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Guest Editorial

No Inorganic Materials, No Progress

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Indeed, what would be our life without inorganic materials? Sustainable energy, telecommunications and green transportation, environmental depollution issues, health care and bio-food delivery are considered as top priorities of our modern society. Such strategic issues have sparked phenomenal interest in inorganic chemistry as they hold great promise to develop 21st century solutions and face global challenges. Nanostructured materials have revealed unprecedented physical (optics, magnetism, etc.) and chemical (e.g. catalysis, energy conversion and storage) properties that are absent in bulk matter of the same chemical composition. These specific functionalities are the consequence of a complex multilevel and nano-organisation of the architecture of inorganic materials. The global properties as well as functional performances greatly depend on the extent to which these levels are mastered during the synthesis process.

Nowadays nanomaterials face a revolution entering a new era of nanotechnology. A new forum devoted to such an interdisciplinary field, which could gather inorganic, coordination and material chemists as well as material physicists, was born in 2011 with the **International Conference on Advanced Complex Inorganic Nanomaterials (ACIN)**. The successful fourth edition was organised in Namur (Belgium), July 16–20th, 2018, by the Laboratory of Inorganic Materials Chemistry from the University of Namur, the Institute of Condensed Matter and Nanosciences (IMCN) from UCLouvain (Belgium) and the Wuhan University of Technology (China). This meeting offered the possibility to listen to famous and recognized scientists (Jean Marie Lehn, Clément Sanchez, Makato Fujita, Vivian W.-W. Yam, Bert Weckhuysen, Luis Liz-Marzán, Gadi Rothenberg, Svetlena Mintova, Stephane Parola, Shin-ichi Ohkoshi, João Rocha, Azzedine Bousseksou) to name but a few.

The aim of the conference was to cover recent innovations in both fundamental and applied aspects in the field of inorganic nanomaterials and coordination complexes. In particular, focus was on advanced preparation methods and cutting edge charac-

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Yann Garcia studied chemistry and physics at the University of Bordeaux (France). He obtained his doctorate on January 18th, 1999 with the highest possible distinction (supervisor Prof. Olivier Kahn), after his stay at the Bordeaux Institute of Condensed Matter Chemistry (ICMCB-CNRS) from 1994–1998, where he was introduced to the blooming field of molecular magnetism. He next joined the Institute of Inorganic and Analytical Chemistry at the University of Mainz (Germany) in February 1999 to work under the guidance of Prof. Philipp Gütlich as a TMR EU post-doctoral fellow, where he was trained in experimental Mössbauer spectroscopy and spin-crossover phenomena. In 2001, he was offered a permanent research fellow position at CNRS (University Pierre and Marie Curie, Paris VI), but was appointed the same year to Assistant Professor at the Université catholique de Louvain (Belgium), where he is now Professor. He has co-authored more than 230 papers with several cover pages of major chemistry journals, as well as 13 book chapters on inorganic chemistry, several guest editorials and two patent applications. He is an Editorial Board member of EurJIC, associate editor of the Mössbauer Effect Reference Data Journal (MERDJ), President of the French Speaking Mössbauer Society (www.gfsm.fr) and member of the International Board of the Applications of the Mössbauer Effect (IBAME). He was President of the FRS-FNRS thematic doctoral school in Supra(molecular) and functional chemistry (CHIM), Belgium in 2012 and 2018. Prof. Garcia's interests encompass switchable metal-organic frameworks, spin-crossover phenomena, organic solid-state photochemistry, hybrid inorganic nanomaterials for magnetism and cleaning water technologies. He is also working on the input of Mössbauer spectroscopy and muon spin relaxation towards coordination chemistry issues. His research group at IMCN, Louvain-la-Neuve, is active within one COST action and several exchange programmes in eastern Europe as well as in North and West Africa.

Bao-Lian Su was elected to the Royal Academy of Belgium on March 2011. He is Fellow of the Royal Society of Chemistry and Life Member of Clare Hall College, University of Cambridge since 2012. Prof. Su held the "Belgian Francqui Chaire" in 2012–2013. He earned his Doctorate in Sciences from the University Pierre and Marie Curie, Paris, France, in 1992. After a post-doctoral stay at the University of Namur, Belgium, and then Project leader at Catalytica

Inc., California, USA, he joined the faculty of the University of Namur in September 1995 and created the Laboratory of Inorganic Materials Chemistry. In 2002, he was promoted to Professor and in 2004 again protmoted to Full Professor. He was appointed to Deputy Director of the Chemistry Department in 1998 and then was Director from 2007 to 2010. Prof. Su served as the President of Namur Division of the Royal Society of Chemistry, Belgium. He has been elected as Council member of the International Zeolite Association since 2007 and Council member of the International Mesostructured Materials Association since 2008. He was President of the Graduate School of Science and Engineering of Materials, Interfaces and Nanostructures (MAIN), Belgium. Prof. Su has received a series of major awards such as the "First Class Invention Award of Sinopec" in 1992, the "China Patent Excellence Award" in 1994, the "Adolphe Wetrems Prize" of the Royal Academy of Belgium in 2007 and the "Distinguished Award for Novel Materials and their Synthesis" by the International Union of Pure and Applied Chemistry (IUPAC) in 2011. He has been elected "Person of the Year 2008" in the Science Category by the Belgian magazine "Confluent". He has published 380 scientific papers (with more than 11000 citations and an H index of 55) and book chapters and is the editor of one Wiley-VCH book and four special issues of high-profile journals. He also holds 5 international and 20 national patents. Prof. Su's current research fields include the synthesis, study and molecular engineering of nanostructures and highly organized and hierarchically porous materials, bio-integrated living and bioinspired materials and biomaterials for catalysis, photocatalysis, artificial photosynthesis, nanotechnology, biotechnology, information technology, energy storage and conversion and cell therapy.

terisation techniques, new applications and new properties, in particular spin crossover materials, functional porous materials including metal organic frameworks, hybrids and bio-inspired systems. A special session of the conference was organised on the destruction of volatile organic compounds in the frame of two Interreg V projects 'DepollutAir' and TEXACOV. A total of 291 abstracts were received, which were presented in 11 plenary, 9 keynote and 54 invited lectures, 54 oral communications and 163 posters.

This inorganic chemistry event is presently honoured by a EurJIC special issue, which includes one Minireview and 15 Full Papers, covering different aspects of nanomaterials ranging from new synthesis methods to smart applications.

Nanostructuration of inorganic materials involves the use of advanced preparation methods, which are presented in this volume. For instance, Siffert and Cousin *et al.* present the microwave synthesis of oxides on Co/Fe hydrotalcite nanocatalysts for the total oxidation of toxic volatile organic compounds, which are known to be harmful pollutants for human health and environment. Garcia, Sawczak *et al.*, introduce for the first time, the use of matrix-assisted pulsed laser evaporation to deposit thin films of an iron(II) spin-crossover complex displaying a bistability domain at room temperature and known to be photomagnetic. Applications in oxygen reduction are covered by Duan *et al.* with a Pt/Carbon nanotube nanocatalyst whereas Guo *et al.* used Mo_2C/Fe_5C_2 nanoparticles embedded in N-doped carbon.

The field of **functional oxides** is also covered by Ivanov *et al.* who discuss the synthesis of rare-earth phosphates by hydrothermal crystallization, which leads to the identification of a new phase $NH_4Ce_2(PO_4)_3$. In analogy to TiO_2 anatase nanocubes discussed by Tremel *et al.*, the same team present in a second contribution, the synthesis of SnO_2 microplates displaying photocatalytic and antibacterial properties. Gold nanoparticles supported on ZnO as plasmonic photocatalysts were prepared by Bueno-Alejo and Hueso *et al.*, a work that paves the way for solar-driven applications.

Modified **silica** are extremely interesting materials since they provide unique hybrid organic-inorganic materials with various potential applications, in particular, those based on their porous properties. In this context, Wong Chi Man *et al*. prepared new mesoporous hybrid organosilica materials from organosilanes, whereas Blin *et al*. investigate the stability of dual mesostructured silica and of a macro-mesostructured silica. Sun and Bai *et al*. report on ZnO@bimodal mesoporous silica for controlled drug delivery, whereas Radi and Garcia *et al*. report on functionalized silica for the selective confinement of Cd(II), with application to river water samples. This hybrid material offers, in addition, excellent regenerating ability. Finally, Chen *et al*. introduce the reader to 3D monolithic porous materials as carbon aerogels for environment clean-up. Their excellent Minireview also includes removal of heavy metal ions and CO_2 capture.

Organometallic compounds are represented by Gelman *et al*. who discuss homogeneous Ir or Pd catalysts for chemoselective transfer hydrogenation of nitrobenzene. A further contribution to the ACIN conference series by Wong Chi Man and Sanchez *et al*. presents the synthesis of precursors to MOFs and coordination polymer like architectures with various potential applications and is featured on the back cover of this special issue.

Last but not least, whereas single laser shot within the bistability domain of spin-transition materials has been investigated by various groups, Collet and Bertoni *et al*. provide insights to the photoinduced phase-transition mechanism in a rubidium manganese hexacyanoferrate system by using X-ray diffraction in their contribution. The mechanism differs from the one reported for spin-crossover materials. This very important paper is also featured on the front cover of this special issue.

To conclude, the popularity of the fourth ACIN can not only be probed by the large number of delegates originating from many countries as well as from the great appreciation received by the two chairmen just after the meeting. Participants stressed the highly stimulating atmosphere enabling the exchange of ideas, the outstanding quality of the oral program, the variety of inspiring themes and topics, the number of poster prizes from well-established publishing houses and companies, the possibility to submit a manuscript to a high-profile journal as well as the overall top organization in a friendly atmosphere. "An international conference from which we got a lot and which helped us to establish strong collaborations, some being still active after our first participation!" ACIN has raised high expectations within the nanomaterial and inorganic chemistry communities for the next edition of the series, which will be announced shortly. As

the Guest Editors, we wish to thank all contributors and reviewers of this special issue, as well as the EurJIC team for their professionalism and constant enthusiasm. We also wish to extend our sincere gratitude to the session chairs, and the local and scientific committees that have helped to organise such a memorable event. But above all, we wish to thank you the participants for the high standard you have set in the research presented at ACIN 2018. Without you this conference would not be possible. Finally, we thank the readers of this special issue, which we hope you will find useful.

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