors	6
Abstracts of Plenary speakers	7
Abstracts of Award speakers	20
Abstracts of Invited speakers	25
Abstracts of Science Slam Speakers	76
Abstracts of Posters	87
Authors index	453



**International
Sol-Gel
Conference**

Next Generation
St Petersburg, Russia
August 25-30, 2019

ORGANIZERS

Chairs



Dr. Vladimir Vinogradov
(Chair)
ITMO University



Prof. David Avnir
(Co-Chair)
Hebrew University, Israel



Prof. Vadim Kessler
(Co-Chair)
Swedish University of
Agricultural Sciences



Dr. Daria Kozlova
(Co-Chair)
ITMO University

International Advisory Board

Prof. Michel Aegerter
Editor in Chief JSST, Switzerland

Prof. Rui M. Almeida
Instituto Superior Técnico, Portugal

Prof. Byeong-Soo Bae
Korea Advanced Institute of Science and
Technology - KAIST, Korea

Prof. Jeffrey C. Brinker
Sandia National Laboratories, USA

Prof. Massimo Guglielmi
University of Padova, Italy

Prof. Nicola Hüsing
University of Salzburg, Austria

Prof. David Levy
Instituto de Ciencia de Materiales de Madrid -
Consejo Superior de Investigaciones Científicas
(ICMM-CSIC), Spain

Prof. Kazuki Nakanishi
Kyoto University, Japan

Prof. Stéphane Parola
Ecole Normale Supérieure de Lyon, France

Prof. Olga A. Shilova
Institute of Silicate Chemistry of the Russian
Academy of Sciences, Russia

Dr. Michel Wong Chi Man
Ecole Nationale Supérieure de Chimie de
Montpellier - ENSCM, France

Prof. Sara Aldabe Bilmes
Universidad de Buenos Aires, Argentina

Prof. Valentine P. Ananikov
Zelinsky Institute of Organic Chemistry, Russia

Prof. John Bartlett
University of the Sunshine Coast, Australia

Prof. Bruce Dunn
University of California Los Angeles - UCLA, USA

Prof. Benoît Heinrichs
University of Liège, Belgium

Prof. Kazuyuki Kuroda
Waseda University, Japan

Prof. Francisco Maldonado-Hodar
University of Granada, Spain

Prof. Jean-Marie Nedelec
Institut de Chimie de Clermont-Ferrand, France

Prof. Sidney J. L. Ribeiro
Institute of Chemistry - Universidade Estadual
Paulista - UNESP, Brazil

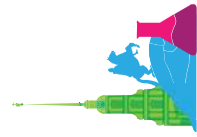
Prof. Galo SOLER-ILLIA
Universidad de Buenos Aires - UBA, Argentina

Prof. Hui Yang
Zhejiang University, China

TIMETABLE

	Sunday 25th August	Monday 26th August	Tuesday 27th August	Wednesday 28th August	Thursday 29th August	Friday 30th August
8:00						
8:30		Registration* 8:00-18:00	Registration 8:30-18:00	Registration 8:30-18:00	Registration 8:30-18:00	
9:00	Registration 9:00-18:30	Opening ceremony at BDT theatre	Poster mounting	Poster mounting		
9:30		Mari-Ann Einarsson at BDT theatre	Andrey Rogach Kazuki Nakanishi	Aziz Muzaferov Mario Pagliaro	Life Achievement Award.	Markus Niederberger
10:00		Coffee break at BDT theatre. Move to ITMO University	Coffee break. Poster mounting	Coffee break. Poster mounting	Ulrich Award. ISGS Fellow Ceremony	Session: Non-hydrolytic sol-gel materials
10:30			Parallel sessions: 1. Photonic sol-gel materials 2. Hybrid materials	Joanna Aizenberg Bicasa presentation		Coffee break
11:00		Peter Fratzl	Parallel sessions: 1. Silica and Silsesquioxanes 2. Fundamental aspects of sol-gel chemistry	Parallel sessions: 1. Silica and Silsesquioxanes 2. Fundamental aspects of sol-gel chemistry	Coffee break	
11:30		Buffet lunch	Buffet lunch + Poster Session I 13:00 - 15:00	Buffet lunch + Poster Session II	Parallel sessions: 1. Optically active sol-gel 2. Biomaterials	
12:00			ISGS Meeting	Buffet lunch	Buffet lunch 13:30 - 15:30	Frank Caruso
12:30	Aerogel Workshop	Nicola Hüsing	Eugenia Kumacheva Merck presentation	Meeting of ISGS and the JSST board	Meeting of ISGS and the JSST board	Closing session
13:00		Break	Parallel sessions: 1. Processing of sol-gel materials 2. Membranes	Science communication Lecture	Science communication Lecture	
13:30		Parallel sessions: 1. Coating and Films 2. Biosafety and Bioapplication	Parallel sessions: 1. Processing of sol-gel materials 2. Membranes	Parallel sessions: 1. Electrochromism, electrocatalysis and electrospinning 2. Sol-gel coatings	Parallel sessions: 1. Electrochromism, electrocatalysis and electrospinning 2. Sol-gel coatings	
14:00		Coffee break	Coffee break	Guided city bus tour		
14:30		Parallel sessions: 1. Applied sol-gel materials 2. Silica and sesquioxanes	Panel discussion: How to build a successful career?			
15:00			Evening on own/ "like a local" program			
15:30		Russian Evening			Closing Reception and Science Slam	
16:00						
16:30						
17:00						
17:30						
18:00						
18:30						
19:00	Welcome Reception					
19:30						
20:00						
20:30						
21:00						

* 08:00 - 18:00 at ITMO University
08:00 - 11:00 at BDT theatre



**International
Sol-Gel
Conference**

Next Generation
St. Petersburg, Russia
August 25-30, 2019

Aqueous citrate sol-gel synthesis towards the double $A_2Ni(Te, W)O_6$ and triple $A_3(Fe, Co)_2(Te, W)O_9$ perovskites

Igor Djerdj⁽¹⁾, Jelena Bijelić⁽¹⁾, Anamarija Stanković⁽¹⁾, Martina Medvidović-Kosanović⁽¹⁾, Marina Sekulić⁽¹⁾, Berislav Marković⁽¹⁾, Pascal Cop⁽²⁾, Yu Sun⁽²⁾, Zvonko Jagličić^(3,4), Ákos Kukovecz⁽⁵⁾, Georg Garnweitner⁽⁶⁾ and Bernd Smarsly⁽²⁾

- 1- Department of Chemistry, Josip Juraj Strossmayer University of Osijek, Cara Hadrijana 8/A, HR-31000 Osijek, Croatia
 - 2- Institute for Physical Chemistry, Justus Liebig University of Giessen, Heinrich-Buff-Ring 17, D-35392 Giessen, Germany
 - 3- Institute of Mathematics, Physics & Mechanics, University of Ljubljana, Jadranska 19, SI-1000 Ljubljana, Slovenia
 - 4- Faculty of Civil and Geodetic Engineering, University of Ljubljana, Jamova 2, SI-1000 Ljubljana, Slovenia
 - 5- Department of Applied and Environmental Chemistry, University of Szeged, Rerrich Bela Ter 1, Szeged, H-6720, Hungary
 - 6- Institute for Particle Technology and Laboratory for Emerging Nanometrology, Technische Universität Braunschweig, Volkmaroder Str. 5, D-38104 Braunschweig, Germany
- igor.djerdj@kemija.unios.hr

Abstract: Specific structure of perovskite compounds provides them with various interesting properties which vary from magnetic and electric properties to magnetic frustration and half-metallicity. Double $A_2Ni(Te, W)O_6$ and triple $A_3(Fe, Co)_2(W/Te)O_9$ (A= Sr, Ba) perovskites have been prepared in nanocrystalline form using a modified aqueous sol-gel citrate route. Solution chemistry synthesis mechanism and synthesized compounds itself have been studied by electrochemical measurements. Structural investigation has been conducted by ambient and in situ X-ray powder diffraction (PXRD), X-ray photoelectron spectroscopy (XPS), transmission electron microscopy (TEM), selected area electron diffraction (SAED), thermogravimetric analysis (TGA) and unpolarized Raman spectroscopy, while their magnetic properties have been determined using SQUID measurements. Similar research has already been conducted with tellurium- [1] and tungsten- [2] based perovskites. In this research the advances of solution chemistry methods (bottom up approach), namely sol-gel citrate route, over the solid-state routes towards the synthesis of complex perovskite structures will be presented. The obtained compounds have been structurally characterized using above mentioned state-of-the-art techniques and, in addition, magnetic ground state has been determined.

References:

1. I. Djerdj, J. Popović, S. Mal, T. Weller, M. Nuskol, Z. Jagličić, Ž. Skoko, D. Pajić, C. Suhomski, P. Voepel, R. Marschall, B. Kozlevčar and B. M. Smarsly, *Cryst. Growth Des.* 16(5) (2016), 2535-2541.
2. J. Bijelić, A. Stanković, B. Matasović, B. Marković, M. Bijelić, Ž. Skoko, J. Popović, G. Štefanić, Z. Jagličić, S. Zellmer, T. Preller, G. Garnweitner, T. Đorđević, P. Cop, B. Smarsly, I. Djerdj, *CrysEngComm* 21(2019), 218-227.

Authors acknowledge Croatian Science Foundation (IP-2016-06-3115) for full financial support and DAAD for partial support via a German-Croatian exchange partnership (ID 57335028).

Preparation of Photocatalytic Titania on Organic Support via Sol-Gel Method for Water Clarification

İlker ERDEM⁽¹⁾

1- Abdullah Gül University (AGU), Faculty of Engineering, Material Science and Nanoengineering Dept., Sümer Campus, Kocasinan, Kayseri, TR
ilker.erdem@agu.edu.tr

Abstract: The water is an important resource for life which should be recycled. The recycling of water is getting more difficult with the industrialization and release of versatile pollutants in big quantities. There are research activities to create new methodology for clarification of resistant pollutants, which are hard to remove. An alternative method is to oxidize these pollutants via photocatalytic oxidation. Titania (TiO_2) has photocatalytic activity that it may be used for the clarification purpose. The previous research reported that the titania has a higher catalytic efficiency with decreasing particulate size. Using sol-gel method is promising to have submicron titania particulates with high photocatalytic activity. The crystal morphology of titania was also reported to be effective on its photocatalytic activity. The anatase phase and/or mixture anatase & rutile phases were reported to have higher catalytic activity. The sol-gel method enables preparation of titania with controlled crystal morphology that will enable preparation of photocatalytic titania with relatively higher efficiency. The efficiency of photocatalytic activity of titania was also tried to be enhanced via decreasing its energy band gap for excitation, which will make it sensitive to radiations with relatively lower energy (i.e. higher wave length). For this purpose different elements (e.g. Fe, Ni, Au, S, N, C, etc.) were doped in titania, or some dyes were used to make it photocatalytically active under visible light (instead of ultraviolet (UV) light which has higher energy but is with limited ratio in sunlight). In present work sol-gel method was used to prepare nano/submicron-titania on organic supports using titanium isopropoxide. The organic supports were ground nut shell powder (e.g. walnut) which are waste/side products. The photocatalytic activity of organic supported submicron titania catalyst was determined via oxidation of dyes (e.g. methylene blue) under excitation via UV and/or visible light and it was compared with activity of commercial nano titania powder. Higher efficiencies were obtained by using the prepared organic supported titania catalyst which may have relatively lower cost than the commercial nano titania powder. The particle size distribution (PSD) analysis was performed via laser light scattering technique and average particle sizes of a few nanometers were measured for the sols prepared. The prepared catalyst using the sols and the fine (ground) powder of nut shells was characterized via SEM (scanning electron microscope) and XRD (X-ray diffraction). Research continues on possible enhancements for photocatalytic activity of the prepared catalyst, which already has promising efficiency for clarification of water. The utilization of prepared organic supported titania catalyst may also be possible for some other applications.