



**CERIC-ERIC** is an integrated multidisciplinary Research Infrastructure open for basic and applied users in the fields of Materials, Biomaterials and Nanotechnology. With a single entry point to excellent facilities, it allows structural investigation, analysis and synthesis of materials, using photon, electron, neutron, and ion based techniques.



Results



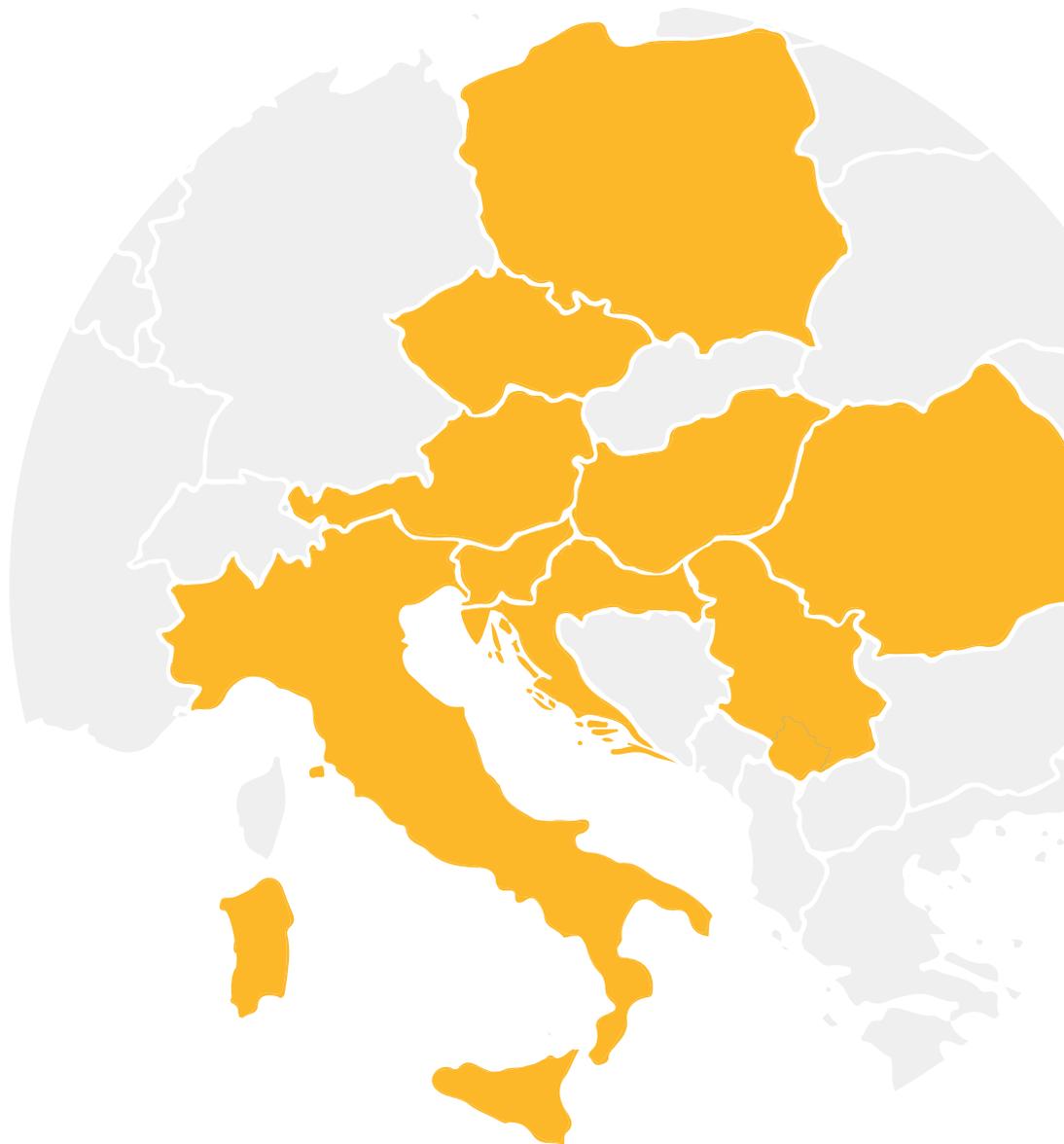
Opportunities



Events



Highlights



## CERIC-ERIC newsletter

n.5

March 2016

# Results

## New design strategies towards more effective catalysts\*

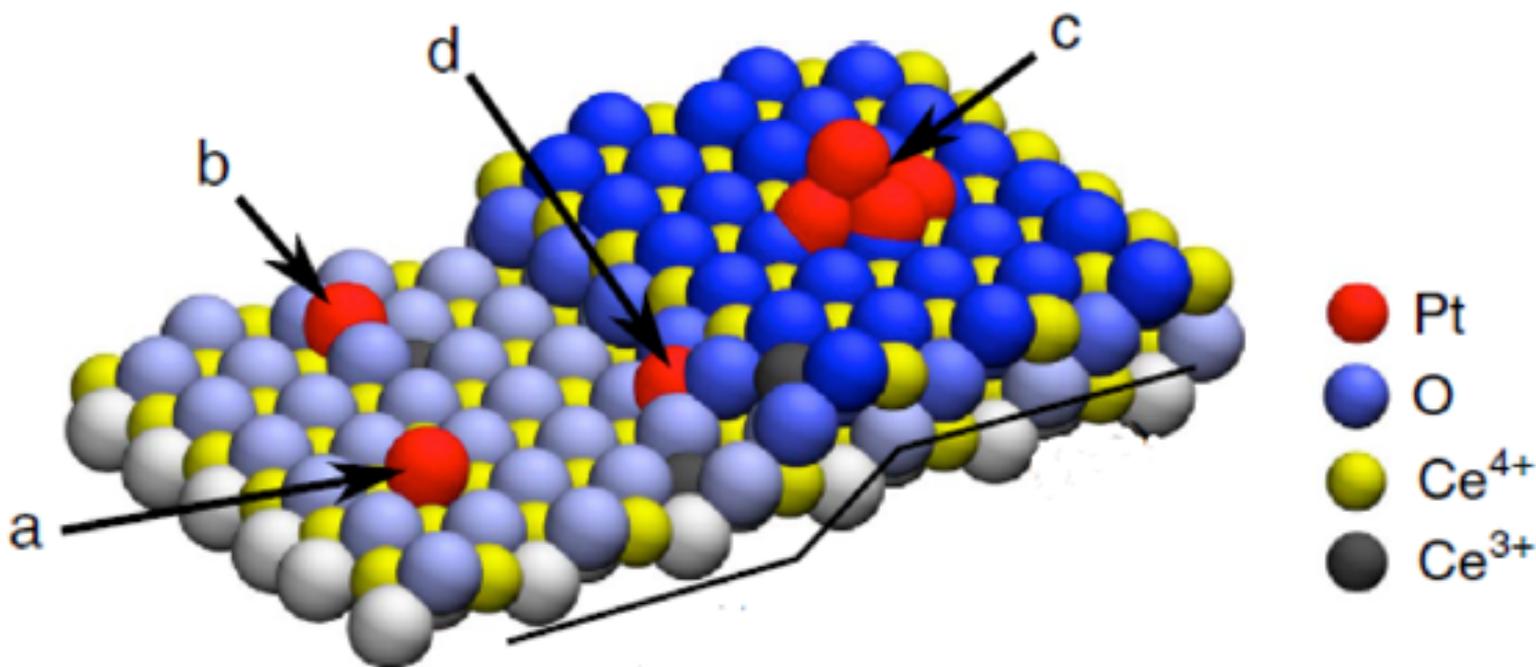
An efficient catalytic process is crucial for several applications like energy production in fuel cells and catalytic converters in cars. Precious noble-metals such as Platinum play a key role in the catalysis and their use has to be optimized to reduce costs and maximize their potential. Single-atom catalysts maximize the utilization of supported precious metals by exposing every single metal atom to reactants. Although this concept is widely known, preserving the stability of single atoms on a support material under working conditions (e.g. high temperature) is still a major challenge.

**Filip Dvorak** and **Matteo Farnesi Camellone** with their colleagues from the Charles University in Prague, the CNR-IOM DEMOCRITOS in Trieste, and the SISSA in Trieste combined the CERIC highly sensitive **photoelectron spectroscopy** with **scanning tunneling microscopy** and **density functional**

**theory calculations**, to explore the physics and chemistry behind the exceptional activity of ceria-based catalysts with an atomic dispersion of ionic platinum.

Dvorak's and Camellone's study shows that monoatomic step-edges, that are the most pervasive defects on solid surfaces such as the support material ceria, provide specific structural and electronic environments for the selective formation of uniform, thermally and chemically stable Pt<sup>2+</sup> ions. Moreover they found that the platinum ions are stabilized as platinum oxide (PtO<sub>4</sub>), which can provide additional reactivity in oxidation reactions.

Experimentally controlling the engineering and decoration of the steps, as in the present study, may bring to a more effective use of precious metals in the catalytic processes, for a less expensive and more environment-friendly energy production.



Location of the Platinum atoms (red) on the Ceria substrate. They were found adsorbed on the surface (a), replacing oxygen (b), as Pt<sub>6</sub> cluster on the top of a monolayer (c) and, most stable, as PtO<sub>4</sub> in the step-edge (d).

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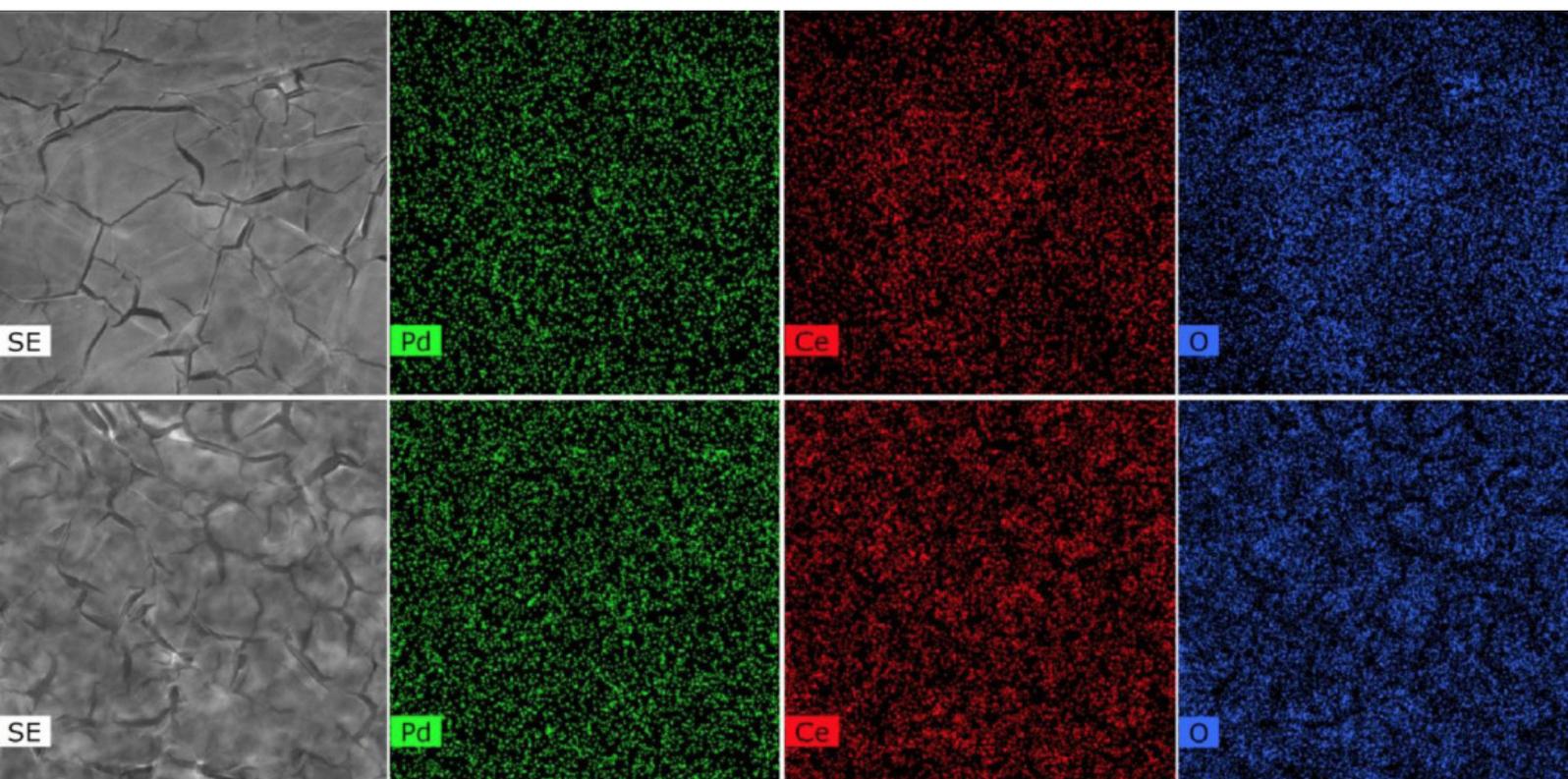
## New findings on the effects of impurities on catalytic combustion open the way to the production of cleaner energy\*

The catalytic combustion of methane ( $\text{CH}_4$ ), the main component of natural gas, is a crucial process for the production of clean energy. Palladium (Pd)-based catalysts are the most active materials for the oxidation of methane at low temperatures. In contact with cerium oxide ( $\text{CeO}_2$ ), Pd reaches a high activity. The synthesis of Pd nanoparticles surrounded by a thin porous shell of ceria allows to fully exploit this property. Nevertheless, these catalysts can deactivate under real conditions, especially in the presence of water vapor, sulfur and phosphorus species, as seen in the irreversible deactivation of automotive catalytic converters. The presence of phosphorus compounds ( $\text{P}_2\text{O}_5$  or  $\text{H}_3\text{PO}_4$ ) in vehicle exhaust is due to decomposition/volatilization of anti-wear additives that are present in most available motor oils. **Matteo Monai** (University of Trieste) and his colleagues shed some light into this matter performing a fundamental

investigation on the mechanism of phosphorous poisoning of catalysts.

The researchers prepared a model catalyst system and exposed it to phosphorous under various conditions. The behavior of the system has been studied by a unique combination of techniques, some of which offered by CERIC: **Synchrotron Radiation Photoelectron Spectroscopy (XPS)**, **Scanning Electron Microscopy (SEM)**, **Atomic Force Microscopy (AFM)** and **X-ray Absorption Near Edge Structure (XANES)**. The study led to the conclusion that phosphorous itself is only lowering the performance of the catalyst, rather than destroying it completely. Only in combination with water vapor it leads to the coagulation (clotting) of the  $\text{CeO}_2$  nanoparticles, which “lock-up” the palladium and completely deactivate the catalyst. The understanding of this mechanism can be used to design more stable catalytic systems, increasing the chance to tackle relevant environmental issues in the future.

\*M. Monai, et al., Phosphorus poisoning during wet oxidation of methane over Pd@ $\text{CeO}_2$ /graphite model catalysts, Appl. Catal. B: Environ.(2015), <http://dx.doi.org/10.1016/j.apcatb.2015.10.001>



20 m viewfield SEM images and EDS mapping of Pd, Ce and O signals of fresh Pd@ $\text{CeO}_2$ /graphite (top row) and Pd@ $\text{CeO}_2$ /P-graphite (bottom row) samples

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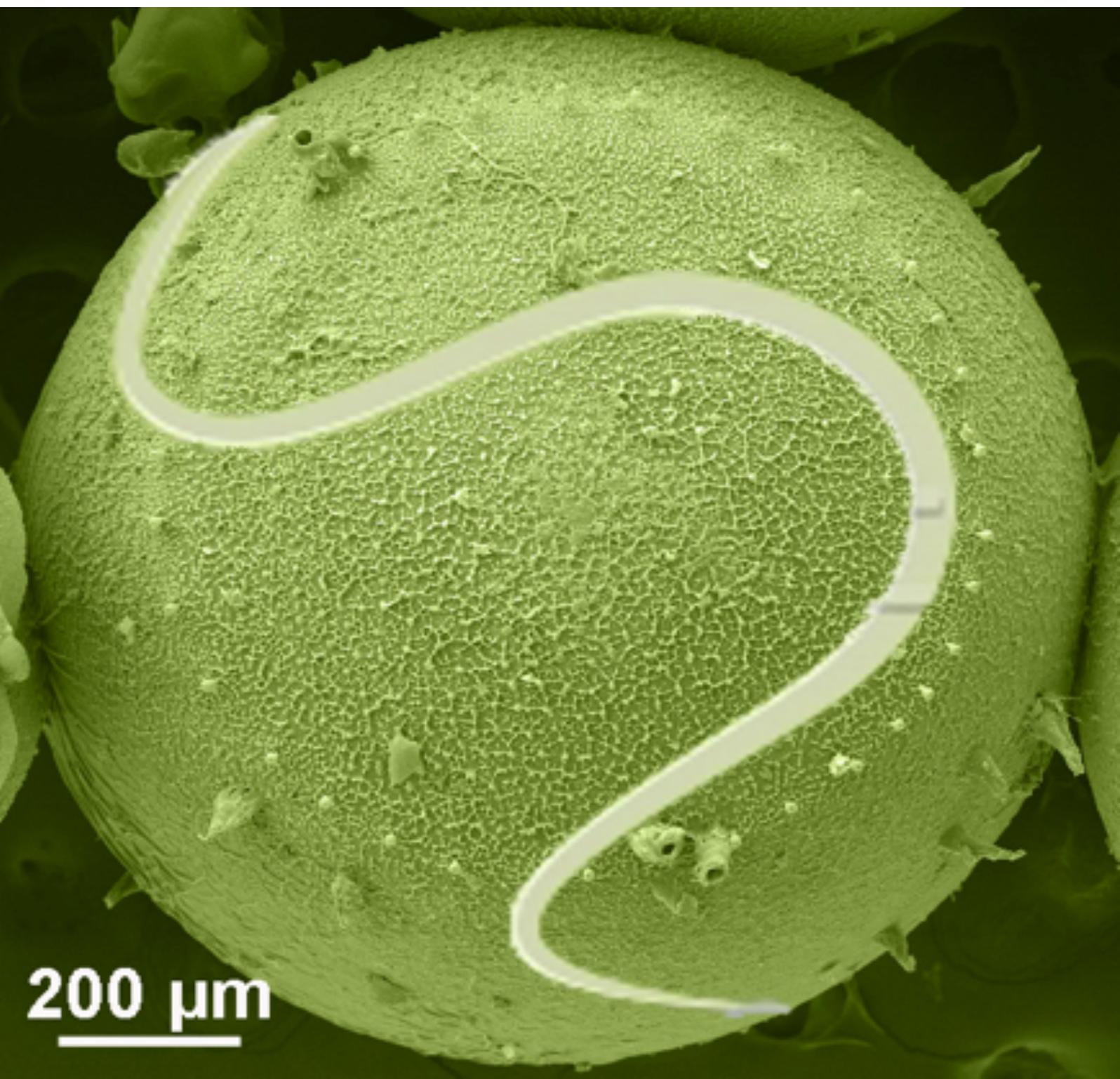
## Selected the winners of the CERIC Science Picture Contest 2016

*Three participants from three CERIC Partner Facilities will be awarded*

14 March 2016

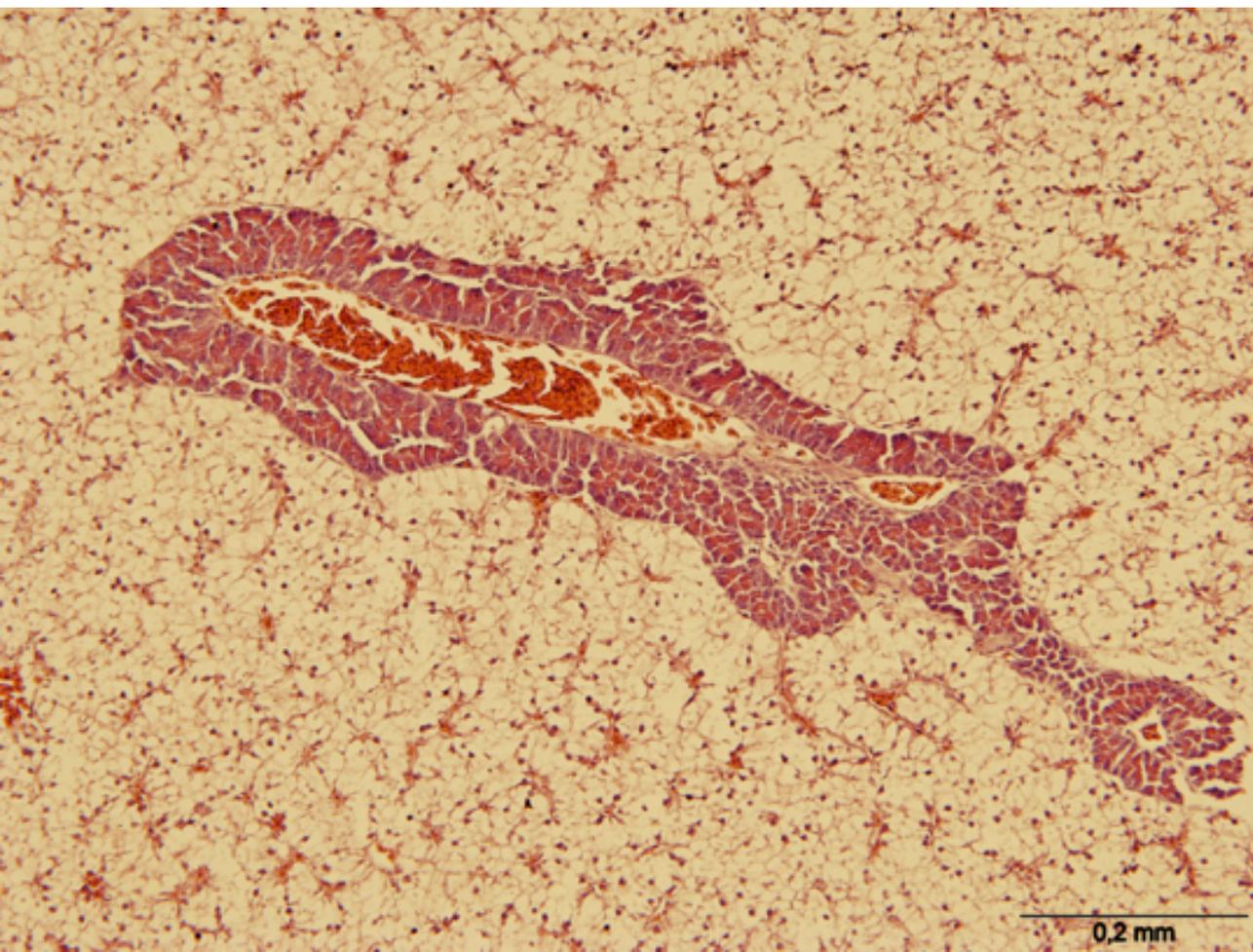
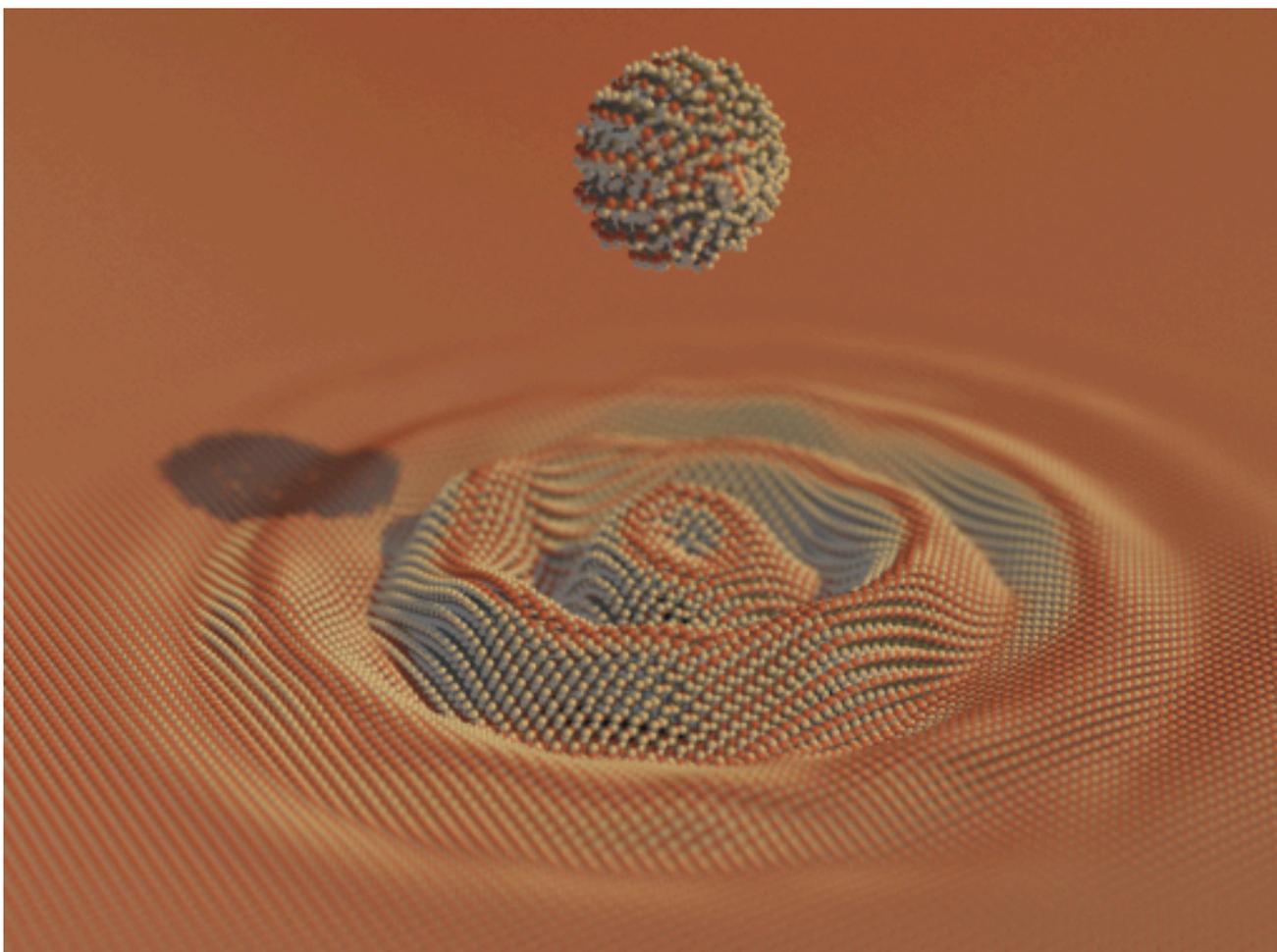
The Evaluation Committee of the Internal CERIC Science Picture Contest 2016 ranked all the submitted images and selected the three winners of this 1st edition:

**Raluca Florentina Negrea**  
from the National Institute  
of Material Physics in  
Romania, with the picture  
**Tennis Ball**



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**Tomáš  
Duchon** from  
the Czech  
Surface  
Physics  
Laboratory in  
Prague, with  
the picture  
**Drop of  
Ethanol**



**Josip Barisic**  
from the  
Ruder  
Boškovic  
Institute in  
Zagreb, with  
the picture  
**Fish in Fish**

March 2016

## The number of submitted proposals has substantially increased in the last CERIC Call

*1 March 2016*

The 4th CERIC Call for Proposals was closed on the 1st of March. **61 proposals** have been submitted, with a 15% increase in comparison to the previous call. This demonstrates the efficacy of the two-step procedure, which has allowed the applicants to have a pre-evaluation of their proposals and to improve them before the final submission. Another engaging element has been the possibility to apply with single-instruments

proposals, to access those facilities that do not have other channels of open access available. 20 research groups have chosen this option. Nevertheless, the combination of more techniques is still the distinguishing and most appealing characteristic of CERIC-ERIC, as it is shown by the 41 multi-technique proposals received.

## Closed the first call for the CERIC Research Grants

*Three participants from three CERIC Partner Facilities will be awarded**7 March 2016*

CERIC received **16 applications** in response to the Call for Research Grants closed on the 7th of March. Proposals cover a wide range of scientific areas: Structural and Molecular Biology, Catalysis, Device Development, Functional Materials, Surfaces and Thin Films, Chemical Processes and Kinetics, Biochemistry and Biophysics, Instrumentation and Development Methods.

The Grant will provide funding to the best investigators and their research teams to pursue high level and ground-breaking research in science and engineering. This research is expected to lead to advances

at the frontiers of knowledge by using and eventually improving the research infrastructures in the CERIC Partner Facilities, taking best advantage of the consortium and contributing to its improvement. The researchers have applied with projects with a multi-technique and multidisciplinary approach, within the area covered by CERIC and involving more than one of the CERIC Partner Facilities. An independent international committee of scientific experts will evaluate the proposals. The results will be published within summer 2016.



**Grants**

# Events

## CERIC @ the 4th ERIC-Network Meeting

Amsterdam - The Netherlands, 8-9 March 2016

In collaboration with the European Commission (EC), EATRIS-ERIC and CLARIN-ERIC have co-organized the 4th ERIC-Network Meeting, which took place in Amsterdam on March 8 and 9. CERIC, together with other ERICs, national governments and EC representatives, as well as Research Infrastructures planning on applying for the ERIC status, had the opportunity to share experiences on common issues experienced by ERICs and to engage in a dialogue with the European Commission and national funders about possible solutions.

**Harry Tuinder** and **Keji Adunmo** from the EC and **Odd-Ivar Eriksen** (Chair of the ESFRI WG on Implementation) reported about the ERICs state of play, the Charter of Access and the ongoing policy issues. The participants have been given updates about the ESFRI Roadmap,

and the pre-conditions for the long-term sustainability of RIs have been described.

Other common issues related to the status of the staff employed by the ERICs, to mobility and administration have been discussed, as well as the status of participation in H2020 and other EU funding programs and the state of play related to VAT exemption. The ERICs “to be” have been presented and they shared their experiences and main challenges.

In the last brainstorming session, the participants have shared ideas about the possible more formal structuring of the ERIC-Network. CERIC-ERIC, SHARE-ERIC and BBMRI-ERIC have been asked to draft a proposal to be discussed in the next ERIC-Network meeting, which will be hosted by ECRIN-ERIC.

From left: Dr. Anton Ussi, Operation & Finance Director – EATRIS-ERIC and Harry Tuinder, European Commission, DG RTD



March 2016

## 13th International School and Symposium on Synchrotron Radiation in Natural Science (ISSRNS'2016)

Ustron - Poland, 13-18 June 2016



ISSRNS  
2016

The 13th International School and  
Symposium on Synchrotron Radiation  
in Natural Science (ISSRNS'2016)

13-18 June 2016, Ustroń, Poland

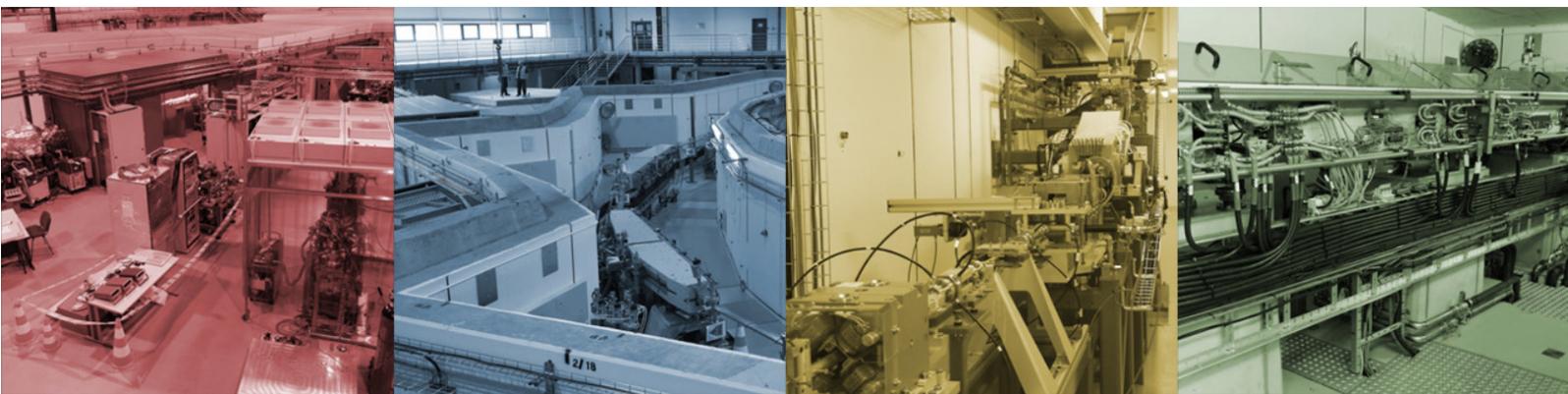
The Polish Synchrotron Radiation Society - PSRS ([www.synchrotron.org.pl](http://www.synchrotron.org.pl)) organizes the 13th International School and Symposium on Synchrotron Radiation, taking place on 13-18 June 2016 in the hotel "GWAREK" in Ustroń-Jaszowiec (Poland). The aim of this interdisciplinary meeting is to **bring together scientists and students working with synchrotron radiation**.

ISSRNS is a traditional forum gathering users (scientists and graduate students) for discussing fundamental issues of application of the synchrotron radiation and related methods in natural sciences. The meeting will focus on novel applications of synchrotron radiation in physics, chemistry, material and life sciences.

The programme of the Symposium will comprise invited lectures (40 minutes), oral communications (20 minutes) and poster presentations. The abstracts of all presentations presented on ISSRNS will be published in a volume of Synchrotron Radiation in Natural Science, and the proceedings in a reputable international journal. The official language of the meeting is English.

ISSRNS' 2016 will be organized in cooperation with Adam Mickiewicz University in Poznan, Poland ([www.amu.edu.pl](http://www.amu.edu.pl)).

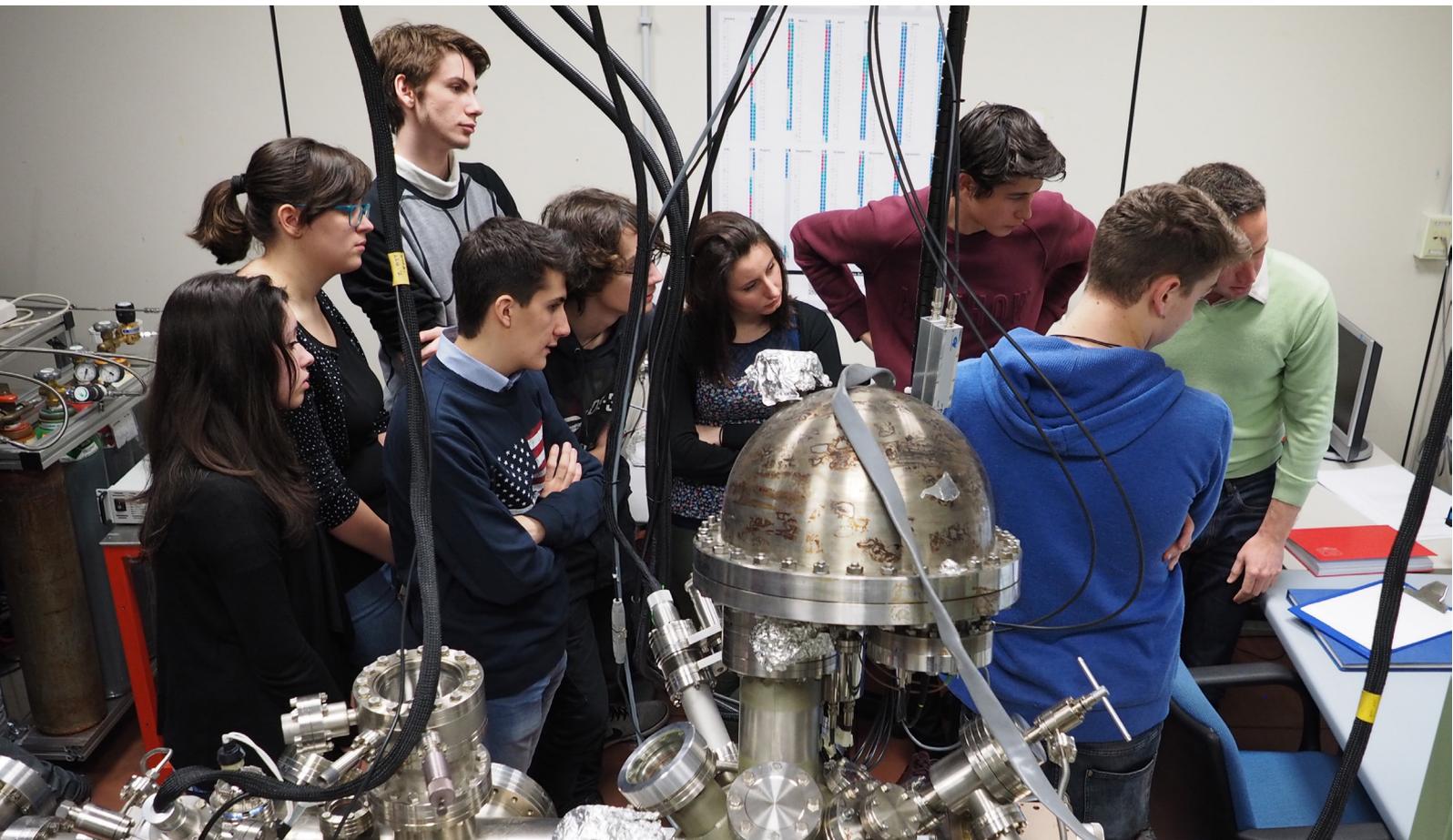
Please find more information in the website of the event: <http://issrns13.home.amu.edu.pl>



## How exciting is to be a scientist!

*The students involved in the project PaGES experienced scientists' life*

*Cervignano del Friuli, Gorizia, Trieste - Italy, February–March 2016 2016*



In February and March 2016, scientists and managers from CERIC-ERIC and Elettra Sincrotrone Trieste had their first meetings with the students and the teachers of the schools partners in the PaGES project. During the first two cycles of courses, 60 students have been introduced to the basics of project management: they have been explained what a project is, what are its characteristics and phases and what tools can be used for its planning, monitoring and management. The theoretical part has been linked to a team building game reproducing the characteristics of a project: a team with its skills, a limited amount of resources, and a timeframe within which the project has to be concluded. The invited scientists showed some of the applications that the research on advanced materials could have. In particular, during

the visit of students to the synchrotron at Elettra, the participants had the chance to directly experience the life of a scientist, by learning how to create Composite Hybrid Materials and to grow Carbon Nanotubes. International researchers from CERIC explained what are the main steps to take up a scientific career and answered to the many questions of the students.

As a follow-up, hints and tips on how to present and disseminate the scientific data both to a scientific and to a wider public have been given, to increase the chances of an efficient science communication.

The last cycle of events is planned in the beginning of April: the students will present their work and the results of the experiments to their schoolmates and to their teachers.

# Highlights

## Poland officially joins CERIC-ERIC as full Member

*The Synchrotron SOLARIS has been formally appointed as the Polish Partner Facility in CERIC*

*Poland, 2 March 2016*



Poland has formally entered CERIC-ERIC, with the decision of the Polish Ministry of Science and Higher Education to join the membership, and with the approval of the General Assembly of CERIC-ERIC. With this decision, the National Synchrotron Radiation Centre SOLARIS in Krakow has been formally appointed as the Polish Partner Facility in CERIC-ERIC. Therefore, starting from this year, Poland will offer free open access to the techniques of SOLARIS to the CERIC international users, selected by peer review. This will allow integrating these techniques with those available in the other Partner Facilities of CERIC-ERIC in Austria, Croatia, the Czech Republic, Hungary, Italy, Romania and Slovenia.

The Polish Ministry has designated Prof. Marek Stankiewicz, Director of SOLARIS, and Mr. Michał Rybiński, Chief Expert in the Department of Innovation and Development of the Ministry of Science and Higher Education, as the Polish delegates to the CERIC-ERIC General Assembly, in compliance with the art. 11 of the CERIC Statute. Carlo Rizzuto – Chair of the CERIC General Assembly, Jana Kolar – CERIC Executive Director, and the other CERIC governing bodies have welcomed with great enthusiasm this new entry in the distributed Research Infrastructure and have expressed their best wishes for a long and fruitful cooperation.



### Video interview to Jana Kolar by RTV SLO

The video, focused on the role, position and achievements of women in science, has been broadcasted on womens' day in the Slovenian TV



**CLICK HERE TO WATCH THE VIDEO**

Watch the interview at min. 18.22 (in Slovenian only)



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