NANOMXCN

Mexico-China Workshop on Nano: Materials/Science/Technology

August 10 - 17 • 2015 / Mexico

MEXICO - CHINA - HK

MÉXICO
GOBIERNO DE LA REPUBLICA

CONACYT
Consejo Nacional de Ciencia y Tecnología

CityU
香港城市大學
City University of Hong Kong

Universidad Nacional Autónoma de México

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TOPICS

The workshop focuses on the use of nanostructured materials for the development of environmentally friendly technologies for renewable energy and water remediation; this includes for example:

• Development of new synthesis and surface engineering methods for the fabrication of tailored self-assembled nanostructured materials.

• In-situ characterization and control of the structure and composition of self-assembled nanomaterials with distinctive (non-homogeneous) nano - and micro-characteristics.

• Hierarchical nanostructures.

• Nanomaterials for energy harvesting and storage.

• Hard nanostructured surfaces for optical/optoelectronic applications.

• Corrosion resistant nanostructured surfaces with enhanced catalytic properties.

• Nanoporous surfaces and membranes.

• Plasmonic effects for ultrasensitive detection of pollutants and photo-catalysis.

• Nanotechnologies for water desalination.

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MEXICO-CHINA WORKSHOP ON NANOMATERIALS, NANOSCIENCE AND NANOTECHNOLOGY: RENEWABLE ENERGY AND WATER REMEDIATION

MEXICO / AUGUST . 2015

NANOMXCN Mexico-China Workshop on Nano: Materials/Science/Technology

CONACYT Consejo Nacional de Ciencia y Tecnología

MÉXICO GOBIERNO DE LA REPUBLICA

Sociedad Mexicana de Materiales

Universidad Nacional Autónoma de México

Instituto de Investigaciones en Materiales

CONACYT 251046
Consejo Nacional de Ciencia y Tecnología

NANOMXCN
Mexico-China Workshop on Nano: Materials/Science/Technology

Workshop

Mexico-China workshop on Nanomaterials, Nanoscience and Nanotechnology: renewable energy and water remediation

Dates: 10 -17 August, 2015, Cancún Mexico.

Self-assembled nanostructured materials and systems play a major role in the rapid development of advanced proof-of-concept device applications needed to address critical issues of modern day society. Nanomaterials advantages arise from their unique characteristics such as increased surface to volume ratio or particle/quasi-particle confinement (including electrons, photons, plasmons, etc.) that give rise to novel opportunities to control and tailor the resulting material properties. However, much effort in nanomaterials fabrication and nanosciece of devices is required to realize economically feasible, solutions. The development of advanced technologies to provide renewable energy and clean water are among the top critical priorities shared by many countries.

NANOMXCN will provide a specialized forum for prominent scientist of China, including Hong Kong SAR, and Mexico interested in the development of joint collaborations and scientific exchange to address these issues.

The scientific discussions will focus on the use of nanostructured system design for enhanced device performance by control of the nano- and micro- structure and composition of the materials involved in order to optimize their physical and chemical properties as well as their response to their working environments. This will include, for example, development of new synthesis and surface engineering methods - including in-situ characterization and control - for tailored self-assembled nanostructured materials with desired properties, computer modeling for optimization of nano- and micro- structure and composition, the resulting interfaces, and the device performance, and novel strategies to harness the advantages of nanotechnology approaches including enhanced surface-to-volume ratio, electronic, photonic, and plasmonic confinement.

Fundamental of NANOMXCNs proposal is the renewed interest between Mexico and China to establish increased cooperation links in many fields including science and technology. It is expected that this workshop could become the first of a series of scientific workshops and meetings hosted alternatively by both countries that will result in a long term sustained effort to increase the scientific cooperation in nanomaterials, nanoscience and nanotechnology for critical applications of common interests to Mexico

and China. In this context it is important to emphasize the urgent need to increase the collaboration between Mexico and China as it relates to the proposed topics of this workshop; for example a literature search (SCIE) gives only 50 papers with the topic "nano" that have been co-authored by Mexico and China for all years of the database; this figure is 92 papers for the topic "water".

The workshop focuses on the use of nanostructured materials for the development of environmentally friendly technologies for renewable energy and water remediation; this includes for example:

- Development of new synthesis and surface engineering methods for the fabrication of tailored self-assembled nanostructured materials.
- In-situ characterization and control of the structure and composition of self-assembled nanomaterials with distinctive (non-homogeneous) nano- and micro- characteristics.
- Hierarchical nanostructures
- Nanomaterials for energy harvesting and storage
- Hard nanostructured surfaces for optical/optoelectronic applications.
- Corrosion resistant nanostructured surfaces with enhanced catalytic properties.
- Nanoporous surfaces and membranes
- Plasmonic effects for ultrasensitive detection of pollutants and photo-catalysis.
- Nanotechnologies for water desalination

International Advisory Committee and KeyNote Speakers

- Yip-Wah Chung, Northwestern University, USA
- Jiang Guibin, Research Center for Eco-Environmental Sciences, CAS, China
- Isaac Hernández-Calderón, CINVESTAV Zacatenco, Mexico
- Chao-Jun Li, McGill University, Canada
- S. Y. Tong, South University of Science and Technology of China (SUSTC), China

KeyNote Speakers

- Pedro J. J. Alvarez, Rice University, USA
- Jiesheng Chen, School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University.
- Elder de la Rosa, Centro de Investigaciones en Óptica, México.
- Wanqi Jie, Northwest Polytechnic University, China
- Leo W. M. Lau, Beijing Computational Science Research Center
- Marina Rincón, Instituto de Energías Renovables, UNAM, México.
- Jiyang Wang, Shandong University and South China University of Technology, China
- Zhong Lin Wang, School of Materials Science and Engineering, Georgia Institute of Technology, USA
- Ching Ping Wong, Chinese University of Hong Kong, Hong Kong SAR, China.
- Rodolfo Zanella, Centro de Ciencias Aplicadas y Desarrollo Tecnológico, UNAM, México.

Invited Speakers

- Erika Bustos, CIDETEQ, Qro, México
- Luis F. Cházaro, Instituto Potosino de Investigación Científica y Tecnológica A.C.
- Aracely Hernandez-Ramirez, Universidad Autonoma de Nuevo Leon, Mexico
- Juan Manriquez Rocha, CIDETEQ, México
- Gerko Oskam, Centro de Investigacion y de Estudios Avanzados del IPN, Mexico
- Juan Luis Peña Chapa, CINVESTAV, Mérida, México
- Jinwen Shi, Xian Jiaotong University, China
- Jinzhan Su, Xian Jiaotong University, China
- Jianfang Wang, The Chinese University of Hong Kong, Hong Kong SAR, China
- Guidong Yang, Xi'an Jiaotong University, China
- Hailin Zhao Hu, Instituto de Energías Renovables, UNAM, México
- Jiang, Guibin, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences
- Arturo Morales-Acevedo, Centro de Investigación y de Estudios Avanzados del IPN.
- Yongsong Luo, Xinyang Normal University.
- Xiangdong Li, The Hong Kong Polytechnic University, Hong Kong SAR, China.

Organizers

Juan Antonio Zapien
Lead Organizer
City University of Hong Kong, Hong Kong

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UNIVERSIDAD AUTONOMA DE AGUASCALIENTES

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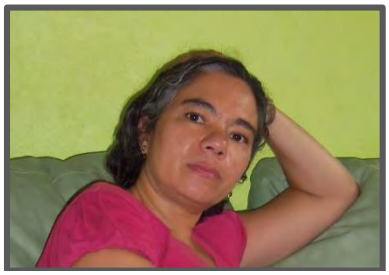
Juan Antonio Zapien is Associate Professor at City University of Hong Kong, SAR China where he teaches physical optics and related courses for undergraduate and postgraduate students. He obtained his BSc (Physics) from the "Universidad Nacional Autonoma de Mexico" (UNAM) performing his undergraduate thesis at the Materials Research Institute of UNAM (IIM-UNAM). He received his PhD degree from The Pennsylvania State University (USA) in 2000 working in the optical characterization of the nucleation and growth of cBN and wide band gap materials. His current research interests are in the quantitative optical characterization of nanostructures for photonic and plasmonic applications, the use of nanomaterials for energy, lighting, and sensing applications, and the real time optical characterization of the nucleation and growth of thin films. He has co-authored three book chapters and over 110 SCI publications that have received more than 3300 citations (*h-index* 28). He has been involved in the organization of several international meetings and has also participated as invited speaker in more than 22 international conferences.

Selected publications:

1. King Tai Cheung, Yishu Foo, Chap Hang To, Juan Antonio Zapien, "Towards FDTD modeling of spectroscopic ellipsometry data at large angles of incidence" *Appl. Surf. Sci.* 281 (2013) 2– 7.
2. A. Ng, X. Liu, C.H. To, A. B. Djurisic, J. A. Zapien, W. K. Chan, "Annealing of P3HT:PCBM Blend Film-The Effect on Its Optical Properties" *ACS Appl. Mat. Int.* 5 (2013) 4247-4259.
3. Xuejin Zhang, Hao Tang, Jian An Huang, Linbao Luo, Juan Antonio Zapien, and Shuit-Tong Lee "Surface-Enhanced Emission from Single Semiconductor Nanoribbons" *Nano Lett*. 11 (2011) 4626-4630
4. S. Jha, J.-C. Qian, O. Kutsay, J. Kovac Jr, C.-Y. Luan, J. A. Zapien, W. Zhang, S.T. Lee and I. Bello "Violet-blue LEDs based on p-GaN/n-ZnO nanorods and their stability" *Nanotechnol* 22, 245202 (2011), doi:10.1088/0957-4484/22/24/245202.
5. J. A. Zapien, Y. K. Liu, Y. Y. Shan, H. Tang, C. S. Lee, and S. T. Lee, "Continuous near-infrared-to-ultraviolet lasing from II-VI nanoribbons" *Appl. Phys. Lett.* 90 (2007) 213114.



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Dr. Rodil holds a degree in physics from the Universidad Nacional Autónoma de México, UNAM, where she also obtained the degree of Master of Science (materials) obtaining the merit Alfonso Caso medal. She received her Ph.D. at the Department of Engineering of the University of Cambridge in 2001. In March 2001, she joined the Instituto de Investigaciones en Materiales (Material's Research Institute, IIM) of the UNAM as an associate researcher. Rodil is currently a full professor at the IIM. She has been award with two medals from the UNAM; the Sor Juana Inés de la Cruz (Distinguished women) in 2009 and the Fernando de Alba (Experimental Physics) in 2014.

Rodil`s research interests are focused on the synthesis and application of coatings or thin films deposited by plasma-assisted methods. As a Materials scientist, she found exciting the opportunities offered by the non-thermodynamic conditions of the plasma to synthesize materials presenting amorphous or crystalline phases that are not attainable under thermodynamic conditions. Rodil's group (PLASNAMAT) is mainly conformed by postgraduate students, which keep alive the different research lines. She has graduated 6 PhD and about 15 master's students and published 90 articles, 17 papers in proceedings and eight book chapters.

Selected Publications:

1. Sitaramanjaneya Mouli Thalluri, Roberto Jose Mirabal, Osmary Lissette Depablos, Simelys Hernandez, Nunzio Russo, Sandra E Rodil, *Chemical induced porosity on BiVO4 films produced by double magnetron sputtering to enhance the photo-electrochemical response.* Physical Chemistry Chemical Physics 17(27) 17821-17827
2. Celia L Gomez, Osmary Depablos-Rivera, Phaedra Silva-Bermudez, Stephen Muhl, Andreas Zeinert, Michael Lejeune, Stephane Charvet, Pierre Barroy, Enrique Camps, Sandra E Rodil, *Opto-electronic properties of bismuth oxide films presenting different crystallographic phases*. Thin Solid Films 578 (2015) 103-112.
3. Rene Olivares-Navarrete, Sandra E Rodil, Sharon L Hyzy, Ginger R Dunn, Argelia Almaguer-Flores, Zvi Schwartz, Barbara D Boyan, *Role of integrin subunits in mesenchymal stem cell differentiation and osteoblast maturation on graphitic carbon-coated microstructured surfaces*. Biomaterials 51 (2015) 69-79.
4. Argelia Almaguer-Flores, L. A. Ximénez-Fyvie, S. E. Rodil, *Oral Bacterial Adhesion on Amorphous Carbon and Titanium Films: Effect of Surface Roughness and Culture Media*, Journal of Biomedical Materials Research Part B: Applied Biomaterials 92 (2010) 196-204.
5. Andrea C. Ferrari, S. E. Rodil, J. Robertson. *Interpretation of Infrared and Raman spectra of amorphous carbon nitrides,* Physics Review B67, 155306-1 - 155306-20 (2003).

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Prof. Guoqiang Li received his PhD degree in materials science at Northwestern Polytechnical University, Xi'an, China, in 2004. Afterwards, he joined GE Global Research as an R&D scientist, and then carried out two postdoctoral research experiences in the University of Tokyo (2005-2007) under the JSPS fellowship, and University of Oxford (2007-2010) under the Royal Society International Incoming Fellowship. He has been a full professor at South China University of Technology, China since 2010.

Prof. Li has broad interests in epitaxial growth of III-V compound semiconductor materials and fabrication of relevant optoelectronic devices, in particular, light-emitting diodes (LEDs) and solar cells. He has received a few awards and honors, including National Science Fund for Excellent Young Scholars of China, National Award for Technological Invention of China, National Excellent PhD Thesis of China, Guangdong Provincial Outstanding Youth in Science and Technology, Guangdong Youth May 4th Medal, etc. He has published over 90 peer-reviewed articles and patented over 40 techniques. He is also the author of 1 monograph and 2 book chapters.

Prof. Li is a standing committee member for Chinese Materials Association-UK (CMA-UK), and the co-founder and chair in materials science of Oxford Forum of Science and Technology (OXFOST).

Selected Publications

1. Guoqiang Li,* Wenliang Wang, Weijia Yang and Haiyan Wang, Epitaxial growth of group III-nitride films by pulsed laser deposition and their use in the development of LED devices (Review), Surf. Sci. Rep., 70(2015)380-423
2. Guoqiang Li,* et. al., Performance improvement of GaN-based light-emitting diodes grown on Si(111) substrates (Feature Article), J. Mater. Chem. C, 3(2015)1484-1490.
3. Wenliang Wang, Weijia Yang, Haiyan Wang and Guoqiang Li,* Epitaxial growth of GaN films on unconventional oxide substrates (Feature Article), J. Mater. Chem. C, 2(2014)9342-9358.
4. Wenliang Wang, Weijia Yang, Fangliang Gao, Yunhao Lin and Guoqiang Li,* Highly-efficient GaN-based light-emitting diode wafers on La 0.3Sr1.7AlTaO6 (LSAT) substrates, Sci. Rep., 5(2015)9315-9320.
5. Guoqiang Li,* et. al., Pattern design of and epitaxial growth on patterned sapphire substrates for highly efficient GaN-based LEDs (Feature Article), Cryst. Growth Des., 12(2012)2836-2841.

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Iliana E. Medina-Ramírez got a PhD in chemistry (organometallic and materials chemistry) from Tulane University (2005). She has nearly 10 years of research experience in the field of nano-structured materials (metallic, metal oxides and metal-chalcogenides), with particular interest in photocatalytic materials for environmental remediation. She has published about 30 papers in internationally peer review journals, 4 book chapters and co-edited a book. She has also participated in several international conferences. She has supervised 30 BSc students, 8 MSc students and 2 doctorate students. She was awarded the best junior researcher prize (2007) and advanced researcher award (2nd place, 2011) at her current academic institution. She is a member of the System of National Researchers (Mexico).

Selected Publications

6. I Medina-Ramírez, JL Liu, A Hernández-Ramírez, C Romo-Bernal. Synthesis, characterization, photocatalytic evaluation, and toxicity studies of TiO2–Fe3+ nanocatalyst (2014). Journal of Materials Science 49 (15), 5309-5323.
7. I Medina-Ramirez, Z Luo, S Bashir, R Mernaugh, JL Liu. Facile design and nanostructural evaluation of silver-modified titania used as disinfectant (2011). Dalton Transactions 40 (5), 1047- 1054.
8. X Pan, I Medina-Ramirez, R Mernaugh, J Liu. Nanocharacterization and bactericidal performance of silver modified titania photocatalyst (2010). Colloids and Surfaces B: Biointerfaces 77 (1), 82- 89.
9. I Medina-Ramirez, S Bashir, Z Luo, JL Liu. Green synthesis and characterization of polymer-stabilized silver nanoparticles (2009). Colloids and Surfaces B: Biointerfaces 73 (2), 185-191.
10. I Medina-Ramírez, M González-García, JL Liu. Nanostructure characterization of polymer-stabilized gold nanoparticles and nanofilms derived from green synthesis (2009). Journal of materials science 44 (23), 6325-6332.

Sustainable Energy: Technological Hypes and Real Solutions

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Yip-Wah Chung obtained his BS (physics and mathematics) and MPhil (physics) degrees from the University of Hong Kong, and PhD (physics) from the University of California at Berkeley. He then joined the Department of Materials Science and Engineering at Northwestern University in 1977. He served as Director of the Center for Engineering Tribology at Northwestern from 1987 to 1992, as Department Chair from 1992 to 1998, and as program officer in surface engineering and materials design at the U.S. National Science Foundation. He has published over 200 papers, two textbooks (*Practical Guide to Surface Science and Spectroscopy*, *Introduction to Materials Science and Engineering*), one monograph (*Micro- and Nanoscale Phenomena in Tribology*) and co-edited one encyclopedia (*Encyclopedia of Tribology*). His current research studies include hard coatings, high-performance steels, and advanced lubricants for improved vehicle efficiency. He was named Fellow, ASM International; Fellow, AVS; and Fellow, Society of Tribologists and Lubrication Engineers. His other awards include Teacher of the Year in Materials Science, Visiting Fellow of the Japan Society for Promotion of Science, Innovative Research Award and Best Paper Awards from the ASME Tribology Division, Technical Achievement Award from the National Storage Industry Consortium, Bronze Bauhinia Star Medal from the Hong Kong SAR Government. He is also a multi-engine instrument-rated commercial pilot and an advanced/instrument ground instructor.

Selected Publications

1. Chen Wang, Kaicheng Shi, Cameron Gross, Julio Miranda Pureza, Monica de Mesquita Lacerda, Yip-Wah Chung, “Toughness enhancement of nanostructured hard coatings: design strategies and toughness measurement techniques”, Surface & Coatings Technology 257, 206-212 (2014)
2. Thomas Zolper, Afif M. Seyam, Changle Chen, Manfred Jungk, Andreas Stammer, Herbert Stoegbauer, Tobin J. Marks, Yip-Wah Chung, Qian Wang, “Energy-efficient siloxane lubricants utilizing temporary shear-thinning”, Tribol. Lett. 49, 525-538 (2013)
3. Christina P. Twist, Afif M. Seyam, Changle Chen, Myung-Gil Kim, Michael P. Weberski Jr., Ning Ren, Tobin Marks, Yip-Wah Chung, Q. Jane Wang, “Molecularly-Engineered Lubricants: Synthesis, Activation, and Tribological Characterization of Silver Complexes as Lubricant Additives,” Advanced Engineering Materials 14, 101-105 (2012)
4. W. M. Silva, V. J. Trava-Airoldi, Y. W. Chung, “Surface modification of 6150 steel substrates for the deposition of thick and adherent diamond-like carbon coatings”, Surface and Coatings Technology 205, 3703-3707 (2011)
5. M. E. Fine, S. Vaynman, D. Isheim, Y. W. Chung, S. P. Bhat, C. H. Hahin, “A new paradigm for designing high-fracture-energy steels”, Materials and Metallurgical Transactions 41, 3318-3325 (2010).

Size Characterization and Stable Isotope Fractionation of Silver Nanoparticles

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Guibin Jiang received his Ph.D in environmental chemistry from the Research Center for Eco-Environmental Sciences of the Chinese Academy of Sciences in 1991. He was a visiting scholar in National Research Council of Canada during 1989-1991 and a postdoc fellow at the University of Antwerp, during 1994-1996. He is currently Director-General of the Research Center for Eco-Environmental Sciences and the Director of the State Key Laboratory of Environmental Chemistry and Ecotoxicology. His research mainly focuses on environmental analytical chemistry and toxicology. He received the Chang Jiang Scholars Achievement Award in 2007 and the National Natural Science Award in 2003 and 2011and the Outstanding Achievement Award on POPs of Chinese Academy of Sciences in 2013.

Selected Publications

1. Yongguang Yin, Yanbin Li, Chao Tai, Yong Cai & Guibin Jiang, Fumigant methyl iodide can methylate inorganic mercury species in natural waters, Nature Communications | 5:4633 | DOI: 10.1038/ncomms5633l
2. Mu, Qingxin; Jiang, Guibin; Chen, Lingxin; Zhou, Hongyu; Fourches, Denis; Tropsha, Alexander; Yan, Bing. Chemical basis of interactions between engineered nanoparticles and biological systems. Chemical reviews 2014, 114, 7740-7781.
3. Yin, Yongguang; Yu, Sujuan; Liu, Jingfu; Jiang, Guibin. Thermal and Photoinduced Reduction of Ionic Au(III) to Elemental Au Nanoparticles by Dissolved Organic Matter in Water: Possible Source of Naturally Occurring Au Nanoparticles. Environmental Science & Technology 2014, 48, 2671-2679.
4. Yin, Nuoya; Liu, Qian; Liu, Jiyan; He, Bin; Cui, Lin; Li, Zhuona; Yun, Zhaojun; Qu, Guangbo; Liu, Sijin; Zhou, Qunfang; Jiang, Guibin. Silver Nanoparticle Exposure Attenuates the Viability of Rat Cerebellum Granule Cells through Apoptosis Coupled to Oxidative Stress, Small 2013, 9, 1831-1841.
5. Yin, Yongguang; Liu, Jingfu; Jiang, Guibin. Sunlight-Induced Reduction of Ionic Ag and Au to Metallic Nanoparticles by Dissolved Organic Matter. ACS Nano 2012, 6, 7910-7919.

Heterostructures Based on Layer-by-Layer Controlled Quantum Wells of II-VI Semiconductors for Optoelectronic Applications

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Isaac Hernández-Calderón received a Ph. D. in Physics from the Institute of Physics "Gleb Wathagin" of the State University of Campinas (UNICAMP), Brazil in 1981 and spend a postdoctoral stay at the Max Planck Institute FKF in Stuttgart (1981-84), he received an Alexander von Humboldt fellowship. Then he joined the Physics Department of the Center for Research and Advanced Studies (Cinvestav) in Mexico City, he has been two times chair of this Department. His research is related to semiconductor physics, mainly the epitaxial growth and characterization of semiconductor heterostructures, nanostructures and low dimensional systems; surface and interface physics and more recently electron microscopy. He has published around 140 scientific papers; written two invited review chapters and edited nine international proceedings books. He has around 270 presentations in scientific meetings and more than 60 invited national and international talks. He has advised 17 M. Sc. and 9 Ph. D. theses, some more underway. He has been president of the Mexican Vacuum Society and the Latin American Surface Science and Vacuum Society and the main organizer of several well recognized international conferences. He is member of the Mexican National Researchers System (SNI-3), member of the Mexican Academy of Sciences and others. In 2003 he and his group received the First Prize of the Toshiba-IPN award.

Selected publications:

1. Study of the coupling of ultra-thin CdSe double quantum wells". J.A. Lorenzo-Andrade, F. Sutara, I. Hernández-Calderón, Superlattices and Microstructures, doi:10.1016/j.spmi.2015.07.008, 2015.
2. Ab initio structural and electronic band-structure study of MgSe", H. Elsayed, D. Olguín, A. Cantarero, I. Hernandez-Calderón, Phys. Status Solidi B 252, No. 4, 663–669 (2015).
3. Spectral photoresponse of ZnSe/GaAs(001) heterostructures with CdSe ultra-thin quantum well insertions", D. A. Valverde-Chávez, F. Sutara, and I. Hernández-Calderón. AIP Conf. Proc.1598, 171 (2014).
4. Epitaxial Growth of thin films and quantum structures of II-VI visible-bandgap semiconductors." (Book chapter) I. Hernández-Calderón in Molecular Beam Epitaxy: From research to mass production. Chapter 14: 311-346 (2013), Edited by M. Henini, ISBN: 9780123878397, Elsevier Inc.: Elsevier Science.
5. Influence of the composition profile in the excitonic emission of thin graded ZnCdSe quantum wells",František Šutara and Isaac Hernández-Calderón, Phys. Status Solidi C 9, No. 8–9, 1787–1789 (2012).

Nanocatalysts for Green and Sustainable Chemical Syntheses

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Chao-Jun Li received his Ph.D. at McGill University (1992) and was a NSERC Postdoctoral Fellow at Stanford University (92-94). From 1994-2003, he was on the faculty at Tulane University (US) and, in 2003, returned to McGill University, where he holds the Canada Research Chair (Tier I) in Green Chemistry and E. B. Eddy Chair of Chemistry. He serves as the Co-Chair of the Canadian Green Chemistry and Engineering Network, the Director of CFI Infrastructure for Green Chemistry and Green Chemicals, the Director of NSERC CREATE for Green Chemistry, and the Co-Director of the FRQNT Center for Green Chemistry and Catalysis (CCVC). He is a Fellow of the Royal Society of Canada (Academy of Sciences), the American Association for the Advancement of Science (AAAS), the American Chemical Society (ACS), the Royal Society of Chemistry (UK), and the Chemical Institute of Canada (CIC). He has published >300 research articles, 7 books, and has given >300 plenary/keynote/invited lectures. His research focuses on exploring new chemistry that complements conventional reactivity and possess high "atom-efficiency"---with a goal towards Green Chemistry. He was on the list of the World's Most Highly Cited Scientists by Thomson Reuters (2014).

Selected Publications

1. Li, L.; Mu, X.; Liu, W.; Mi, Z.; Li, C.-J., "A Simple and Efficient System for Combined Solar-Energy Harvesting and Reversible Hydrogen Storage", *J. Am. Chem. Soc*. 2015, *137*, 7576–7579.
2. Girard, S. A.; Knauber, T.; Li, C.-J. "The Cross-Dehydrogenative Coupling of Csp3-H Bonds: A Versatile Strategy for C-C Bond Formations" *Angew. Chem. Int. Ed.*, 2014, *53*, 74-100.
3. Li, C.-J. "Cross-Dehydrogenative-Coupling (CDC): Explore C-C Bond Formations beyond Functional Group Transformations", *Acc. Chem. Res*. 2009, 42, 335-344.
4. Li, C.-J. "The Development of Catalytic Nucleophilic Additions of Terminal Alkynes in Water", *Acc. Chem. Res*. 2010, *43*, 581-590.
5. Li, C.-J.; Trost, B. M. "Green Chemistry for Chemical Synthesis", *Proc. Natl. Acad. Sci. (USA)*, 2008, *105*, 13197-13202.

Understanding Stabilization Forces on ZnO Polar Surfaces

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Professor S. Y. Tong is an academic of the CAS and TWAS, Fellow of the American Physics Society and an expert in surface science and technology. He graduated from the Faculty of Science, the University of Hong Kong in 1964, and received the M.S. and Ph.D. degrees in 1967 and 1969, respectively. S. Y. Tong has authored 6 books and published more than 270 journal articles, including 2 articles in Science, 2 articles in Physics Today, 1 article in Advances in Physics, 1 article in Progress in Surface Science, 1 article in Proceedings of National Academy of Sciences and 32 articles in Physical Review Letters. His total citation is over 8,000 and H factor 47**.** He has achieved severl awards and honors, such as, Recipient of the Shenzhen "Leading Talents" (2011); Elected Academician of TWAS (2010); Elected Academician of CAS, (2001) and Recipient of the Croucher Foundation Research Fellowship, Hong Kong (1997), among others.

Selected Publications

1. X. D. Wang, Z. L. Han, B. P. Tonner, Y. Chen, S. Y. Tong,"Auger Electron Angular Distributions from Surfaces: Forward Focusing of Silhouettes?", Science 248, 1129 (1990).
2. M. H.Xie, S. M. Seutter, W. K. Zhu, L. X. Zheng, Huasheng Wu and S. Y. Tong, "Anisotropic Step-flow Growth and Island Growth of GaN (0001) by Molecular Beam Epitaxy", Physical Review Letters 82, 2749 (1999).
3. D. D.D. Ma, C.S. Lee, F. C. K. Au, S.Y. Tong and S. T.Lee, "Small-Diameter Silicon Nanowire Surfaces", Science 299, 1874 (2003).
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Nanotechnology-Enabled Water Treatment and Microbial Control: Mechanisms, Applications and Implications

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Dr. Pedro J. J. Alvarez is the George R. Brown Professor of the Department of Civil and Environmental Engineering at Rice University. He previously taught at the University of Iowa, where he also served as Associate Director for the Center for Biocatalysis and Bioprocessing and as Honorary Consul for Nicaragua. Dr. Alvarez received the B. Eng. Degree in Civil Engineering from McGill University and MS and Ph.D. degrees in Environmental Engineering from the University of Michigan. Prof. Alvarez's research focuses on environmental sustainability through bioremediation of contaminated aquifers, fate and transport of toxic chemicals, water footprint of biofuels, microbial-plant interactions, water treatment and reuse, and environmental implications and applications of nanotechnology. Dr. Alvarez is the 2012 Clarke Prize Recipient and also won the 2014 AAEES Grand Prize for Excellence in Environmental Engineering and Science. He is a Diplomat of the American Academy of Environmental Engineers, a Fellow of AAAS, ASCE, IWA, WEF and the Leopold Leadership Foundation, and a founding member of the Nicaraguan Academy of Sciences. Past honors include President of AEESP, the Malcolm Pirnie-AEESP Frontiers in Research Award, the WEF McKee Medal for Groundwater Protection, the SERDP cleanup project of the year award, the Button of the City of Valencia, the Collegiate Excellence in Teaching Award from the University of Iowa; the Alejo Zuloaga Medal from the Universidad de Carabobo, Venezuela; a Career Award from the National Science Foundation; a Rackham Fellowship, and various best paper awards with his students. Dr. Alvarez currently serves as Associate Editor of Environmental Science and Technology. Additionally, he serves as honorary professor at Nankai University in Tianjin and the Chinese Academy of Sciences in Beijing, China, and as adjunct professor at the Universidade Federal de Santa Catarina in Florianopolis, Brazil and recently completed service on the EPA's Science Advisory Board.

Selected Publications

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Recent Advances on Nano-Materials and Technologies for Advanced Electronic, Photonics and MEMS applications

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Prof. C.P. Wong, the Dean of Engineering of the Chinese University of Hong Kong, is a world-renowned scholar in electronic engineering and a member of the US National Academy of Engineering. He is on a no-pay leave from the Georgia Institute of Technology (GT) where he is a Regents' Professor and the Charles Smithgall Institute-Endowed Chair in the School of Materials Science and Engineering. Professor Wong received primary and secondary education in Hong Kong and furthered his education in the US. He received his BS degree from Purdue University, and his MS and PhD degree from the Pennsylvania State University. After his doctoral study, he was awarded a postdoctoral fellowship under Nobel laureate Prof. Henry Taube at Stanford University. Prior to joining Georgia Tech, he was with AT&T Bell Laboratories for many years and became an AT&T Bell Laboratories Fellow(the highest technical award bestowed by AT&T Bell Labs) in 1992. Professor Wong has published widely with over 1,000 technical papers, authored and edited 12 books. He has yielded fruitful research results and holds over 65 US patents. Professor Wong is considered an industry legend and has made significant contributions to the industry by pioneering new materials, which fundamentally changed the semiconductor packaging technology. Professor Wong has successfully motivated and nurtured numerous inquisitive young minds over the years. As a distinguished scholar, Professor Wong was awarded numerous international honors, such as the IEEE CPMT Society Outstanding Sustained Technical Contributions Award in 1995, the IEEE Third Millennium Medal in 2000, the IEEE EAB Education Award in 2001, the IEEE CPMT Society Exceptional Technical Contributions Award in 2002, the Georgia Tech Class 1934 Distinguished Professor Award(the highest award by GT to its faculty) in 2004, named holder of the Charles Smithgall Institute-Endowed Chair(one of the two GT Institute-endowed Chairs) in 2005, the IEEE Components, Packaging and Manufacturing Technology Field Award(hailed as Father of the Modern Semiconductor Packaging) in 2006, the Sigma Xi's Monie Ferst Award in 2007, the Society of Manufacturing Engineers' Total Excellence in Electronic Manufacturing Award in 2008, the IEEE CPMT David Feldman Award in 2009. He has also received the 2012 International Dresden Barkhausen Award(Germany).Professor Wong is a member of the US National Academy of Engineering(elected in 2000), and a foreign academician member of the Chinese Academy of Engineering (elected in 2013).

Composite and Hierarchical Structures in Electrode Materials

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Jiesheng Chen received his BSc and MSc degrees from Sun Yat-sen University in Guangzhou in 1983 and 1986, respectively. In 1989 he obtained his PhD degree at Jilin University and from 1990 he worked as a postdoctoral fellow in the Royal Institution of Great Britain, the United Kingdom, until 1994 when he joined the faculty of the Department of Chemistry, Jilin University as a professor. Since 2008, he has been a professor in the School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University. His research interest is the synthesis of solid compounds and composite materials with new structures and functions. He is a fellow of the Royal Society of Chemistry.

Selected Publications

1. F. H. Du, B. Li, W. Fu, Y. J. Xiong, K. X. Wang, J. S. Chen. Surface Binding of Polypyrrole on Porous Silicon Hollow Nanospheres for Li-Ion Battery Anodes with High Structure Stability. Adv. Mater., 2014, 26, 6145-6150.
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6. Angew. Chem. Int. Ed., 2011, 50, 8299-8303.

Nano-photonica for Lighting and Solar Cells Applications

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E. De la Rosa Cruz received the PhD degree in 1998 from Centro de Investigaciones en Optica (CIO) and joined to CIO as a principal investigaror (PI) in 2000. His research interest are the synthesis and study of linear and non-linear optical properties of nanostructured materials (ceramics, semiconductor, metallic) for photonics application such as solid state lighting, displays, dosimetry, biosensors, solar cells, biomedical applications, laser and amplifiers. He has published more than 100 peer-reviewed scientific papers and cited more than 2000 times, supervised nine PhD and thirteen MSc students. He is level III in the Sistema Nacional de Investigadores (SNI) and member of OSA, SPIE, AMO and SMF.

Selected Publications

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Behaviors of nano- to micro- size Te precipitates in CdZnTe as radiation detector materials

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Professor Wanqi Jie， got his Bachelor (1981), Master (1984) and Ph.D.(1988) degree from the Department of Materials Science and Engineering, Northwestern Polytechnical University (NPU). Since then, he has been working in the School of Materials Science and Engineering in NPU up to now. During the time, he worked in Technical University of Berlin as a visiting scholar from 1991 to 1992, promoted to a full professor in 1993 and in the position of Dean in the School of Materials Science and Engineering from 1996 to 2002. His research interesting covers the solidification of metallic materials, crystal growth and applications of compound semiconductors. He has published over 400 scientific papers and two books and possesses 26 patents in the above fields. He also received two national awards for the scientific innovation.

Selected Publications

1. Gu Yaxu, Rong Caicai, Xu Yadong, et al., Effects of Te inclusions on charge-carrier transport properties in CdZnTe radiation detectors, NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS, 2015, 343:89-93
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5. RuiYang, WanqiJie, HangLiu, YadongXu, Narrow shape distribution of Te inclusions in ZnTe single crystals grown from Te solution, Journal of Crystal Growth, 2014, 404:14–19

Nanoscience and Nanotechnology in China

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Professor Lau is a National Thousand Talents Awardee in China, and currently leads the Chengdu Green Energy and Green Manufacturing Technology R&D Center as its founding director. He has worked on R&D relevant to nanomaterials and nanotechnology, surface science and engineering, and thin-films. Professor Lau is particularly keen on advocating practical applications of research results. In this aspect, he is currently developing projects on nano-plasmonics for food safety testing, photovoltaic module manufacturing, distributed PV engineering, and green-town planning in China. Professor Lau was born in China and grew up in Hong Kong. He developed his career in Canada and then returned to Hong Kong where he served the Chinese University of Hong Kong as Chair Professor of Materials Science, Head of Physics Department, and Dean of Science Faculty. In 2005, he returned to Canada again to direct Surface Science Western, a research center excelling in university-industry collaboration. In 2010, he moved back to China, with his main focus on novel and practical green energy and manufacturing technologies, and on training highly qualified personnel in these fields. Professor Lau has published some 300 articles, invented some 50 patented or patent-pending technologies, and founded 5 high-tech startups.

Selected Publications

1. Cross-linking the surface of cured polydimethylsiloxane via hyperthemal hydrogen projectile bombardment, ACS Appl. Mater. Interf. 7, 8515-8524(2015)
2. Electrodeposited CZTS solar cells from Reline electrolyte, Green Chem. 16, 841-3845(2014)
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5. Grafting of polyelectrolytes onto hydrocarbon surfaces by high-energy hydrogen induced cross-linking for making metallized polymer films", Chem. Comm. 49, 4658-4660 {2013)
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7. Resolving surface chemical states in XPS analysis of first row transition metals, oxides and hydroxides: Sc, Ti, V, Cu and Zn”, Appl. Surf. Sci. 257, 887-898(2010)
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Large-Scale Storage for Sustainable Energy: Innovation on Materials and Device Desigan

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Marina E. Rincón is a senior researcher at Instituto de Energías Renovables (Renewable Energy Institute) of Universidad Nacional Autónoma de México. She has a PhD on Chemistry from the University of California-Santa Bárbara and rounded professional experience in the academia and industry. She is a Professor in engineering, materials science, and physical chemistry. Her research interests include: electrochemical and photoelectrochemical energy conversion and storage; synthesis and characterization of composites based on inorganic and organic semiconductors; large area metal oxides matrices and low-dimensional nanocarbon materials for energy and environmental applications. Marina is a member of prestigious organizations, such as: Sigma XI (The Scientific Research Society), American Nano Society, American Chemical Society, The Electrochemical Society, Materials Research Society. She has been a national and international panellist in expert commissions for project evaluations related to engineering, basic science, and energy sustainability.

Recent Development of Functional Crystals in China

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Prof. Jiyang Wang graduated from the Department of Chemistry, Nanjing University in 1968. He is now professor of Shandong University and South China University of Technology, Vice President and the Secretary- in Chief, Chinese Association for Crystal Growth as well. So far, he has grown more than 30 kinds of important functional crystals. He has published more than 300 research papers in academic journals and books, and the H-index is 29. He has received more than 40 domestic and international patents. He has made great contribution to the functional crystal materials and received a number of national and provincial awards. Prof. Wang has organized locale and international conferences and workshops on the crystal growth, such as the 3rd Asian conference on crystal growth and crystal technology, China-Japan bilateral symposium on crystal growth and crystal technology. In August 2010, as the secretary-general, he organized ICCGE-16 in Beijing.

Selected Publications

1. H. H. Yu, N. Zong, Z.B. Pan, H.J. Zhang, J.Y. Wang,* Z.P. Wang, and Z.Y. Xu, Efficient high-power self-frequency-doubling Nd:GdCOB laser at 545 and 530 nm (2011). Optics Letters 36(19), 3852-3854.
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Piezotronics and Piezo-Phototronics

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Dr. Zhong Lin (ZL) **Wang** received his PhD from Arizona State University in 1987. He now is the Hightower Chair in Materials Science and Engineering and Regents' Professor at Georgia Tech. Dr. Wang has made original and innovative contributions to the synthesis, discovery, characterization and understanding of fundamental physical properties of oxide nanobelts and nanowires, as well as applications of nanowires in energy sciences, electronics, optoelectronics and biological science. His discovery and breakthroughs in developing nanogenerators establish the principle and technological road map for harvesting mechanical energy from environment and biological systems for powering a personal electronics. His research on self-powered nanosystems has inspired the worldwide effort in academia and industry for studying energy for micro-nano-systems, which is now a distinct disciplinary in energy research and future sensor networks. He coined and pioneered the field of piezotronics and piezo-phototronics by introducing piezoelectric potential gated charge transport process in fabricating new electronic and optoelectronic devices. This breakthrough by redesign CMOS transistor has important applications in smart MEMS/NEMS, nanorobotics, human-electronics interface and sensors. Dr. Wang's publications have been cited for over 82,000 times. The H-index of his citations is 139. Dr. Wang was elected as a foreign member of the Chinese Academy of Sciences in 2009, member of European Academy of Sciences in 2002, fellow of American Physical Society in 2005, fellow of AAAS in 2006, fellow of Materials Research Society in 2008, fellow of Microscopy Society of America in 2010, and fellow of the World Innovation Foundation in 2002. He received 2014 World Technology Prize in Materials; 2014 the James C. McGroddy Prize for New Materials from America Physical Society, 2013 ACS Nano Lectureship award, 2012 Edward Orton Memorial Lecture Award and 2009 Purdy Award from American Ceramic Society, 2011 MRS Medal from the Materials Research Society, 1999 Burton Medal from Microscopy Society of America. Details can be found at: http://www.nanoscience.gatech.edu

Photocatalytic Hydrogen Production by Au-M_xO_y/TiO_2 (M = Ag, Cu, Ni)

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Rodolfo Zanella got a PhD in engineering and high technology (catalysis) from Paris VI University (2003). He has more than 10 years of research experience in the field of synthesis of monometallic and bimetallic nanoparticles supported on reducible and non reducible powder oxides, catalysis focused on exhaust gas reactions (CO oxidation, NO reduction, total oxidation), catalysis focused on the production and purification of H_2 (photocatalytic production, WGS and PROX) and photocatalytic degradation of organic compounds. He has published about 65 papers in internationally peer review journals and 5 book chapters. He has supervised 24 BSc students, 9 MSc students, 3 doctorate students and 5 postdoctoral fellow. He was awarded the Gabino Barreda and Alfonso Caso medals both of UNAM, the Best Ph D Thesis in materials science and engineering Award by the Materials Research Institute-UNAM and the Distinction "Universidad Nacional" for Young Scientist. Moreover Elsevier has recognized him twice to be the author of highly cited articles in Chemical Engineering Journals and he has been recognized as one of the most cited researchers at UNAM in the field of chemistry.

Selected Publications

1. S. Oros-Ruiz, R. Zanella, S. E. Collins, A. Hernández-Gordillo, R. Gómez. Photocatalytic Hydrogen Production by Au-MxOy (M=Ag, Cu, Ni) Catalysts Supported on TiO_2 Catalysis Communications 47, (2014) 1-6, doi: 10.1016/j.catcom.2013.12.033
2. A. Sandoval, C. Louis, R. Zanella.Improved Activity and Stability in CO Oxidation of Bimetallic Au-Cu/TiO_2 Catalysts Prepared by Deposition-Precipitation with Urea Applied Catalysis B: Environmental, 140-141 (2013) 363-377 doi: 10.1016/j.apcatb.2013.04.039
3. R. Zanella, V. Rodríguez-González, Y. Arzola, A. Moreno-Rodríguez Au/Y-TiO_2 Catalyst: High Activity and Long-Term Stability in CO Oxidation, ACS Catalysis 2 (2012),1-11, doi: 10.1021/cs200332v.
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6. R. Zanella, S. Giorgio, C. Henry, C. Louis, Alternative methods for the preparation of gold nanoparticles supported on TiO_2 , Journal of Physical Chemistry B, 106, (2002) 7634-7642.

Electrochemical Detectors using Modified Electrodes with Prussian Blue and Organic Polymers to Detect Compounds with Biological and Environmental Importance

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Erika Bustos got a PhD in Electrochemistry from Center for Research and Technology Development in Electrochemistry, C. S. (2006). She has nearly 10 years of research experience in the field of design, construction and characterization of modified surfaces to detect and transform organic and inorganic compounds with biological and environmental importance in different matrix. She has published about 50 papers in internationally peer review journals, 18 book chapters, 1 book and 3 patent registration. She has also participated in several national and international conferences. She has supervised 14 BSc students, 11 MSc students and 8 PhD students. She was awarded Alejandrina 2015 Award for Young Talent Research, Scholarship for Women in Science L'Oreal - United Nations Educational, Scientific and Cultural Organization (UNESCO), Mexican Academy of Sciences (AMC) 2012, Fellowship Program Summer stays in the United States for Young Researchers 2012 through the AMC and the United States – Mexico Foundation for Science (FUMEC) at Lehigh University in Pennsylvania, USA. She is a member of the System of National Researchers (Mexico), level II.

Selected Publications

1. "Kinetic and Thermodynamic Study of Mercury (II) Adsorption on Ca-Bentonite". I. Robles, L. Godínez and E. Bustos. Electrochemical Treatments for Organic Pollutant Degradation in Water and Soils. Electrochemical Society Transactions, 64, 2015, 32, 13-23. ISSN: 1110-662X.
2. "Novel EKR – BDD Process for the Destruction of PAHs in Liquid Phase". A. Medel, D. Patiño, E. Méndez, Y. Mëas, Luis A. Godínez, J. Manríquez, F. Rodríguez, A. Rodríguez, E. Bustos. Environmental Engineering and Management Journal, 14, 2015, 4, 879 – 886. ISSN: 1582-9596.
3. "Influence of EDTA on the Electrochemical Removal of Mercury (II) in Soil from San Joaquín, Querétaro, México". I. Robles, T. Serrano, J. J. Pérez, G. Hernández, S. Solís, R. García, T. Pi and E. Bustos. Journal of Mexican Chemical Society, 58, 2014, 3, 332 – 338. ISSN: 1870-249X.
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5. "Evaluation of IrO_2-Ta_2O_5|Ti electrodes employed during the electroremediation of hydrocarbons-contaminated soil." Maribel Pérez-Corona, Arturo Corona, Elías Daniel Beltrán, Jesús Cárdenas y Erika Bustos. Sustainable Environmental Research, 2013, 279 – 284. ISSN: 1022-7630.

Facet-dependent catalytic activity of nanosheets-assembled BiOI microspheres: Removal of aqueous endocrine disruptors

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Selected Publications

1. Pan, Meilan; Zhang, Haijun; Gao, Guandao; Liu, Lu; Chen, Wei. 2015, "Facet-Dependent Catalytic Activity of Nanosheets-Assembled BiOI Microspheres in Degradation of Bisphenol A," ***Environmental Science & Technology***, *49* (10), 6240–6248.
2. Chen, Weifeng; Zhu, Dongqiang; Zheng, Shourong; Chen, Wei. 2014, "Catalytic Effects of Functionalized Carbon Nanotubes on Dehydrochlorination of 1,1,2,2-Tetrachloroethane," ***Environmental Science & Technology***, 48, 3856–3863.
3. Qi, Zhichong; Hou, Lei; Zhu, Dongqiang; Ji, Rong; Chen, Wei. 2014, "Enhanced Transport of Phenanthrene and 1-Naphthol by Colloidal Graphene Oxide Nanoparticles in Saturated Soil," ***Environmental Science & Technology***, 48, 10136–10144.
4. Zhang, H.; Ge, M.; Yang, L.; Zhou, Z.; Chen, W.; Li, Q.; Liu, L. 2013, "Synthesis and Catalytic Properties of Sb_2S_3 Nanowire-Bundle as Counter Electrode for Dye-Sensitized Solar Cells," ***Journal of Physical Chemistry C***,117, 10285–10290.
5. Ge, M.; Li, Y.; Liu, L.; Zhou, Z.; Chen, W. 2011, "Bi_2O_3-Bi_2WO_6 Composite Microspheres: Hydrothermal Synthesis and Photocatalytic Performances," ***Journal of Physical Chemistry C***, 115, 13, 5220–5225.

Carbon nanomaterials for water remediation

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Luis F. Cházaro-Ruiz got a PhD in Chemistry (electrochemical activation of organometallic compounds) from CINVESTAV-Mexico (2006). From 2006 to 2010 he completed two postdoctoral stays, the first in Leibniz IFW-Dresden, Germany, performing espectroelectrochemistry of polythiophenes. The second stay was held in Prague, the Czech Republic at the IOCB-Academy of Sciences, in synthesis and characterization of metallacarboranes. Since 2010 he has been researcher at the IPICYT, San Luis Potosi, Mexico. His current research is focused on electroanalysis, for the detection of environmental contaminants, and Bioelectrochemical Systems (Biosensors and Microbial Electrochemical Cells) for waste water depuration.

Selected Publications

1. Bibiana Cercado, Luis Felipe Cházaro, Vianey Ruiz, Israel López-Prieto, Germán Buitrón, Elías Razo-Flores, "Biotic and abiotic characterization of bioanodes formed on oxidized carbon electrodes as a basis to predict their performance", (2013) *Biosensors and Bioelectronics*, 50, 373-38.
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3. Jessica Márquez, Luis F. Cházaro-Ruiz, László Zimányi, Gabriela Palestino∗, “Immobilization strategies and electrochemical evaluation of porous silicon based cytochrome c electrode”, (2014) Electrochimica Acta .
4. Bibiana Cercado, Ana Laura Vega-Guerrero, Francisco Rodríguez-Valadez, José Luis Hernández- López, Luis Felipe Cházaro-Ruiz, Marie-Line Délia, Alain Bergel, “Carbonaceous and protein constituents in dairy wastewater lead to a differentiated current generation in microbial fuel cells (MFCs)”, (2014) Journal of the Mexican Chemical Society, 58, 310-315.
5. Paola Mayela De la Cruz Guzman, Angelica Aguilar-Aguilar, Alan Bañuelos-Frias, Luis Felipe Chazaro-Ruiz and Gabriela Palestino "Hybrid Porous Silicon- Rhodamine B Derivative Nanostructures as Chemical Sensor for Hg(II) Detection". (2014) ECS TRANSACTIONS 64, 31-34.

Synthesis, Characterization and Photocatalytic Behaviour of WO_3/TiO_{2-A} (A = N) Under Solar Radiation

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SELECTED PUBLICATIONS:

1. Synthesis by sol–gel of WO_3/TiO_2 for solar photocatalytic degradation of malathion pesticide, N.A. Ramos-Delgado, L. Hinojosa-Reyes, I.L. Guzman-Mar, M.A. Gracia-Pinilla, A. Hernández-Ramírez, Catalysis Today, 209 (2013) 35– 40.
2. Solar photocatalytic activity of TiO_2 modified with WO_3 on the degradation of an organophosphorus pesticide, N.A. Ramos-Delgado, M.A. Gracia-Pinilla, L. Maya-Treviño, L. Hinojosa-Reyes, J.L. Guzman-Mar, A. Hernández-Ramírez, Journal of Hazardous Materials, 263, (2013) 36-44 .
3. Sensitization of TiO2 with novel Cu(II) and Ni(II) polyaza complexes: Evaluation of its photocatalytic activity, J.F. Góngora-Gómez, P. Elizondo-Martínez, N. Pérez, M. Villanueva-Rodríguez, L. Hinojosa-Reyes, A. Hernández-Ramírez, Ceramics International, 40 (2014) 14207–14214
4. Comparison of the solar photocatalytic activity of ZnO-Fe_2O_3 and ZnO-Fe^o on 2,4-D degradation in a CPC reactor . M.L. Maya-Treviño, M. Villanueva-Rodríguez, J.L. Guzmán-Mar, L. Hinojosa-Reyes, A. Hernández-Ramírez, Photochem. Photobiol. Sci., 14 (2015) 543-549
5. Synthesis of nitrogen-doped ZnO by sol-gel method: characterization and its application on visible photocatalytic degradation of 2,4-D and picloram herbicides, J.J. Macías-Sánchez, L. Hinojosa-Reyes, A. Caballero-Quintero, W. de la Cruz, E. Ruiz-Ruiz, A. Hernández-Ramírez and J.L. Guzmán-Mar., Photochem Photobiol Sci. 14 (2015) 536-542.

Electrocatalytic Oxidation of Urea on Ni(Ii)Cyclam Modified Nanoparticulate TiO_2 Anodes for Promoting H_2 Evolution on Pt Electrodes

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Juan Manríquez-Rocha obtained a PhD in electrochemistry (functional modified electrodes) from Centro de Investigación y Desarrollo Tecnológico en Electroquímica S.C (CIDETEQ, 2007). He has 14 years of research experience on functional modified electrodes for applications in electrochemistry photovoltaics, electrocatalysis and electrochemical detectors, having particular interest in dye-sensitized solar cells, electrochemical generation of H_2 from urea oxidation and amperometric detectors of biological metabolites. He has published about 37 papers in internationally peer-reviewed journals, 6 co-edited chapters of books. He has directed 20 theses distributed as follows: 5 PhD theses, 8 MSc theses and 7 BSc theses. He was awarded The Best Theses on Electrochemistry by The Mexican Electrochemical Society (2nd place at BSc category, 1999; 1st place at MSc category, 2003). He was selected as Coordinator of the Posgraduate on Science and Technology (specialty on Environmental Engineering) from March 15th, 2011 to April 12nd, 2012; and later as Subdirector of Postgraduate Studies from April 13rd, 2012 to May 15th, 2013; both in CIDETEQ. He is member of the National System of Researchers at category II.

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1. "Electrocatalysis of the oxidation of alcohol and phenol derivates pollutants at vitreous carbon electrode coated by nickel macrocyclic complex-based films" J. Manriquez, J.L. Bravo, S. Gutierrez-Granados, S. Sucar Succar, C. Bied-Charreton, A.Alatorre Ordaz, F.Bedioui; Anal. Chim. Acta, 378 (1999) 159-168.
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3. "Ni(II) 1,4,8,11-tetraazacyclotetradecane Electrocatalytic Films Prepared on Top of Surface Anchored PAMAM Dendrimers Layers. A New Type of Electrocatalytic Material for the Electrochemical Oxidation of Methanol" Miguel A. González-Fuentes, J. Manríquez, S. Gutiérrez-Granados, A. Alatorre-Ordaz, Luis A. Godínez; Chem. Commun. (2005) 898-900.
4. "Design, Self-Assembly, and Photophysical Properties of Pentameric Metallomacrocycles:[M_5(N-hexyl[1,2-bis(2,2':6',2"-terpyridin-4-yl)]carbazole$_5$] [M= Fe(II), Ru(II), and Zn(II)]" Seok-Ho Hwang, Charles N. Moorefield, Luis A. Godínez, Juan Manríquez, Erika Bustos and George R. Newkome. Chem. Commun., 2005, 4672-4674.
5. "Tuning the Structural, Electrical and Optical Properties of Ti(III)-Doped Nanocrystalline TiO2 Films by Electrophoretic Deposition Time" J. Manríquez, Luis A. Godínez; Thin Solid Films 515 (2007) 3402-3413.

Solar energy conversion systems based on photoelectrochemistry at nanomaterials

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Dr. Gerko Oskam obtained his doctorate degree in Chemistry from Utrecht University (The Netherlands) in 1993. From 1993 to 2001, he worked in the Department of Materials Science and Engineering at the Johns Hopkins University (Baltimore, MD, USA), first as a post-doc then as an associate research scientist. Since 2001, Dr. Oskam is a Professor in the Department of Applied Physics of CINVESTAV-IPN (Mérida, Yuc., México), with research projects in the synthesis and application of functional nanomaterials, electron transport and recombination mechanisms in the dye-sensitized solar cell, photoelectrochemical hydrogen generation and solar-thermal energy conversion materials. Dr. Oskam has published 75 articles, which have received more than 3,300 citations, with an h-index of 32; he has published several book chapters and holds two US patents. He has served as an Associate Editor of Science of Advanced Materials (2008-2011), and is currently Associate Editor of the Journal of the Mexican Chemical Society (2014 - present). He has directed 8 undergraduate, 10 masters and 8 Ph.D. theses at CINVESTAV. He is the recipient of the 2011 Elsevier Scopus Award Mexico, and he is a member of the National System of Researchers at the highest level (Level 3).

Selected Publications

1. Electrodeposition and characterization of nanostructured black nickel selective absorber coatings for solar–thermal energy conversion". F. I. Lizama-Tzec, J. D. Macías, M. A. Estrella-Gutiérrez, A. C. Cahue-López, O. Arés, R. de Coss, J. J. Alvarado-Gil, G. Oskam. *J. Mater. Sci.: Mater. Electron.* 26, 5553–5561 (2015).
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4. Mechanisms of electron transport and recombination in ZnO nanostructures for dye-sensitized solar cells". Alberto G. Poot, Manuel Macías-Montero, Jesús Idígoras, Ana Borrás, Angel Barranco, A. R. González-Elipe, Francisco I. Lizama, Gerko Oskam and Juan A. Anta. *ChemPhysChem.* 15, 1088-1097 (2014).
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"CdTe/CdS SOLAR CELL ACTIVATED WITH $MgCl_2$"

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Juan Luis Peña Chapa got a PhD in Physics (Experimental Solid State Physics) from the Department of Physics, CINVESTAV Zacatenco, México DF (1978). He has more than 30 years of research experience in the field of thin films polycrystalline and nanostructure, mainly semiconductors. In the last 12 years, with particular interest in materials for photovoltaic conversion of solar energy in electricity for energy sustainability. He has published more than 100 papers in internationally peer review journals. In 2012 his Group of Solar Cells achieved to fabricate thin film solar cells of CdS/CdTe with more than 14% efficiency (Selected Publication #2). Now are doing the scaling process for solar panels. He has also organized and participated in several international conferences. He has supervised 30 BSc students, 8 MSc students and 24 doctorate students. He is a member of the System of National Researchers (Mexico) Level III.

Selected Publications:

1. J.L. Peña, O. Arés, V. Rejón, A. Rios-Flores, Juan M. Camacho, N. Romeo, A.Bosio. A detailed study of the series resistance effect on CdS/CdTe solar cells with Cu/Mo back contact. Thin Solid Films 520 (2011) 680-683.
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3. V. Rejón, I. Riech, J.L. Peña. "Study of CdS/CdTe solar cells activated with an oxygen–CHClF2 gas mixture". *Solar Energy* 95, 319–324, 2013.
4. E. Hernández-Rodríguez, V. Rejón, I. Riech, M. Acosta, J.L. Peña. "Morphological and chemical study of CdTe thin films annealed in $CHClF_2$-O_2 gas mixture". *Solar Energy,* 107, 305-313, 2014.
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Visilbe-light-driven photocatalytic water splitting

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Jinwen Shi got his PhD Degree in Power Engineering and Engineering Thermophysics from Xi'an Jiaotong University University, China (2012). Sponsored by the State Scholarship Fund of China and the "National Institute for Materials Science–Xi'an Jiaotong University Joint Graduate School Program" from October 2008 to September 2009, he studied in National Institute for Materials Science in Japan as a visiting PhD student under the supervision of Prof. Dr. Jinhua Ye. He has over 10 years of research experience in the field of visilbe-light-driven photocatalytic water splitting. He has published about 30 papers in internationally peer review journals and participated in about 20 international conferences. He was awarded the Excellent Paper Award by the international journal *Prog. Nat. Sci. Mater. Int.* (2015) and Outstanding Research Paper Award by *11th China Hydrogen Energy Conference& 3rd Mainland, Taiwan, and Hong Kong Symposium on Hydrogen Energy* (2010).

Selected Publications

1. Jinwen Shi, Xiangjiu Guan, Zhaohui Zhou, Haipei Liu, Liejin Guo. Eosin Y-sensitized nanosheet-stacked hollow-sphere TiO_2 for efficient photocatalytic H_2 production under visible-light irradiation. J. Nanopart. Res., 2015, 17 (6): 252.
2. Jinwen Shi, Liejin Guo. ABO_3-based photocatalysts for water splittting. Prog. Nat. Sci. Mater. Int., 2012, 22 (6), 592-615. (Invited review, Excellent Paper Award)
3. Jinwen Shi, Lijing Ma, Po Wu, Zhaohui Zhou, Penghui Guo, Shaohua Shen, Dengwei Jing, Liejin Guo. A novel $Sn_2Sb_2O_7$ nanophotocatalyst for visible-light-driven H_2 evolution. Nano Res., 2012, 5 (8), 576-583.
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5. Jinwen Shi, Jinhua Ye, Zhaohui Zhou, Mingtao Li, Liejin Guo. Hydrothermal synthesis of $Na_{0.5}La_{0.5}TiO_3$–$LaCrO_3$ solid-solution single-crystal nanocubes for visible-light-driven photocatalytic H_2 evolution. Chem. Eur. J., 2011, 17 (28), 7858-7867.

Optimization of WO_3 Nanorod and its conformal $WO_3/BiVO_4$ Nanowire Heterojunction for Photoelectrochemical Water Oxidation

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Jinzhan Su received his PhD degree at Xi'an Jiaotong University, Xi'an, China in 2011. From Oct. 2008 to Sep. 2010, he worked as a visiting scholar in the Pennsylvania State University, PA, United States. He is currently an assistant professor in the International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, China. His current research focuses on one dimensional nanostructural semiconductor for energy conversion and photoelectronics. He has published about 13 papers in internationally peer review journals, one issued pattern. He has also participated in several international conferences with 2 invited talks. He is currently associate editor of an open-access, peer-reviewed journal *Nano reports* published by The American Computational Science Society.

Selected Publications

1. Jinzhan Su, Liejin Guo, "High aspect ratio TiO2 nanowires tailored in concentrated HCl hydrothermal condition for photoelectrochemical water splitting", RSC Advances 2015, 5, 53012-53018 .
2. Jinzhan Su, Liejin Guo, Ningzhong Bao, and Craig A. Grimes, Nanostructured WO3/BiVO4 Heterojunction Films for Efficient Photoelectrochemical Water Splitting. Nano Lett.2011,11(5): 1928-1933.
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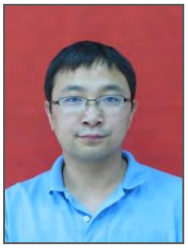
4. Jinzhan Su, Liejin Guo, Sorachon Yoriya, and Craig A. Grimes, Aqueous Growth of Pyramidal-Shaped BiVO4 Nanowire Arrays and Structural Characterization: Application to Photoelectrochemical Water Splitting. Crystal growth & design, 2010, 10(2): 856-861.

Design and Preparation of novel photocatalysts with various nanostructure and their application in environmental purification



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Gui-Dong Yang got a PhD in chemical engineering from China University of Petroleum (2010). As a joint PhD students, he studied in Oxford University during 2008-2010. He has nearly 10 years of research experience in the field of photocatalysis and he is interested in the synthesis and development of a novel calss of titania-based nanostructured materials for the photocatalytic degradation of organic compounds. He has published about 20 papers in internationally peer review journals, and the total citations of these publications are more than 650 times. He has also participated in several international conferences. He was enrolled in the program for excellent young professor of Xi'an Jiaotong University (XJTU, 2014) and won the XJTU First Top Ten Young Academic Faculty (2015).

Selected Publications

1. Wang, T., Yan X., Zhao S., Lin B., Xue C., Yang G-D*., Ding S., Yang B., Ma C., Yang G., Yang G-R., A facile one-step synthesis of three-dimensionally ordered macroporous N doped TiO_2 with ethanediamine as the nitrogen source, J. Mater. Chem. A , 2014, 2,15611-15619.
2. Xue C., Wang T., Yang G-D*., Yang B-L., Ding S., A facile strategy for the synthesis of hierarchical TiO_2/CdS hollow sphere heterostructures with excellent visible light activity, J. Mater. Chem. A ; 2014, 2,7674-7679.
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5. Yang G-D., Jiang Z., Shi H., Xiao T., Yan Z.. Preparation of highly visible-light active N-doped TiO_2 photocatalst [J]. *Journal of Materials Chemistry*, 2010, 201: 5301–5309.

Monodisperse CdS Spheres Synthesized by Microwave Heating for Hybrid Solar Cell Applications

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Selected Publications

1. C. Selene Coria-Monroy, Claudia Martínez-Alonso, M. Sotelo-Lerma, José Manuel Hernández, Hailin Hu*, "Stabilizer-free CdSe/CdS core/shell particles from one-step solution precipitation and their application in hybrid solar cells", Journal of Materials Science: Materials in Electrónics. 2015, DOI 10.1007/s10854-014-2071-3.
2. Carlos A. Rodríguez-Castañeda, Paola M. Moreno-Romero, Claudia Martínez-Alonso, Hailin Hu*, "Microwave synthesized monodisperse CdS spheres of different size and color for solar cell applications", aceptado para ser publicado en Journal of Nanomaterials Volume 2015, Article ID 424635, 10 pages http://dx.doi.org/10.1155/2015/424635.
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5. L. Hechavarría, N. Mendoza, M.E. Rincón, J. Campos, H. Hu*, "Photoelectrochromic performance of tungsten oxide based devices with PEG-Titanium complex as solvent-free electrolytes", Solar Energy Materials & Solar Cells 100 (2012) 27-32.

Synthesis of $NiTiO_3$ as a new material for photocatalysis in the visible wavelength range

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Selected Publications

1. M. A. Ruiz-Preciado, A. Kassiba, *A. Morales-Acevedo* and M. Makowska-Janusik, "Vibrational and Electronic Peculiarities of $NiTiO_3$ nanostructures inferred from first principle calculations", Royal Society of Chemistry Advances 5, 17396-17404 (2015).
2. A. Ruiz-Preciado, A. Kassiba, A. Gibaud, *A. Morales-Acevedo*, "Comparison of nickel titanate ($NiTiO_3$) powders synthesized by sol–gel and solid state reaction", Materials Science in Semiconductor Processing 37, 171-178 (2015).
3. R. Bernal-Correa, *A. Morales-Acevedo*, A. Pulzara Mora, J. Montes Monsalve, M. López López, "Design of $Al_xGa_{1-x}As/GaAs/In_yGa_{1-y}As$ triple junction solar cells with anti-reflective coating", Materials Science in Semiconductor Processing 37, 57-61 (2015).
4. *Arturo Morales-Acevedo*, "Design of very thin CdTe Solar Cells with high efficiency", Energy Procedia 57, 3051-3057 (2014).
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Flexibility-Based Orderly Structure Arrays for Energy Storage Application

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1. YS Luo, JS Luo, J Jiang, WW Zhou, HP Yang, X Y Qi, H Zhang, HJ Fan, Denis YW Yu, CM. Li, T Yu, Seed-assisted synthesis of highly ordered TiO_2@α-Fe_2O_3 core/shell arrays on carbon textiles for lithium-ion battery applications, *Energy Environ. Sci.*, 2012, 5, 6559-6566.
2. JS Luo, XH Xia, YS Luo, C Guan, JL Liu, XY Qi, T Yu, H Zhang, HJ Fan, Rational Designed Hierarchical TiO_2@Fe_2O_3Hollow Nanostructures for Improved Lithium Ion Storage, *Adv. Energy Mater.*, 2013, 3, 737-743.
3. YS Luo, J S Luo, WW Zhou, XY Qi, H Zhang, Denis YW Yu, CM Li, HJ Fan, T Yu, Controlled synthesis of hierarchical graphene wrapped TiO_2@Co_3O_4 coaxial nanobelt arrays for high-performance lithium storage, *J. Mater. Chem. A*, 2013, 1, 273-281.
4. KW Qiu, Y Lu, D Y Zhang, JB Cheng, HL Yan, JY Xu, XM Liu, JK Kim, YS Luo*, Mesoporous, hierarchical core/shell structured $ZnCo_2O_4$/MnO_2 nanocone forests for high-performance supercapacitors, *Nano Energy*, 2015, 11, 687-696.
5. KW Qiu, YLu, JB Cheng, HL Yan, XY Hou, DY Zhang, M Lu, XM Liu, YS Luo*, Ultrathin mesoporous Co_3O_4nanosheets on Ni foam for high-performance supercapacitors, *Electrochim. Acta*, 2015, **157**, 62-68.

Colloidal metal nanocrystals for plasmonic catalysis

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Jianfang Wang obtained BS in inorganic chemistry (major) and software design (minor) from University of Science and Technology of China in 1993, MS in inorganic chemistry from Peking University in 1996, and PhD in physical chemistry from Harvard University in 2002. He did postdoctoral study in University of California, Santa Barbara from February 2002 to July 2005. He then joined in Department of Physics of The Chinese University of Hong Kong (CUHK) as an assistant professor in 2005 and became an associate professor in 2011. His current research interests focus on metal nanocrystals, nanoplasmonics and metal oxide nanostructures for photocatalysis. Details about his research can be found at http://www.phy.cuhk.edu.hk/~jfwang/ and at https://scholar.google.com/citations?user=7SK4Gn4AAAAJ&hl=en&oi=ao.

Selected Publications

1. JX Wang, T Ming, Z Jin, JF Wang, LD Sun, CH Yan. Photon energy upconversion through thermal radiation with the power efficiency reaching 16% (2014). Nature communications 5, 5669.
2. NN Jiang, L Shao, JF Wang. (Gold nanorod core)/(polyaniline shell) plasmonic switches with large plasmon shifts and modulation depths (2014). Advanced materials 26, 3282-3289.
3. F Wang, CH Li, HJ Chen, RB Jiang, LD Sun, Q Li, JF Wang, JC Yu, CH Yan. Plasmonic harvesting of light energy for Suzuki coupling reactions (2013). Journal of the american chemical society 135, 5588-5601.
4. Z Jin, MD Xiao, ZH Bao, P Wang, JF Wang. A general approach to mesoporous metal oxide microspheres loaded with noble metal nanoparticles (2012). Angewandte chemie international edition 51, 6406-6410.
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The role of class I integrons in the dissemination of sulfonamide resistance genes in the Pearl River and Pearl River Estuary, South China

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Xiang-dong Li is a Chair Professor of Environmental Science and Technology at Hong Kong PolyU. He obtained BSc in Earth Sciences and MSc in Geochemistry from Nanjing University, China, and PhD in Environmental Technology from Imperial College London, UK. Prof. Li's major research interests include regional environmental pollution, urban environmental studies, and phytoremediation of contaminated land. He has published more than 150 papers in leading international journals, and is one of the highly cited researchers in the Environment/Ecology research fields of the ISI database. His recent research projects have mainly focused on environmental changes in the fast developing Pearl River Delta region, South China. Prof. Li's research team has been engaged in the study of trace metals and organic pollutants in soils, sediments, biological samples and atmospheric particles, including their impacts on human health and ecological systems. Professor Li is the past president (2011-2013) of International Society of Environmental Geochemistry and Health (SEGH). He currently serves as an Associate Editor for *Environmental Science and Technology* (*ES&T*), a leading journal in environmental research published by American Chemical Society (ACS).

Selected Publications

1. Xu, W.H., Zhang, G., Wai, O.W.H., Zou, S.C., Li, X.D.* 2009. Transport and adsorption of antibiotics by marine sediments in a dynamic environment. *Journal of Soil and Sediment*, 9, 364-373.
2. Chen B.W., Liang X.M., Xu, W.H., Huang, X.P., Li, X.D.* 2012. The changes in trace metal contamination over the last decade in surface sediments of the Pearl River Estuary, south China. *Science of the Total Environment*, 439, 141-149.
3. Chen B.W., Liang X.M., Huang, X.P., Zhang, T., Li, X.D.* 2013. Differentiating anthropogenic impacts on ARGs in the Pearl River Estuary by using suitable gene indicators. *Water Research*, 47, 2811-2820.
4. Liang X.M., Chen B.W., Nie, X.P., Shi, Z., Huang, X.P., Li, X.D.* 2013. The distribution and partitioning of common antibiotics in water and sediment of the Pearl River Estuary, South China. *Chemosphere*, 92, 1410-1416.
5. Chen B.W., Yang, Y., Liang X.M., Yu, K., Zhang, T., Li, X.D.* 2013. Metagenomic profiles of antibiotic resistance genes (ARGs) between human impacted estuary and deep ocean sediments. *Environmental Science and Technology*, 47, 12753-12760.

Visible Light-Induced Photocatalytic Activity of Modified Titanium (IV) Oxide with Zero-Valent Bismuth Clusters

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Hynd Remita got her PhD in Physical Chemistry from Paris-Sud University and did her post-doc in the University of Medicine of Sherbrooke (Canada). She is a CNRS researcher since 1994 and she is working in the Laboratoire de Chimie Physique in Orsay at Paris-Sud University. She is presently director of research at the CNRS. Her research interests focus on radiolysis, metal nanoparticles and nanomaterials, nucleation and growth processes, and conducting polymers. She works on the applications of nanomaterials in fuel cells and photocatalysis. She is also interested in the actions of dissemination and implementation of Science

Selected Publications

1. Ghosh, S.; Kouamé, N.A.; Ramos, L.; Remita, S.; Dazzi, A.; Deniset-Besseau, A..Beaunier, P.; Goubard, F.; Aubert, P.-H.; Remita, H., Conducting polymer nanostructures for photocatalysis under visible light. Nature Materials 14, 505 – 511 (2015).
2. Grabowska, E.; Zaleska, A.; Sorgues, S.; Kunst, M.; Etcheberry, A.; Colbeau-Justin, C.; Remita, H. "Modification of Titanium (IV) Dioxide with Small Silver Nanoparticles: Application in Photocatalysis". J. Phys. Chem. C 117:1955-1962 (2013).
3. A. Lehoux, L. Ramos, P. Beaunier, D. Bahena Uribe, P. Dieudonné, F. Audonnet, A. Etcheberry,M. José-Yacaman, H.Remita, Tuning the porosity of bimetallic nanostructures by a soft templating approach, Adv. Funct. Mater. 22, 4900–4908 (2012).
4. F. Ksar, G.. Ramos, B. Keita, L. Nadjo, P. Beaunier, H. Remita, "Palladium-gold nanostuctures: application in ethanol oxidation », Chem. Mater., 21, 3677 (2009).
5. J. Belloni, M. Tréger, H. Remita, R. De Keyser, "Enhancement yield of photoinduced electrons in doped silver halide crystals", Nature, 402, 865-867, (1999).

Transition of nanospheres to nanofibers of CdS prepared in Ethylenediamine-butanol solvent and its photocatalytic properties

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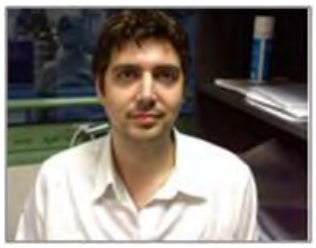
Agileo Hernández-Gordillo got a PhD in chemistry (semiconductor materials and photocatalysis), from the Universidad Autónoma Metropolitana-Iztapalapa (2013). In October of 2014 year, he joined to the Materials Research Institute of UNAM as academic young researcher to participes in the project "Nanostructure of bismuth". His researching line is "Development of semiconductor materials nanostructured for environmental remediation and for energy production". He is a member of the System of National Researchers (Mexico). He has participated in several national and international conference. Recently, he is a Guest Editor in a special issue of Catalysis Today Journal and he has published about 20 papers in internationally peer review journals.

Selected Publications

1. A. Hernández-Gordillo, et al., Preparation of efficient CdS nanofibers for hydrogen production using ethylenediamine ($NH_2CH_2CH_2NH_2$) as template, J. Colloid Interf. Sc. 451 (2015) 40–45.
2. A. Hernández-Gordillo, et al., Silver nanoparticles loaded on Cu-doped TiO_2 for the effective reduction of nitro-aromatic contaminants, Chem. Engin. J. 261 (2015) 53-59.
3. A. Hernández-Gordillo, et al., Photoconversion of 4-Nitrophenol in the presence of Hydrazine with AgNPs-TiO_2 prepared by the Sol-Gel method, J. Hazard. Mat. 268 (2014) 84– 91.
4. A. Hernandez-Gordillo, et al., Visible light photocatalytic reduction of *4-Nitrophenol* using CdS in the presence of Na_2SO_3, J. Photochem. Photobiol. A: Chem. 257 (2013) 44-49.
5. A. Hernandez-Gordillo, et al., An efficient ZnS-UV photocatalysts generated in situ from $ZnS(en)_{0.5}$ hybrid during the H_2 production in methanol–water solution, Int. J. Hyd. Energy, 37 (2012) 17002-17008.

A charge-carrier dynamics study in photocatalytic TiO_2 by Time Resolved Microwave Conductivity



Alexandre Hérissan
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Alexandre Hérissan is currently a third year PhD student in physical-chemistry in Laboratoire de Chimie Physique (LCP), Orsay (France). He got a Master degree in physical chemistry obtained in Université Paris-Sud, Orsay, France. His topic of research concerns mainly investigation of charge-carrier dynamics in semi-conductors particulary used in photocatalytic applications. He is a member of the French chemical society (*Société Chimique de France*, SCF).

Selected Publications

1. O. Alaoui, A. Herissan, C. Le Quoc, M. Zekri, S.Sorgues, H. Rémita, C. Colbeau-Justin. "Elaboration, charge-carrier lifetimes and activity of Pd-TiO_2 photocatalysts obtained by gamma radiolysis", *Journal of Photochemistry and Photobiology A: Chemistry* 242 (2012), 34-43.
2. N. Kouame, O. Alaoui, A. Herissan, E. Larios, M. José-Yacaman, A. Etcheberry, C. Colbeau-Justin, H. Remita. "Visible light-induced photocatalytic activity of modified titanium(IV) oxide with zero-valent bismuth clusters", *New Journal of Chemistry* 39 (2015), 2316.

Nanoalloys for Catalytic System Applications:

Surface Segregation Model Insights *vs.* Experimental Results

Prof. José Luis Rodríguez López
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Prof. Jose Luis Rodríguez López is interested in understanding the growth and nucleation process of nanoparticles, for to control them and thus focus these nano-systems to plasmonic photocatalytic applications. Also, this fundamental understanding and tunning of the growth-and-shape dependent properties of NPs is applied to particular and specific problems in nanomedicine, using photo-thermal therapy of cancer cell treatment. **He** is also the Principal Chair of the **Nanostructured Materials and Nanotechnology Symposium**, S1D-IMRC-2015.

Selected Publications

1. In-Situ TEM Study of Mechanical Behaviour of Twinned Nanoparticles, Gilberto Casillas-Garcia, Juan Pedro Palomares-Baez, Jose Luis Rodriguez-Lopez, Junhang Luo, Arturo Ponce, Rodrigo Esparza, J. Jesus Velazquez-Salazar, Abel Hurtado-Macias, and Miguel Jose- Yacaman, *Philos. Mag.* 92, 4437 (2012). 10.1080/14786435.2012.709951.
2. Experimental and DFT Studies of Gold Nanoparticles Supported on MgO(111) Nano-sheets and Their Catalytic Activity, Zhi Li, C.V. Ciobanu, J.P. Palomares-Baez, J.L. Rodriguez-Lopez, and R. Richards, *Phys. Chem. Chem. Phys.* 13, 2582-2589 (2011), 10.1039/c0cp01820a. 10.1039/c0cp01820a.
3. Size Effect and Shape Stability of Nanoparticles, Jose Luis Rodriguez-Lopez, Juan Martin Montejano-Carrizales, Juan Pedro Palomares-Baez, Hector Barron Escobar, J. Jesus Velazquez-Salazar, J. Manuel Cabrera-Trujillo, and Miguel Jose-Yacaman, *Key Engineering Materials*, 444, 47-68 (2010); TransTech Publications, Switzerland, 2010.
4. Nucleation and Growth of Stellated Gold Clusters: Experimental Synthesis and Theoretical Study, J.M. Cabrera-Trujillo, J. M. Montejano-Carrizales, J.L. Rodriguez-Lopez, J.J. Velazquez-Salazar, W. Zhang, and M. Jose-Yacaman, *J. Phys. Chem. C* 114, 21051-21060 (2010). 10.1021/jp1068208
5. General Segregation and Chemical Ordering in Bimetallic Nanoclusters Through Atomistic View Points, J.A. Reyes-Nava, J.L. Rodriguez-Lopez, and U. Pal, *Phys. Rev. B* 80, 161412(R) (2009). 10.1103/PhysRevB.80.161412.

Hydrogen Isotope separation in metal-organic frameworks

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Thomas Heine graduated in physics from TU Dresden under the guidance of Gotthard Seifert, with research stages in Montréal (Dennis R. Salahub) and Exeter (Patrick Fowler). After postdoctoral stages in Bologna (Francesco Zerbetto) and Geneva (Jacques Weber) he obtained the venia legendi in Physical Chemistry at TU Dresden. In 2008 he was appointed as Associated Professor of Theoretical Physics/Theoretical Materials Science at Jacobs University and was promoted to Full Professor in 2011. Since 2015 he holds the Chair of Theoretical Chemistry at University of Leipzig, Germany. His research interests include molecular framework compounds, two-dimensional materials, theoretical spectroscopy, and the development of methods and software for materials science.

Selected Publications

1. Transition metal chalcogenides: ultrathin inorganic materials with tunable electronic properties, T. Heine, Acc. Chem. Res. 48 (2015) 65-72.
2. Highly Effective Hydrogen Isotope Separation in Nanoporous Metal-Organic Frameworks with Open Metal Sites – Direct Measurement and Theoretical Analysis, H. Oh, I. Savchenko, A. Mavrandonakis, T. Heine, M. Hirscher, ACS Nano 8 (2014) 761–770.
3. The induced magnetic field, R. Islas, T. Heine, G. Merino, Acc. Chem. Res. 45 (2012) 215-228.
4. Robust Two-Dimensional Topological Insulators in Methyl-Functionalized Bismuth, Antimony and Lead Bilayer Films, Y. Ma , Y. Dai , L. Kou , T. Frauenheim, T. Heine, Nano Letters 15 (2015) 1083–1089.
5. An Atlas of Two-Dimensional Materials, P. Miro, M. Audiffred, T. Heine, Chem. Soc. Rev. 43 (2014) 6537-6554.

Plasmonic properties of ordered arrays of Ag and Au nanostructures embedded in silica fabricated by a combination of nanosphere lithography with ion implantation

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Juan Carlos Cheang-Wong is a Mexican physicist and researcher in the field of nanoscience and holds a permanent position at the UNAM´s Physics Institute. He got a Bachelor Degree in Physics from the UNAM, and a Diploma of Advanced Studies (Nuclear Physics and ion beam applications) from the Université de Paris VII (France). He received a PhD in Physics (Materials Science) also from the Université de Paris VII. He has been Visiting Scholar for one year (2001-2002) at the Physics Department at Harvard University and also at the Seville University (CNA) in Spain (2008-2009). He has more than 20 years of research experience in the field of characterization and modification of materials using ion beams from MeV accelerators. His current interests lie in developing advanced methods of physics and materials science to achieve the fabrication of ordered arrays of metallic nanostructures exhibiting optical and plasmonic properties, using a combinación of nanosphere lithography and ion implantation techniques. Other primary research interest are: 1) Synthesis of nanoparticles by ion implantation in dielectric materials or by chemical methods (sol-gel); 2) Tailoring and controlled shape deformation of nanoparticles by means of ion irradiation. He has more than 80 publications in internationally peer reviewed journals, and he is a member of the Mexican National Researchers Council (SNI-III).

Selected Publications

1. MeV ion beam deformation of colloidal silica particles. J.C. Cheang-Wong, *et al.* Nucl. Instr. and Meth. B 242 (2006) 452–454.
2. Controlled anisotropic deformation of Ag nanoparticles by Si ion irradiation. A. Oliver, *et al.* Physical Review B 74 (2006) 245425.
3. Energy-dependent deformation of colloidal silica nanoparticles under room temperature irradiation with MeV Si ions. J.C. Cheang-Wong, *et al.* Journal of Nano Research 5 (2009) 61-67.
4. Tunable nanometer electrode gaps by MeV ion irradiation. J.C. Cheang-Wong, *et al.* Applied Physics Letters 100 (2012) 153108.
5. Ion-beam modification of colloidal silica particle masks to tailor the size of ordered arrays of Ag nanostructures produced by nanosphere lithography. E. Reséndiz, *et al.* Mater. Res. Soc. Symp. Proc. 1712 (2014).

Bismuth Oxide Thin Films as a Visible Photocatalyst

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Juan Carlos Medina Álvarez is currently a PhD student in Materials Science and Engineering at Universidad Nacional Autonoma de Mexico. He has Knowledge and experience in materials science, chemistry, and chemical engineering in general and photocatalysis systems in particular. During and after his M.Sc. research, he has been working in some international research projects (BISNANO and PHOCSCLEEN) dealing with thin films for photocatalytic applications. During his research stay in Politecnico di Torino (Italy), he has learned some photoelectrochemical techniques to study the photocatalytic activity of some materials such as Bi_2O_3 and TiO_2. His areas of interest are: thin films deposition, photoelectrochemical tests, water remediation, hydrogen production, optical properties and surface characterization. He is seeking new and challenging opportunities for using my knowledge and experience for the benefit of the society

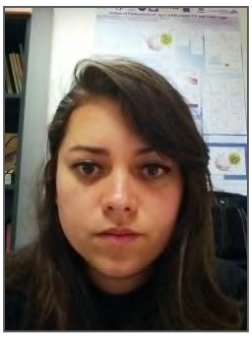
Selected Publications

1. Juan C. Medina, Monserrat Bizarro, Phaedra Silva-Bermudez, Mauro Giorcelli, Alberto Tagliaferro, Sandra E. Rodil, "Photocatalytic Activity of Bismuth Oxide Thin Films deposited by magnetron sputtering" Submitted in September, 2014 to Applied Catalysis B: Environmental

2. Celia L. Gomez, Osmary Depablos-Rivera, Juan C. Medina, Phaedra Silva-Bermudez, Stephen Muhl, Andreas Zeinert, Sandra E. Rodil. “Stabilization of the delta-phase in Bi_2O_3 thin films” Solid State Ionics 255 (2014) 147–152

3. Juan C. Medina and Carlos I. Mendoza “Electrorheological effect and non-Newtonian behavior of a homogeneous nematic cell under shear flow: Hysteresis, bistability, and directional response” Europhysics Letters, 84 (2008) 16002.

Enhanced Photoactivity of TiO_2 using Au Nanoparticles for Water Treatment and Hydrogen Production



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Maria Guadalupe Méndez Medrano was born in Leon, Guanajuato province, Mexico she studied Chemical Engineering in the University of Guanajuato, Mexico. Her thesis was related with the study of graphene, which brought her to receive the distinction of honors from the University of Guanajuato. She got a Master in Nanosciences and Materials from the Institute for Scientific and Technological Research of San Luis Potosi (IPICyT). She obtained the highest grade of her generation. She is presently a joint PhD (Université de Paris-Sud, Orsay, France and IPICyT, San Luis Potosi, Mexico). She obtained the Eiffel fellowship of excellence in 2014. Her research interests are in the area of plasmonic photocatalysis.

Selected Publications

1. Ma. Guadalupe Méndez Medrano, H. C. Rosu, L. A. Torres González , Graphene: the most promising allotrope of carbon, Journal Acta Universitaria of the University of Guanajuato. Vol. 22, (2012) 20-23.

Thin films of CdS:O nanostructured deposited by using the RF-Sputtering reactive technique

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CINVESTAV-IPN unidad Mérida
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Mariely I. Loeza-Poot obtained a degree in physics engineer from Universidad Autónoma de Yucatán (2014). She has three years of research experience in the field of materials science of thin films, with particular interest in photovoltaic materials. She has participation in international congress. Currently, she studies the master in science with specialty in applied physics from Cinvestav IPN, unidad Mérida.

Publication

1. H. Hernández-Rodríguez, M. Loeza-Poot, I. Riech, V. Rejón, J. L. Peña. *A comparative study of CdS:F and CdS:O thin films deposited by reactive RF-sputtering technique for window layer* (2015). Journal of Physics D: Applied Physics 48, 255102.

Study of Nanometrics Grains in Solar Cells CdTe Activated by a Gas Mixture of N_2-O_2-$CHClF_2$

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Adolfo López-Sánchez is a student of Master degree at CINVESTAV-IPN Unit Mérida with specialty in Physicochemistry and he works in the activation process of the solar cells CdS/CdTe.

His earliest works are:

1. Activation process of solar cells of CdS/CdTe using a gas mixture N_2-$CHClF_2$-O_2

2. Study of nanometrics grains in solar cells CdTe activated by a gas mixture of N_2-$CHClF_2$-O_2

Abnormal dielectric relaxation in Nanocrystalline $LaFeO_3$

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Dr. Yang Qiu works in the Key Laboratory of Advanced Micro/Nano Functional Materials, School of Physics and Electronic Engineering, Xinyang Normal University. Qiu received his PhD from Huazhong University of science and technology in 2013, and visited The Institute for Solid State Physics, The University of Tokyo from 2014-11 to 2015-1. Qiu's current research focuses mainly on multiferroics and high dielectric materials.

Selected Publications

1. Z. M. Tian, Y. Qiu, S. L. Yuan, M. S. Wu, S. X. Huo, and H. N. Duan, Enhanced multiferroic properties in Ti-doped $Bi_2Fe_4O_9$ ceramics, J. Appl. Phys., 108, 064110, 2010.
2. Y. Qiu, S. L. Yuan, Z. M. Tian, L. Chen, C. H. Wang, H. N. Duan, K. Guo, Grain size effect on the giant dielectric and nonlinear electrical behaviors of $Bi_{1/2}Na_{1/2}Cu_3Ti_4O_{12}$ ceramics, Appl. Phys. A, 107, 379, 2012.
3. Y. Qiu, Y. S. Luo, Z. J. Zou, Z. M. Tian, S. L. Yuan, Y. Xi, L. Z. Huang, Size effect on magnetic and dielectric properties in nanocrystalline $LaFeO_3$, J. Mater. Sci.-Mater. Electron., 25, 760, 2014.
4. G. S. Gong, Y. Qiu, G. Zerihun, Y. J. Fang, C. Y. Yin, C. M. Zhu, S. Huang, S. L. Yuan, Multiferroic properties in transition metals doped $La_2Ti_2O_7$ ceramics, J. Alloys Comp. 611, 30 2014.
5. Y. Qiu, Z. J. Zou, R. R. Sang, H. Wang, D. Xue, Z. M. Tian, G. S. Gong, and S. L.Yuan, Enhanced magnetic and ferroelectric properties in Cr doped $Bi_2Fe_4O_9$ ceramics, J. Mater. Sci.-Mater. Electron., 26, 1732, 2015.

TiO_2 catalyst treatment for hydrocarbon contaminated soil remediation

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Chemistry Engineering Department.
Universidad Autonoma de Yucatan.
Civil and Environmental Engineering Department.
Rice University
Email: cvargas@correo.uady.mx

Dulce Diana Cabañas -Vargas got a PhD in Environmental Engineering from Leeds University (2002). She has more than 10 years of research experience in the field of wastewater treatment, solid waste management and soil bioremediation, with particular interest in uses of nanomaterials for environmental remediation. She has published 10 papers in internationally peer review journals, one book chapter and co-edited a book. She has also participated in several international conferences. She has supervised 10 BSc students and 5 MEng students.

Publications

1. Cabañas-Vargas DD, de los Ríos Ibarra E, Mena-Salas JP, Escalante-Réndiz DY, Rojas-Herrera R. (2013) Composting Used as a Low Cost Method for Pathogen Elimination in Sewage Sludge in Mérida, Mexico. *Sustainability.* 2013; 5(7):3150-3158.ISSN 2071-1050
2. Michel Canul-Chan, Neyi Estrella-Gómez, Alejandro Zepeda, Diana Cabañas-Vargas, Rafael Rojas (2013) A protocol for metagenomic RNA extraction from bacterial consortium in the presence of crude oil. Romanian Biotechnology letters**.** ISSN 1224 – 5984, abrl 2014).
3. Anahí Fernanda Cardona Gutiérrez, Dulce Diana Cabañas Vargas**,** Alejandro Zepeda Pedreguera. 2013. Evaluación del poder biosorbente de cascara de naranja para la eliminación de metales pesados, Pb (II) y Zn (II). Ingeniería, Revista Académica de la Facultad de Ingeniería. 17 (1): 1-9. ISSN:1665-529X
4. M. R. Sauri-Riancho, D. D. Cabañas-Vargas, M. Echeverría-Victoria, M. Gamboa-Marrufo, R. Centeno-Lara, R. I. Méndez-Novelo. Locating hazardous waste treatment facilities and disposal sites in the State of Yucatan, Mexico. Environ Earth Science (2011) 63:351–362. Springer-Verlag 2010.

INTERNATIONAL MATERIALS RESEARCH CONGRESS

Red Temática de Nanociencias y Nanotecnología

7:30 – 12:00 Registration, Saturday 15th/2015

Room Chichen Itza

SATURDAY, AUGUST 15TH – 2015

8:40 - 9:10 ROOM: Uxmal I

Welcome Dr. Gerardo Cabañas, Sociedad Mexicana de Materiales, President

Addressing by Prof. C. P. Wong, Dean of Engineering, Chinese University of Hong Kong, in representation of Prof. Joseph Sung, Vice-Chancellor and President of The Chinese University of Hong Kong

Inauguration by Mtro. Luis Torreblanca, Addressing and Inauguration by Mtro. Luis Torreblanca, Deputy Director of Technological Development and Innovation, in representation of Dr. Enrique Cabrero Mendoza, General Director of CONACYT.

CHAIRS: JIESHENG CHEN & RODOLFO ZANELLA

9:10 – 9:35 SWMC-001 *RECENT ADVANCES ON NANO-MATERIALS AND TECHNOLOGIES FOR ADVANCED ELECTRONIC, PHOTONIS AND MEMS APPLICATIONS*
C.P. Wong.
Chinese University of Hong Kong, Hong Kong SAR, China

9:35 - 10:00 SWMC-O002 *UNDERSTANDING STABILIZATION FORCES ON ZNO POLAR SURFACES*
S. Y. Tong
South University of Science and Technology of China, China.

10:00 - 10:25 SWMC-O003 *HETEROSTRUCTURES BASED ON LAYER-BY-LAYER CONTROLLED QUANTUM WELLS OF II-VI SEMICONDUCTORS FOR OPTOELECTRONIC APPLICATIONS*
Isaac Hernández-Calderón
Physics Department, Centro de Investigación y de Estudios Avanzados del IPN, Mexico.

10:25 - 10:50 SWMC-O004 *SUSTAINABLE ENERGY: TECHNOLOGICAL HYPES AND REAL SOLUTIONS*
Yip-Wah Chung
Department of Materials Science and Engineering and Mechanical Engineering, Institute for Sustainability and Energy. Northwestern University, Evanston, Illinois, USA.

10:50 – 11:00 **Discussion leaders: Marina Rincon & Jiesheng Chen**

11:00 – 11:30 **Coffee break**

CHAIRS: JL PENA & CHAO-JUN LI

11:30 - 11:55 SWMC-O005 *SIZE CHARACTERIZATION AND STABLE ISOTOPE FRACTIONATION OF SILVER NANOPARTICLES*

Dawei Lu, Lihong Liu, Qian Liu, Guibin Jiang
State Key Laboratory of Environmental Chemistry & Toxicology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China.

11:55 - 12:15 SWMC-O006 *SYNTHESIS, CHARACTERIZATION AND PHOTOCATALYTIC BEHAVIOR OF WO_3/TiO_{2-A} (A = N) UNDER SOLAR RADIATION*

A. Cordero García, A. Hernández-Ramírez
Universidad Autónoma de Nuevo León, Facultad de Ciencias Químicas, Laboratorio de Fotocatálisis y Electroquímica Ambiental, México.

12:15 - 12:35 SWMC-O007 *THE ROLE OF CLASS I INTEGRONS IN THE DISSEMINATION OF SULFONAMIDE RESISTANCE GENES IN THE PEARL RIVER AND PEARL RIVER ESTUARY, SOUTH CHINA*

Baowei Chen[2], Ximei Liang[4], Xiangping Nie[5], Xiaoping Huang[3], Shichun Zou[2], Xiangdong Li[1]
[1]Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong. [2]School of Marine Sciences, Sun Yat-Sen University, China. [3]Key Laboratory of Tropical Marine Bio-resources and Ecology, South China Sea Institute of Oceanology, Chinese Academy of Science , China. [4]Pearl River Fisheries Research Institute, Chinese Academy of Fishery Sciences, China. [5]Department of Ecology/Institute of Hydrobiology, Jinan University, China.

12:35 - 12:55 SWMC-O008 *ELECTROCHEMICAL DETECTORS USING MODIFIED ELECTRODES WITH PRUSSIAN BLUE AND ORGANIC POLYMERS TO DETECT COMPOUNDS WITH BIOLOGICAL AND ENVIRONMENTAL IMPORTANCE*

Erika Bustos Bustos
Environmental Electrochemistry Group, Centro de Investigación y Desarrollo Tecnológico en Electroquímica, S. C. Parque Tecnológico Querétaro s/n, Sanfandila, Pedro Escobedo, Querétaro, México.

12:55 - 13:20 SWMC-O009 *NANOTECHNOLOGY-ENABLED WATER TREATMENT AND MICROBIAL CONTROL: MECHANISMS, APPLICATIONS & IMPLICATIONS*

Pedro J.J. Alvarez
Dept. of Civil & Environmental Engineering, Rice University, Houston, TX. 77005, USA

13:15 – 13:25 **Discussion leaders: Rodolfo Zanella & Guibing Jiang**

13:25 – 15:00 **Lunch**

CHAIRS ELDER DE LA ROSA & JIANFANG WANG

15:00 - 15:25 SWMC-O10 *EXPLORING NEW NANOCATALYSTS FOR CHEMICAL TRANSFORMATIONS*
Chao-Jun Li, McGill University, Canada.

15:25 - 15:45 SWMC-O011 *SYNTHESIS OF $NiTiO_3$ AS A NEW MATERIAL FOR PHOTOCATALYSIS IN THE VISIBLE WAVELENGTH RANGE*
Marco A. Ruíz-Preciado[1, 2], Arturo Morales-Acevedo[1], A. Kassiba[2], A. Gibaud[2] and M. Makowska[3]
[1]Centro de Investigación y de Estudios Avanzados del IPN, Mexico, D. F. [2]Institute of Molecules and Materials of Le Mans, Université du Maine, France. [3]Institute of Physics, Jan Dlugosz University in Czestochowa, Poland.

15:45 - 15:55 SWMC-O012 *VISIBLE LIGHT-INDUCED PHOTOCATALYTIC ACTIVITY OF MODIFIED TITANIUM (IV) OXIDE WITH ZERO-VALENT BISMUTH CLUSTERS*
H. Remita,[1] N. A. Kouamé[1], O. Tahiri Alaoui[2], A. Herissan[1], E. Larios[3,4], M. José-Yacaman[3], A. Etcheberry[5], C. Colbeau-Justin[1]
[1] Laboratoire de Chimie Physique, UMR 8000-CNRS, Bât. 349, France . [2] Département de Chimie, Faculté des Sciences et Techniques, Université My Ismail, Errachidia, Morocco. [3] Department of Physics & Astronomy, The University of Texas at San Antonio, One UTSA Circle, San Antonio, USA. [4] Departamento de Ingeniería Química y Metalurgia, Universidad de Sonora, Sonora, Mexico. [5] Institut Lavoisier de Versailles, France.

15:55 - 16:05 SWMC-O013 *TRANSITION OF NANOSPHERES TO NANOFIBERS OF CdS PREPARED IN ETHYLENEDIAMINE-BUTANOL SOLVENT AND ITS PHOTOCATALYTIC PROPERTIES*
Agileo Hernández-Gordillo[1], Etel Maya-Flores[2], Ricardo Gomez[3]
[1] Instituto de Investigaciones en Materiales, Universidad Nacional Autónoma de México. México. [2] Instituto Mexicano del Petróleo, México. [3] Depto. de Química, Área de Catálisis, Universidad Autónoma Metropolitana – Iztapalapa, México.

16:05 - 16:15 SWMC-O014 *A CHARGE-CARRIER DYNAMICS STUDY IN PHOTOCATALYTIC TiO2 BY TIME RESOLVED MICROWAVE CONDUCTIVITY*
Alexandre Hérissan, Ana Laura Luna Barron, Maria Guadalupe Mendez Medrano, Jonathan Verrett, Hynd Remita, Christophe Colbeau-Justin
Laboratoire de Chimie Physique, CNRS UMR 8000 Université Paris-Sud, Bâtiment, France.

16:15 - 16:25 SWMC-O015 *SURFACE SEGREGATION AND PHASE DIAGRAMS FOR NANOALLOYS IN CATALYSIS: MOLECULAR DYNAMICS SIMULATIONS AND MODELLING STUDY OF AuCu AND AuPd ALLOYS*
José Luis Rodríguez López,[1] Jaime Osiris Salinas Jiménez,[2] and Jaime Enrique Pérez Terrazas[2]
[1] Advanced Materiales Department, Instituto Potosino de Investigación Científica y Tecnológica, A.C, México.
[2] Instituto Tecnológico de Saltillo, División de Estudios de Posgrado e Investigación Saltillo, Coahuila, México.

16:25 – 16:35 **Discussion leaders: Jinwen Shi & Juan Manriquez**

16:35 – 17:00 **Coffee Break**

CHAIRS HYND REMITA & HAILIN HU

17:00 - 17:25 SWMC-O016 *PHOTOCATALYTIC HYDROGEN PRODUCTION BY Au–M_xO_y/TiO_2 (M=Ag, Cu, Ni)*

Rodolfo Zanella[1], Socorro Oros-Ruiz[1,2], Ricardo Gómez[2], Agileo Hernández-Gordillo[2,3], Sebastian E. Collins[4]
[1]Centro de Ciencias Aplicadas y Desarrollo Tecnológico, UNAM. [2]Eco-CATAL, UAM-Iztapalapa. [3]Instituto de Investigaciones en Materiales, UNAM. [4]Instituto de Desarrollo Tecnológico para la Industria Química, UNL.

17:25 - 17:45 SWMC-O017 *MOLYBDENUM SULFIDE NANOSHEETS: AMMONIA POST-TREATMENT TOWARDS IMPROVED VISIBLE-LIGHT-DRIVEN HYDROGEN PRODUCTION*

Jinwen Shi, Yazhou Zhang, Liejin Guo
International Research Center for Renewable Energy (IRCRE), State Key Laboratory of Multiphase Flow in Power Engineering (MFPE), Xi'an Jiaotong University, China.

17:45 - 18:05 SWMC-O018 *ELECTROCATALYTIC OXIDATION OF UREA ON Ni(II)CYCLAM-MODIFIED NANOPARTICULATE TiO_2 ANODES FOR PROMOTING H_2 EVOLUTION ON Pt ELECTRODES*

J. Manríquez,[1] S. Murcio-Hernández,[1] J.J. Pérez-Bueno,[1] S. Sepúlveda[2]
[1] Centro de Investigación y Desarrollo Tecnológico en Electroquímica S.C., México. [2] Centro de Innovación, Investigación y Desarrollo en Ingeniería y Tecnología, Universidad Autónoma de Nuevo León, Nuevo León, México.

18:05 - 18:25 SWMC-O019 *OPTIMIZATION OF WO3 NANOROD AND ITS CONFORMAL WO3/BIVO4 NANOWIRE HETEROJUNCTION FOR PHOTOELECTROCHEMICAL WATER OXIDATION*

J. Su
International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, China

18:25 – 18:35 **Discussion leaders: Yip-Wah Chung & Marina Rincon**

18:35 – 19:30 **Reception & Posters**

POSTERS

SWMC-P001 *HIGHLY EFFICIENT GaN-BASED LIGHT-EMITTING DIODES GROWN ON Si (111) SUBSTRATES*

Guoqiang Li, Yunhao Lin and Wenliang Wang
South China University of Technology, China

SWMC-P002 *BISMUTH OXIDE THIN FILMS AS A VISIBLE PHOTOCATALYST*

J. C. Medina[1,2], K. Barrera-Mota[1,2], M. Bizarro[1], S.E. Rodil[1]
[1] Instituto de Investigaciones en Materiales, Universidad Nacional Autónoma de México, México. [2]Posgrado en Ciencia e Ingeniería de Materiales, México.

SWMC-P003 *ENHANCED PHOTOACTIVITY OF TiO_2 USING Au NANOPARTICLES FOR WATER TREATMENT AND HYDROGEN PRODUCTION*

G. Méndez-Medrano[1,2] A. Herissan,[1] E. Kowalska,[3] A. Lehoux,[3] B. Ohtani,[3]S. Rau,[4] C. Colbeau-Justin,[1] J.L. Rodríguez-López,[2] and H. Remita[1]
[1]Laboratoire de Chimie Physique, France. [2]Advanced Materials Department, IPICYT, Mexico. [3]Catalysis Research Center, Hokkaido University, Sapporo, Japan. [4]Ulm University, Department of Chemistry, Germany.

SWMC-P004 *EVALUATION OF THE PHOTOCATALYTIC ACTIVITY OF Ag@TiO2 AND Ag@ZnO. SYNTHESIS OF CARBONYL COMPOUNDS UNDER VISIBLE LIGHT*

Víctor Eulogio López Guerrero[1], Iliana Ernestina Medina-Ramírez[1], Virginia Flores Morales[2], Irma Adriana Castro Gallo[3]
[1]Universidad Autónoma de Aguascalientes. Departamento de Química, [2]Universidad Autónoma de Zacatecas. Departamento de Química, [3]Departamento de Química, Universidad Autónoma de Aguascalientes, México.

SWMC-P005 *STRUCTURAL, OPTICAL AND TRANSPORT PROPERTIES OF POLYMORPHOUS SILICON THIN FILMS FOR APPLICATIONS IN SOLAR CELLS*

Javitt Linares, Alejandra López-Suárez, Michel Picquart, Guillermo Santana, B. Marel Monroy
Departamento de Materiales de Baja Dimensionalidad, Instituto de Investigaciones en Materiales, UNAM, México, D.F.

SWMC-P006 *THIN FILMS OF CdS:O NANOSTRUCTURED DEPOSITED BY USING THE RF-SPUTTERING REACTIVE TECHNIQUE*

M. Loeza-Poot, E. Hernández-Rodríguez, V. Rejón, I. Riech, J.L. Peña
Applied Physics Department, Centro de Investigación y de Estudios Avanzados del IPN, Mexico. [2]Materials Science Laboratory, University of Yucatán, México.

SWMC-P007 *NANOSTRUCTURED As_2Te_3/Cu BILAYER FOR BACK CONTACT APPLICATION IN CdTe-BASED SOLAR CELLS*

E. Hernández-Rodríguez, V. Rejón, R. Mis-Fernández, J.L. Peña
Applied Physics Department, Centro de Investigación y de Estudios Avanzados del IPN, Mexico.

SWMC-P008 *STUDY OF NANOMETRICS GRAINS IN SOLAR CELLS CdTe ACTIVATED BY A GAS MIXTURE OF N_2-O_2-$CHClF_2$*

A. López-Sánchez, V. Rejón, R. Mis-Fernández, E. Hernández-Rodríguez, J.L. Peña
Applied Physics Department, Centro de Investigación y de Estudios Avanzados del IPN, Mexico.

SWMC-P009 *FACET-DEPENDENT CATALYTIC ACTIVITY OF NANOSHEETS-ASSEMBLED BiOI MICROSPHERES: REMOVAL OF AQUEOUS ENDOCRINE DISRUPTORS*

Guandao Gao, Lu Liu, Wei Chen
College of Environmental Science and Engineering, Nankai University, Wei Jin Road 94, China

SWMC-P010 *ABNORMAL DIELECTRIC RELAXATION IN NANOCRYSTALLINE $LaFeO_3$*

Yang Qiu
Key Laboratory of Advanced Micro/Nano Functional Materials, School of Physics and Electronic Engineering, Xinyang Normal University. China

SWMC-P011 *TiO2 CATALYST TREATMENT FOR HYDROCARBON CONTAMINATED SOIL REMEDIATION*

D. Cabanas-Vargas[1], J. Wang[2], P. J. Alvarez[3]
[1]Universidad Autónoma de Yucatan, MEXICO, [2]Civil and Environmental Engineering. Rice University, [3]Rice University. 6100 Main St, Houston, USA.

SUNDAY, AUGUST 16TH – 2015

ROOM: Uxmal I

CHAIRS ISAAC HERNANDEZ & S. Y. TONG

08:30 - 08:55 SWMC-O020 *PIEZOTRONICS AND PIEZO-PHOTOTRONICS*
Zhong Lin Wang[1,2]
[1]School of Materials Science and Engineering, Georgia Institute of Technology, Atlanta USA. [2]Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, Beijing, China.

08:55 - 09:20 SWMC-O021 *NANOPHOTONICS FOR LIGHTING AND SOLAR CELLS APPLICATIONS*
Elder De la Rosa, Tzarara López-Luke, Haggeo Desirena, Diego Esparza, Andrea Cerdan, José Carlos Basilio, Alejandro Martínez and Ana Sánchez
Centro de Investigaciones en Óptica A.C., México

9:20 - 09:45 SWMC-O022 *COMPOSITE AND HIERARCHICAL STRUCTURES IN ELECTRODE MATERIALS*
Jiesheng Chen
School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University, China.

09:45 - 10:10 SWMC-O023 *LARGE-SCALE STORAGE FOR SUSTAINABLE ENERGY: INNOVATION ON MATERIALS AND DEVICE DESIGN*
M.E. Rincón, A.K. Cuentas-Gallegos, M. Miranda, R. Nava, P. Acevedo, M. Robles, J. Muñiz, M. Valdez, S. Cuevas, E. Ramos, J.A. del Río.
Instituto de Energías Renovables, Universidad Nacional Autónoma de México (IER-UNAM). México.

10:10 - 10:30 SWMC-O024 *CdTe/CdS SOLAR CELL ACTIVATED WITH $MgCl_2$*
J.L. Peña Chapa[1], V. Rejon[1], R. Mis-Fernández[1], Ivan Rimmaudo[1], E. Hernández-Rodríguez[1], Inés Riech[2].
[1]Applied Physics Department, CINVESTAV-IPN, México. [2]Materials Science Laboratory, Faculty of Engineering, University of Yucatán, Mérida, Yucatán. México.

10:30 – 10:40 **Discussion leaders: Rodolfo Zanella & CP Wong**

10:40 – 11:10 **Coffee break**

CHAIRS JIE WANQI & JL PENA

11:10 - 11:35 SWMC-O025 *RECENT DEVELOPMENT OF FUNCTIONAL CRYSTALCS IN CHINA*
Jiyang Wang
State Key Lab. of Crystal Materials, Shandong University, China.

11:35 - 11:55 SWMC-O026 *SOLAR ENERGY CONVERSION SYSTEMS BASED ON PHOTOELECTROCHEMISTRY AT NANOMATERIALS*
G. Oskam
Department of Applied Physics, Centro de Investigación y de Estudios Avanzados del IPN, Mexico, Mérida, México.

11:55 - 12:20 SWMC-O027 *FLEXIBILITY-BASED ORDERLY STRUCTURE ARRAYS FOR ENERGY STORAGE APPLICATION*
Yongsong Luo
Xinyang Normal University, China.

12:20 - 12:40 SWMC-O028 *MONODISPERSE CdS SPHERES SYNTHESIZED BY MICROEAVE HEATING FOR HYBRID SOLAR CELL APPLICATIONS*
Hailin Hu, Claudia Martínez-Alonso, Carlos A. Rodríguez-Castañeda, Paola M. Moreno-Romero, C. Selene Coria-Monroy
Instituto de Energías Renovables, Universidad Nacional Autónoma de México, Morelos, México.

12:40 - 13:00 SWMC-O029 *SOLVOTHERMAL SYNTHESIS OF HIGHLY VISIBLE-LIGHT-RESPONSIVE PERFORMANCE HETEROJUNCTION COMPOSED OF ONE-DIMENSIONAL TiO_2 NANOTUBES AND TWO-DIMENSIONAL BiOBr NANOPLATES*
Chao Xue, Guidong Yang
Department of Chemical Engineering, School of Chemical Engineering and Technology, Xi'an Jiaotong University, China.

13:00 - 13:20 SWMC-O030 *CARBON NANOMATERIALS FOR WATER REMEDIATION*
Luis F. Cházaro-Ruiz, J. René Rangel-Mendez
División de Ciencias Ambientales del Instituto Potosino de Investigación Científica y Tecnológica (IPICYT) A.C., México.

13:20 – 13:30 **Discussion leaders: Jiesheng Chen & Marina Rincon**

13:30 – 15:00 **Lunch**

CHAIRS ELDER DE LA ROSA & YONGSONG LUO

15:00 - 15:25 SWMC-O031 *BEHAVIORS OF NANO-SIZE TE PRECIPITATES IN CdZnTe AS X-RAY RADIATION DETECTOR MATERIALS*
Jie Wanqi
School of Materials Science and Engineering, Northwestern Polytechnical University, Xian, China

15:25 - 15:45 SWMC-O032 *COLLOIDAL METAL NANOCRYSTALS FOR PLASMONIC CATALYSIS*
Jianfang Wang
Department of Physics, The Chinese University of Hong Kong, Shatin, Hong Kong SAR, China.

15:45 - 15:55 SWMC-O033 *HYDROGEN ISOTOPE SEPARATION IN METAL-ORGANIC FRAMEWORKS*
T. Heine
Jacobs University Bremen, School of Physics and Earth Science, Bremen, Germany.

15:55 - 16:05 SWMC-O034 *SURFACE PLASMON ENHANCED OPTOELECTRONIC PROPERTIES OF SEMICONDUCTOR MATERIALS AND DEVICES*
Shuguang Zhang, Lei Wen, and Fangliang Gao.
State key laboratory of luminescent materials and devices, South China University of Technology, Guangzhou, China.

16:05 - 16:15 SWMC-O035 *PLASMONIC PROPERTIES OF ORDERED ARRAYS OF Ag AND Au NANOSTRUCTURES EMBEDDED IN SILICA FABRICATED BY A COMBINACIÓN OF NANOSPHERE LITHOGRAPHY WITH ION IMPLANTATION*
O. Graniel, C. Salinas, E. Flores-Romero, E. Rodríguez-Sevilla, J.C. Cheang-Wong
Instituto de Física, Universidad Nacional Autónoma de México. México.

16:15 - 16:40 SWMC-O036 *NANOSCIENCE AND NANOTECHNOLOGY IN CHINA*
Leo W.M. Lau
Beijing Computational Science Research Center, Beijing, China, Green Energy and Green Manufacturing Technology R&D Center - CAEP Chengdu Science and Technology Development Center, Chengdu, Sichuan, China.

16:40 – 16:50 **Discussion leaders: Guoqiang Li & Arturo Morales-Acevedo**

16:50 – 17:00 **Closing Remarks.**

RECENT ADVANCES ON NANO-MATERIALS AND TECHNOLOGIES FOR ADVANCED ELECTRONIC, PHOTONIS AND MEMS APPLICATIONS

C.P. WONG
The Chinese University of Hong Kong

The advance of modern semiconductor technology is mainly due to the advances of materials, especially polymeric and composite materials. These include the use of polymers and composites as: interlayer dielectrics (for low dielectric constant(k), low loss dielectrics for high speed and low loss signal transmission), encapsulants (for discrete and wafer level packages for Integrated Circuit(IC) devices protection), adhesives (both conductive and non-conductive composites for IC devices and components attachments and electronic system assembly interconnects), embedded passives (both high K capacitors, high Q inductors for high density Printed Wiring Board(PWB) substrates), superhydrophobic self-cleaning lotus effect surfaces, etc. In this presentation, we will review some of the recent advances on nano-materials and nano-technologies that are currently being investigated for these types of applications, such as : lead-free flexible electrically conductive adhesives (ECAs) with flexible/stretchable properties, self assembly monolayer molecular wires for fine pitch and high current density electronic interconnects, flip chip and wafer level underfills for high performance system reliability, nano lead-free alloys for low temperature interconnects, well-aligned carbon nanotubes and graphenes for high current and high Thermal Interface Materials(TIMs), superhydrophobic self-clean lotus leave surface coatings and nanoMetal Assisted Chemical Etching(MaCE) for Micro Electrical Mechanical System(MEMS) and high efficiency solar cell applications.

Keywords: Nano-materials, MaCE, MEMS

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UNDERSTANDING STABILIZATION FORCES ON ZnO POLAR SURFACES

S. Y. Tong
South University of Science and Technology of China, China

At first glance, the stability of polar faces of ionic crystals seems a mystery. Because their layers are alternately made up of oppositely charged ions, a net dipole moment accumulates along the crystal's *c* axis so in principle, the electrostatic energy of a macroscopic crystal bounded by polar surfaces should diverge proportionally as the sample thickness. Nonetheless, a number of stable ionic polar faces occur in nature. Among these, the Zn-terminated (0001) and O-terminated (000-1) faces of ZnO have received widespread attention because these surfaces are active in catalytic and corrosion reactions.

In this talk, I shall explain the competing forces acting to stabilize the polar surfaces of ZnO. To compensate an accumulating dipole moment normal to ionic planes, the Madelung electrostatic force and the ability of under-coordinated Zn ions to form novel bonds compete to stabilize the two polar surfaces. A unified picture is presented in which the bonding flexibility of under-coordinated surface bilayer Zn ions plays a deciding role in shaping the reconstructions on both polar surfaces. The cleavage energy of 2.36 J/m^2 calculated for reconstructed polar faces is comparable to that found on non-polar faces [1]. Results of using a direct method to invert LEED diffraction data inter-atomic distances of surface layers will also be presented.

Keywords: ZnO, polar surfaces, cleavage energy

References:

1. H. Xu, L. Dong, X. Q. Shi, M. A. Van Hove, W. K. Ho, N. Lin, H. S. Wu, and S. Y. Tong, Phys. Rev. B 89, 235403 (2014)

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HETEROSTRUCTURES BASED ON LAYER-BY-LAYER CONTROLLED QUANTUM WELLS OF II-VI SEMICONDUCTORS FOR OPTOELECTRONIC APPLICATIONS

Isaac Hernández-Calderón
Physics Department, CINVESTAV, Ave. IPN 2508, Mexico City, DF 07360

Quantum wells (QWs) of II-VI semiconductors present attractive properties for the elaboration of a large variety of novel optoelectronic devices such as light emitting diodes (LEDs), laser diodes, photodetectors, solar cells, radiation detectors, etc. [1]. By means of epitaxial techniques, it is possible to produce high quality QWs for the elaboration of devices with specific properties. Here, we present the results of the modelling, growth and the optical and structural characterization of several II-VI QW based heterostructures produced in the Laboratory of Semiconductor Nanostructures (NanoSem) of the Physics Department at Cinvestav in Mexico City. The QWs are made of binary compounds and ternary alloys of II-VI (Zn, Cd, Mg, Se, Te) semiconductors, they are grown in a layer-by-layer mode by atomic layer epitaxy (ALE) and submonolayer pulsed beam epitaxy (SPBE) [1, 2]. These methods produce atomic layers of high crystalline quality and allow a precise control of the thickness and composition of the QWs. We employ molecular beam epitaxy (MBE) for the growth of the barriers and other parts of the heterostructures. Some of the systems to be presented are: CdSe/ZnSe ultra-thin quantum wells (UTQWs) and thin $Zn_{1-x}Cd_xSe$ QWs for application in LEDs, lasers and photovoltaic heterostructures; nearly lattice matched ZnCdSe/ZnMgSe QWs for yellow-green LEDs and lasers, and novel CdTe based solar cells. We will illustrate our capability of controlling the composition of each individual ternary alloy atomic layer of the QWs during the growth process, allowing us the fine-tuning of their optical properties.

Work partially supported by Conacyt-Mexico.

Keywords: Quantum wells, Semiconductor nanostructures, optoelectronics

References:

1. Hernández-Calderón, ” Epitaxial growth of thin films and quantum structures of II–VI visible-bandgap semiconductors”. In: Molecular Beam Epitaxy: From research to mass production. Elsevier Inc.: Elsevier Science; 311–346 (2013).SPBE
2. Hernández-Calderón, et al, J. Vac. Sci. Technol. B29:03C137 (1-3), (2011) and references therein.

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1.

SUSTAINABLE ENERGY: TECHNOLOGICAL HYPES AND REAL SOLUTIONS

Yip-Wah Chung
Department of Materials Science and Engineering and Mechanical Engineering, Institute for Sustainability and Energy. Northwestern University, Evanston, Illinois, USA

Global energy problems require solutions that can be implemented on a large-scale, must be economically viable, and result in no adverse environmental impact. Many promising, real solutions in renewable energy generation, energy storage, and energy efficiency have been proposed, some of which are being implemented worldwide. On the other hand, solutions that do not satisfy these criteria, while technically sound, will unlikely have a real impact. The problem with the latter is that they are crowding out resources that would otherwise be devoted to research and development in real solutions. This talk begins with a macro view that illustrates the long-term challenge of balancing energy demand of China and Mexico with renewable energy resources such as solar and wind. This will be followed by examples of technological hypes in photovoltaics, energy efficiency and carbon sequestration that involve interesting science, but do not solve global energy problems, as well as examples of real solutions that can literally change the world. The talk concludes with some observations of the commonality of energy landscapes of China and Mexico and areas of mutual interest.

Keywords: Sustainable energy, Energy efficiency, Real solutions

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SIZE CHARACTERIZATION AND STABLE ISOTOPE FRACTIONATION OF SILVER NANOPARTICLES

Dawei Lu[1], Lihong Liu[1], Qian Liu[1], Guibin Jiang[1]
[1]State Key Laboratory of Environmental Chemistry & Toxicology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China

Nanoparticles (NPs) are widely used in consumer products and their disposal levels into the environment are increasing. However, there still is a lack of proper analytical methods to study NPs in complex media. We have developed new methods for identification, size characterization, quantification, and distinguishing the origins of silver nanoparticles (AgNPs) in complex media. The identification and size characterization of NPs were achieved based on capillary electrophoresis coupled to inductively coupled plasma mass spectrometry (CE-ICP-MS). We can obtain accurate information on chemical compositions, size distributions, and ionic species of multiple NPs in a single run. Furthermore, we found that the natural formation and dissolution of AgNPs can cause significant Ag stable isotope fractionation, and such fractionations provide a new means to study complex environmental behaviors of AgNPs as well as to distinguish the origin of AgNPs in the environment.

Keywords: Nanoparticle, Stabe Isotope, Silver

References:

1. H. Liu, B. He, Q. Liu, Z. J. Yun, X. T. Yan, Y. M. Long, G. B. Jiang, *Angew. Chem. Int. Ed.*, 2014, 53, 14476-14479.
2. Yin, J. F. Liu, G. B. Jiang, *ACS Nano*, 2012, 6, 7910-7919.
3. N. Akaighe, R. I. MacCuspie, D. A. Navarro, D. S. Aga, S. Banerjee, M. Sohn, *Environ. Sci. Technol.*, 2011, 45, 3895-3901

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SYNTHESIS, CHARACTERIZATION AND PHOTOCATALYTIC BEHAVIOR OF WO_3/TiO_{2-A} (A = N) UNDER SOLAR RADIATION

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[1]Universidad Autónoma de Nuevo León, Facultad de Ciencias Químicas, Laboratorio de Fotocatálisis y Electroquímica Ambiental

Heterogeneous photocatalysis using TiO_2 has proven to be an efficient process to destroy organic pollutants, due to its ability to generate transient species mainly hydroxyl radicals (HO•) which can degrade toxic molecules and their transformation products. However, a challenging issue is to develop new TiO_2 photocatalytic materials with enhanced activities under both UV and visible light irradiation. Many studies have focused on mixed oxide semiconductors because an efficient charge separation can be obtained by coupling two semiconductor particles that have different energy levels. Among these strategies, WO_3 coupling has been studied to improve the photocatalytic activity of TiO_2. On the other hand, the use of non-metals such as C, N and F could enhance the effectiveness of mixed oxides minimizing electron-hole recombination to improve the photocatalytic process.

In this investigation the catalysts TiO_2 (T), 2%WO_3/TiO_2 (TW) and WO_3/TiO_2 doped with N (TWN) were prepared by sol-gel technique. The solar photocatalytic activity (SPA) of the catalysts was tested under solar simulated radiation on the degradation of diclofenac aqueous solution. The prepared catalyst were characterized by X-Ray diffraction (XRD), UV-Vis spectroscopy with the diffuse reflectance mode (DRUV-Vis), scanning electron microscopy SEM-EDS and X-ray Photoelectron Spectroscopy (XPS). The SPA was evaluated by monitoring the drug degradation using reversed-phase chromatography (HPLC) with UV detection. The mineralization percentage was assessed by tracing total organic carbon content (TOC) in the aqueous solution in a TOC-V CSH Analyzer. The obtained results revealed that the WO_3/TiO_{2-N} catalyst exhibited better photocatalytic performance than T and TW materials on the degradation of diclofenac solution under solar radiation.

Keywords: WO3/TiO2, diclofenac, photocatalyst

References:

1. N.A. Ramos-Delgado M.A. Gracia-Pinilla, L.M.-T., L. Hinojosa-Reyes, J.L. Guzman-Mar, A. Hernández-Ramírez,, *Solar photocatalytic activity of TiO_2 modified with WO_3 on the degradation of an organophosphorus pesticide.* Journal of Hazardous Materials, 2013. 263(1): 36-44.

2. Mehdi Ismail, L.B., Orfan Zahraa, *Photocatalytic behavior of WO_3-loaded TiO_2 systems in the oxidation of salicylic acid.* Journal of Photochemistry and Photobiology A: Chemistry, 2011. 222(2-3): 314-322.

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THE ROLE OF CLASS I INTEGRONS IN THE DISSEMINATION OF SULFONAMIDE RESISTANCE GENES IN THE PEARL RIVER AND PEARL RIVER ESTUARY, SOUTH CHINA

Baowei Chen[2], Ximei Liang[4], Xiangping Nie[5], Xiaoping Huang[3], Shichun Zou[2], Xiangdong Li[1]

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Antibiotic resistance genes (ARGs), as a newly emerging contaminant, are unique because they are disseminated through horizontal gene transfer in the environment. In the present study, a class 1 integron gene (int1) and various ARGs (sul1, sul2, sul3, qnrS, and ermB) were measured in water and sediment samples from the Pearl River (PR) to the Pearl River Estuary (PRE), where there is a distinct gradient in anthropogenic impact. The int1, sul1, and sul2 genes were detected in all samples, and their concentrations exhibited a clear trend of decline consistent with anthropogenic impact. Both the int1 and sul genes had dynamically migrated between water and sediments. The relative abundance of the int1 gene normalized to the 16S rRNA gene correlated significantly with the total concentrations of antibiotics in water and sediments. Good correlations were also observed between the abundance of int1 and each type of sul gene in the samples. However, the sul1 gene showed a much stronger relationship with int1 in different seasons, probably due to the presence of sul1 in the conserved region of class 1 integron. Our results strongly support that integrons play an important role in the dissemination of ARGs in human-impacted aquatic environments.

Keywords: antibiotic resistance genes (ARG), Pearl River Estuary (PRE), South China

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ELECTROCHEMICAL DETECTORS USING MODIFIED ELECTRODES WITH PRUSSIAN BLUE AND ORGANIC POLYMERS TO DETECT COMPOUNDS WITH BIOLOGICAL AND ENVIRONMENTAL IMPORTANCE

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Monitoring the levels of biologically and environmentally important compounds in different ecosystems is an important task because these compounds can seriously affect human health. Consequently, different analytical methods are develop to determine the quantity of these kinds of pollutants, one of which is the electrochemical detection.

Electrochemical detectors can be constructed using modified surfaces with electro-catalyzers to get higher selectivity and reliability than spectroscopic methods. A commonly-used electro-catalyzer is Prussian Blue (PB), a coordination compound with two reported stoichiometries, namely the insoluble form, $Fe_4[Fe(CN)_6]_3 \cdot 6H_2O$, and the soluble form, $KFeFe(CN)_6$.

We developed different modified surfaces with the insoluble form of PB as an electro-catalyzer in electrochemical detectors of hydrogen peroxide (H_2O_2), dopamine (DA), ascorbic acid (AA), mercury (Hg^{2+}), and hydrocarbons (HC) with an intermediate fraction. These modified surfaces with PB are construct by immersion in the presence of organic polymers as polyamidoamine dendrimers (PAMAM) and polyacrylate, obtaining detection and quantification limits close to ppm without manipulation of the sample in a short time and without matrix effect.

Keywords: Prussian Blue, Electrochemical Detectors, Organic Polymers

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NANOTECHNOLOGY-ENABLED WATER TREATMENT AND MICROBIAL CONTROL: MECHANISMS, APPLICATIONS & IMPLICATIONS

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Through control over material size, morphology and chemical structure, nanotechnology offers novel materials that are nearly "all surface" and that can be more reactive per atom than bulk materials. Such nanomaterials can offer superior catalytic, adsorptive, optical, electrical and/or antimicrobial properties that enable new technology platforms for next-generation water treatment, reclamation, and supply systems. This presentation will address emerging opportunities for nanotechnology to meet a growing need for safer and more efficient decentralized water treatment and dis biofouling control. The antibacterial mechanisms of common organic and inorganic nanomaterials will be illustrated within the context of various applications, including photocatalytic functionalized fullerenes to inactivate virus and oxidize recalcitrant pollutants, nanophotonic particles to enable direct solar desalination, and silver nanoparticles to endow water filtration membranes with biofouling resistance. Because microorganisms also form the basis of all known ecosystems and provide many critical environmental services, the implications of microbial-nanoparticle interactions will also be considered in the context of potential risks associated with accidental or incidental nanomaterial releases. This analysis will focus on how water chemistry affects nanoparticle bioavailability, mobility, toxicity and reactivity, and how to steward safer and eco-responsible nanotechnology.

Keywords: water treatment, Microbial control, Photocatalytic

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EXPLORING NEW NANOCATALYSTS FOR CHEMICAL TRANSFORMATIONS

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The efficient making of new molecules is central to any new product in the pharmaceutical, materials science, microelectronics, and biotech industries. With the ever increasing awareness of sustainability, great attentions have been paid to more efficient chemical transformations from readily available feedstock to higher value chemical products by exploring new catalytic systems. Due to the unique ability of combining the features of both homogeneous and heterogeneous catalysts, nanocatalysts plays a very important role in developing efficient chemical transformations. This talk will describe several examples of these efforts in our laboratory. These include the catalytic transformations with magnetic nanoparticles and the catalytic alkane activation with semiconductor nanocatalysts.

Keywords: nanocatalysts, Chemical synthesis, sustainability

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SYNTHESIS OF $NiTiO_3$ AS A NEW MATERIAL FOR PHOTOCATALYSIS IN THE VISIBLE WAVELENGTH RANGE

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Until today, TiO_2 (anatase) has been considered the best photocatalytic material for water splitting and toxic organics degradation under UV light. However, its application has been very limited because sunlight radiation has only a small fraction of photons in the UV wavelength range and artificial UV light sources are expensive. Hence, there is a great interest in developing new photocatalysis materials to be used with visible radiation. $NiTiO_3$ could be such a material because it has a band-gap around 2.45 eV and it is a compound involving both O and Ti atoms, as in the anatase TiO_2. Therefore, we have prepared powders of this material by a sol-gel route. We shall show that after an annealing process at high temperatures (1300 °C) the material becomes pure $NiTiO_3$, without any other chemical phases, which are present in the sol-gel grown powders. The structural, chemical and optical properties of the powders have been studied and compared to those expected from electronic structure calculations made by DFT and molecular modeling for nano-particles of this material. It will be shown that these calculations predict an absorption spectrum with three distinctive bands, as observed experimentally. All these experimental and theoretical results have encouraged us to obtain the $NiTiO_3$ nano-particles, but using a different sol-gel route for having pure powders at lower annealing temperatures (around 600 °C).

Keywords: photocatalytic, UV_Vis wavelengths, nano-particles

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VISIBLE LIGHT-INDUCED PHOTOCATALYTIC ACTIVITY OF MODIFIED TITANIUM (IV) OXIDE WITH ZERO-VALENT BISMUTH CLUSTERS

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The important challenge in photocatalysis is to find efficient and stable photocatalysts under visible light. Small Bi zero-valence clusters were synthesized on TiO_2-P25 by radiolysis. Photocatalytic tests were conducted under UV, visible and solar light. with rhodamine B and phenol taken as model pollutant. Surface modification of TiO_2 with zero valence Bi nanoclusters induces a high photocatalytic activity under visible light.[1] Very small amount of Bi (0.5% wt.) can activate titania for photocatalytic applications under visible light. Time resolved microwave conductivity (TRMC) technique was used to study the charge carrier dynamics. TRMC measurements indicate that under visible irradiation Bi nanoclusters inject electrons in the conduction band of TiO_2. These photocatalysts are very stable with cycling.

Considering that bismuth is very abundant and non-toxic, surface modification of TiO_2 with Bi clusters can lead to cheap, eco-friendly and efficient photocatalysts under solar light. These nanomaterials can also find applications in photovoltaics and solar cells.

Keywords: Titanium Dioxide, Zero Valent Bismuth Clusters, Photocatalysis

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TRANSITION OF NANOSPHERES TO NANOFIBERS OF CdS PREPARED IN ETHYLENEDIAMINE-BUTANOL SOLVENT AND ITS PHOTOCATALYTIC PROPERTIES

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CdS is a semiconductor widely used as photocatalyst because it is capable to absorb light in the visible region (Blue light) and to conduct photocatalytic reduction reactions [1-3]; however, its photocatalytic properties strongly depend on the nanocrystalline, morphology, textural and surface properties created during its preparation step. On the other hand, semiconductor nanomaterials with one-dimensional morphology like nanowires or nanorods are preferable because its efficiency in the photocatalytic reactions is enhanced due to the large active surface exposed [4-6]. It is known that the crystal structure and morphological properties are controlled by using template-solvent type, have great influence in the photocatalytic activity [7]. In this work, CdS nanospheres or nanofibers were prepared in a mixture of solvent of Ethylenediamine-butanol, varying the volume molar ratio (00, 30 and 60% vol. of ethylenediamine). The photocatalytic activity was tested in the 4-nitrophenol reduction under blue light irradiation. The highest photoreduction activity of nanofibers is discussed in function on the morphological, textural and surface properties. A possible mechanism of nanospheres-nanofibers transitions is given.

Keywords: template-solvent, nanofibers CdS, 4-nitrophenol reduction

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A CHARGE-CARRIER DYNAMICS STUDY IN PHOTOCATALYTIC TiO2 BY TIME RESOLVED MICROWAVE CONDUCTIVITY

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Photocatalytic as well as photovolatic processes are directly related to the charge-carrier lifetimes in semiconductors. Time Resolved Microwave Conductivity (TRMC) is a contactless method based on the measurement of reflected microwave power on excited semi-conductors, which is directly connected to the evolution of charge-carriers in the material, where $\Delta P(t)/P$ is the relative change of the reflected microwave power under irradiation, $\Delta\sigma(t)$ the change of conductivity, $\Delta nh(t)$ and $\Delta ne(t)$ are respectively the excess hole and free electron number and μh and μe there mobility. So TRMC method provides a way to follow in real time the evolution of photogenerated charge-carriers.

The aim of this work is to connect charge-carrier dynamics with photocatalysis efficiency in several titania. In this way, a sensitization of TiO2 have been done by dyes first and then by metallic nanoparticles. The TRMC results are then compare to photocatalysis. Others studies consists in checking the influence of the atmosphere, wavelength and excitation density on the charge-carrier lifetimes and generation on the same samples. The results show a clear influence of these parameters and allow us to distinguish some surface and trapping effects on the charge-carrier dynamics, which can succeed to an optimization of the material and experimental condition for photocatalysis.

Keywords: Microwave conductivity, Photocatalytic, TiO_2

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SURFACE SEGREGATION AND PHASE DIAGRAMS FOR NANOALLOYS IN CATALYSIS: MOLECULAR DYNAMICS SIMULATIONS AND MODELLING STUDY OF AuCu AND AuPd ALLOYS

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In recent photocatalytic studies of modified TiO_2 semiconductor (SC) with metal nanoparticles (MNPs), it is shown that MNPs deposited on the SC matrix act as electron traps facilitating electron–hole separation and promoting the interfacial electron transfer process. Also, through the excitation of the surface plasmons, electrons can be injected into the conduction band of the SC.[1,2] But a myriad of works also show that the catalytic activity response differs from system to system and if the MNPs are alloyed or in core-shell phase. Thus, function of the structure and composition of MPNs is crucial for the design of the new generation of plasmonic photocatalysts.

Even that all the associated phenomena in photocatalysis (electron-hole creation and life time, interaction of the radiation with the optical response of the SC and the local surface plasmons resonances from the MNPs, etc., etc.) are all they rooted to electron interactions and the electronic structure of the composite system, in this work we face to study first the atomic structure and surface segregation of bimetallic nanoparticles as a function of size, and the use of a model with general trends for atomic surface segregation.

The applied model is based on the atomic properties of the chemical elements involved in the nanoalloy, and predicts general trends for surface segregation in binary metal clusters based on the difference between the atomic properties of the constituent elements. Results from molecular dynamics simulations show the general trend of Au to segregate to the surface of the systems, and Cu and Pd tend to be at the core. These results are in well agreement with a semiempirical model with general trends for shed lights in the chemical ordering of nanoalloys. [3,4]

Keywords: AuCu alloy, AuPd alloy, Surface Segregation.

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PHOTOCATALYTIC HYDROGEN PRODUCTION BY Au–M_xO_y/TiO_2 (M=Ag, Cu, Ni)

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The need to develop new alternatives for sustainable energy has drawn the attention to emergent clean renewable technologies, since they proceed natural and lasting sources like solar light, wind and geothermal energy. The alternative method of photocatalytic water splitting is promising since it involves the absorption of light to produce hydrogen by irradiating oxide semiconductors. The incorporation of metals or metal oxide nanoparticles on the surface of semiconductors as co-catalysts has proved to enhance the photoactivity for the water splitting reaction. In this talk, a study about the photoactivity of hydrogen by water splitting using Au–MxOy nanoparticles deposited on TiO_2–P25 will be presented and these results will be compared to the hydrogen production of the corresponding Au and M_xO_y nanoparticles on TiO_2, to evaluate the effect of combining Au with Ag_2O, Cu_2O, or NiO as co-catalysts on TiO_2. The results of characterization of the materials by UV–vis diffuse reflectance, TEM, ICP, EDS and XPS will be shown. The photocatalytic reactions were carried out by using a water–metanol mixture, 50–50% vol., and a low-energy mercury lamp (2.2 mW/cm^2). The combinations of Au–Cu_2O/TiO_2 and Au–NiO/TiO_2 effectively increased the hydrogen production (2064 and 1636 μmol•h^{-1}•g^{-1}) obtained by Au/TiO_2 (1204 μmol•h^{-1}•g^{-1}). The higher photoactivities achieved by Au–Cu_2O and Au–NiO nanoparticles deposited on TiO2 were attributed to an enhancement of the electron charge transfer TiO_2 to the Au–M_xO_y systems and the effect of surface plasmon resonance of gold nanoparticles [1, 2].

Keywords: Hydrogen production, water splitting, gold

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MOLYBDENUM SULFIDE NANOSHEETS: AMMONIA POST-TREATMENT TOWARDS IMPROVED VISIBLE-LIGHT-DRIVEN HYDROGEN PRODUCTION

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Energy shortage and environmental pollution have become two urgent problems that restrict social development and endanger human survival. In order to resolve the two issues to realize the sustainable development of society, the most effective route is the active development and utilization of clean and renewable energy sources. Exploring and realizing the conversion and storage of solar energy as hydrogen energy is a powerful route to develop and utilize renewable energy. Correspondingly, it is a key task to exploit photocatalysts with high stability, high efficiency, low cost for visible-light-driven H_2 evolution.[1]

Herein, a series of novel photocatalysts (designated as MoS_2-N) were explored by treating the MoS_2 nanosheets (designated as MoS_2), which were prepared by a hydrothermal reaction using $Na_2MoO_4 \cdot 2H_2O$ as Mo source and CH_3CSNH_2 as S source, in a tube furnace under flowing NH_3 atmosphere at different temperatures. The physiochemical properties of samples were systematically investigated by different instrumental characterizations, and the H_2-evolution photocatalytic properties of samples were evaluated, by using HCOOH as the sacrificial reagent and using in-situ photodeposited Pt as the cocatalyst, under visible-light irradiation ($\lambda > 420$ nm). It was found that, compared with MoS_2 that showed no photocatalytic activity due to the lower conduction band position than the redox potential of H^+/H_2, MoS_2-N showed considerable photocatalytic activity due to the high-temperature NH_3 treatment that evidently modified the physiochemical properties of pristine MoS_2 nanosheets and thus was beneficial for photocatalytic H_2 evolution.

Keywords: H_2, MoS_2, photocatalysis

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ELECTROCATALYTIC OXIDATION OF UREA ON Ni(II)CYCLAM-MODIFIED NANOPARTICULATE TiO_2 ANODES FOR PROMOTING H_2 EVOLUTION ON Pt ELECTRODES

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In this investigation we studied the electrochemical oxidation of urea on Ni(II)cyclam-modified nanoparticulate TiO_2 anodes (**OTE/npTiO_2/Ni(II)cyclam**), where optically transparent electrodes (OTEs) were utilized as electrons collectors. Thereafter, this anodic reaction was coupled with polycrystalline Pt cathodes, where the H_2 evolution was promoted in alkaline aqueous medium. For comparison purposes, the H_2 evolution was also promoted on Pt cathodes when Ni(II)cyclam-modified OTEs (**OTE/Ni(II)cyclam**) were utilized for carrying out the urea oxidation.

Our results showed that the standard potential for the H_2 evolution ($E^o_{H2O/H2}$ = -0.83V vs. NHE) was measured on the Pt cathode when a potential of 1.0V vs. NHE was applied to the **OTE/npTiO_2/Ni(II)cyclam**//electrolyte interface (where the urea oxidation was taking place) with the aid of a potentiostat. On the contrary, the standard potential for the H_2 evolution was achieved on the Pt electrode when a potential of 1.2V vs NHE was applied to the **OTE/Ni(II)cyclam**//electrolyte interface (in order to promote the urea oxidation). These interesting results demonstrated that the applied potential for promoting the urea oxidation on Ni(II)cyclam-modified electrodes was 0.2V-shifted in cathodic sense in the presence of nanoparticulate TiO_2 films, thus revealing a remarkable electrocatalytic phenomena which can be attributed to the surface composition of the TiO_2 nanoparticles.

Keywords: nickel-cyclam, urea oxidation, H2 generation

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OPTIMIZATION OF WO_3 NANOROD AND ITS CONFORMAL WO_3/$BIVO_4$ NANOWIRE HETEROJUNCTION FOR PHOTOELECTROCHEMICAL WATER OXIDATION

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WO_3/$BiVO_4$ nanostructural heterojunction has been proved to be a good structure for photoelectrochemical water splitting under visible-light irradiation. In this report, we grew high aspect ratio by annealing ammonium tungsten bronze ($(NH_4)_{0.33}$•WO_3) nanorods grown on FTO substrate via a modified solvothermal method and followed with $BiVO_4$ coating by pulse laser deposition. Influence of capping agents, reaction temperature annealing temperature on uniformity and morphologies of $(NH_4)_{0.33}$•WO_3 films have been investigated and the growth mechanism of $(NH_4)_{0.33}$•WO_3 nanorods was explored. The results show that NH_4^+ plays a key role for formation of rod-like morphology at appropriate reaction temperature. Monoclinic WO_3 nanorods were obtained via removal of ammonium by annealing the synthesized $(NH_4)_{0.33}$•WO_3 at 500°C in air condition. The WO_3/$BiVO_4$ heterojunction was characterized by X-ray diffraction (XRD), Raman spectroscopy, and scanning electron microscopy (SEM) and X-ray Photoelectron Spectroscopy (XPS). WO_3 nanorod arrays are conformally covered with a $BiVO_4$ layer and a core-shell structure was formed. The WO_3/$BiVO_4$ heterojunction promoted the charge carrier separation due to their appropricate band edge positions alignment. The high aspect ratio WO_3 nanorod arrays provided larger surface for heterojunction formation which further enhance the performance of nanostructural heterojunction. The photoelectrochemical results showed that the photocurrent was improved compared to bare WO_3 nanorod arrays.

Keywords: heterojunction, photoelectrochemical, nanowire

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HIGHLY EFFICIENT GaN-BASED LIGHT-EMITTING DIODES GROWN ON Si (111) SUBSTRATES

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Light-emitting diodes (LEDs) fabricated with GaN and its related III-nitrides have been commercialized. In general, GaN films are grown on sapphire and SiC substrates.[1,2] However, LEDs grown on these foreign substrates face difficulties in wider promotion and application due to their high cost. Recently, GaN-based LEDs grown on Si substrates have attracted enormous attention thanks to the advantages of Si, such as low cost, large size, *etc*. However, the epitaxial growth of GaN films on Si substrates still has at least the following three challenges.[3-6] First, there are serious chemical reactions existing between Ga and Si at elevated temperatures, which might directly hamper the growth of GaN on Si. Second, the large thermal coefficient mismatch (54%) between GaN and Si will induce massive tensile stresses. As a result, cracks are generated on the surface of GaN. Third, high density dislocations, which results the large lattice mismatch (16.9%), can act as non-radiative recombination centers to diminish LEDs efficiency.

So far, many approaches have been deployed to solve these problems. In this regard, most studies for LEDs on Si substrates focus on the structures of hetero-buffer and interlayers, and the effect of growth conditions for GaN itself on GaN-based LEDs on Si substrates has been rarely reported.

In this work, GaN-based LEDs wafers with various reactor pressures for GaN nucleation layers (NLs) have been grown on Si (111) substrates by metal-organic chemical vapor deposition (MOCVD). The influence of reactor pressure for GaN NLs on the properties of GaN-based LEDs grown on Si (111) substrates is investigated in detail. It is revealed that crack-free GaN films are grown on the Si (111) substrate. As the reactor pressure for GaN NLs increases 200 to 600 Torr, the full width at half maximum values of the X-ray diffraction rocking curves for the GaN (0002) and (10-12) planes decrease 480 to 351 arcsec, and 868 to 445 arcsec, respectively, and therefore the threading dislocation density is greatly reduced, which is confirmed by the cross-sectional transmission electron microscopy measurement. Subsequently, the relationship between the bending and annihilation for dislocations and the modes for GaN NL are elucidated. Meanwhile, the effect of reactor pressure for GaN NL on the mode of GaN NL is also systematically studied. Furthermore, the light output power of GaN-based LEDs with GaN NLs grown at reactor pressure of 500 Torr is greatly improved by 73.66% in comparison with that of GaN-based LEDs with GaN NLs grown at reactor pressure of 200 Torr. This work provides a new approach for achieving highly-efficient GaN-based LEDs on Si (111) substrates.

Keywords: Light-emitting diodes, GaN, Si substrate

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BISMUTH OXIDE THIN FILMS AS A VISIBLE PHOTOCATALYST

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Bismuth oxide (Bi_2O_3) delta phase films were deposited by the magnetron sputtering technique and Bi_2O_3 beta phase films were deposited by spray pyrolysis method using bismuth acetate as precursor salt. X-ray diffraction, profilometry, scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), UV-vis diffuse reflectance and ellipsometric spectroscopy were used to characterize the films. The results indicated that the delta Bi_2O_3 thin films had nano-grain morphology whilst beta phase films presented a nanoplate morphology which are adequate for the photocatalytic reactions. The photocatalytic activity for both films was evaluated testing the degradation of methyl orange dye ($C_{14}H_4N_3SO_3Na$) under different wavelengths (UV, white and solar light) and acidic conditions (pH=3-3.5). The dye degradation and the kinetic of the reaction were estimated using the variation of the corresponding absorption band as a function of the irradiation time. The results pointed out that the photocatalytic activity was similar for both Bi_2O_3 phases and it could be improved doing a mechanical treatment over the substrate in order to increase the roughness and as consequence to obtain a larger active area. After calculating and comparing the reaction kinetic constants for both Bi_2O_3 films with TiO_2 and ZnO films, it was concluded that under UV light, the Bi_2O_3 reaction rate is larger than TiO_2 and ZnO reaction rate constants. Moreover, using the Bi_2O_3 films with an induced roughness (1.14 μm) the value of the reaction rate constant is five-fold larger than reaction rate constants of the other oxides. These results suggest that the Bi_2O_3 films are a new promising photocatalytic material for water treatment application.

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Keywords: Photocatalysis, Sputtering, degradation of organic molecules

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ENHANCED PHOTOACTIVITY OF TiO_2 USING Au NANOPARTICLES FOR WATER TREATMENT AND HYDROGEN PRODUCTION

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Gold nanoparticles (Au-NPs) were used to modify the surface of titanium dioxide as visible-light absorbers and as thermal redox active centers. Au-NPs were synthesized on commercial TiO_2 P25 by a chemical method (reduction by Tetrakis (hydroxymethyl) phosphonim chloride (THPC)). The Au/P25 composites have been characterized by different techniques (XRD, HRTEM, UV-Vis DRS). Time Resolved Microwave Conductivity (TMRC) has been used to study the charge carrier dynamics, which is the key factor in photocatalysis.[1,2,3] The photocatalytic activity of Au/TiO_2 was evaluated for the degradation of phenol and acetic acid (used as model pollutants) and for H_2 production by the Water Splitting Process (PWS). The modification of TiO_2 P25 with Au-NPs with preferential localization on anatase phase led to an increase of its photocatalytic activity under UV and visible light. TRMC signals show the injection of the electrons from the Au-NPs to the conduction band of the TiO_2 under visible excitation, due to the activation of Localized Surface Plasmon Resonance (LSPR) of the Au-NPs. Action spectra correlate with the absorption spectra proving that decomposition of acetic acid is carried out by a photocatalytic mechanism. The modified TiO_2 gave also promising results for the production of hydrogen by the water splitting process under visible light.

Keywords: Au/TiO2, Plasmonic Photocatalysts, Action Spectra

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EVALUATION OF THE PHOTOCATALYTIC ACTIVITY OF Ag@TiO2 AND Ag@ZnO. SYNTHESIS OF CARBONYL COMPOUNDS UNDER VISIBLE LIGHT

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Currently, applications of nanotechnology have increased significantly, this due to the improvement of the properties experimented by the materials at this scale. Titanium dioxide (TiO_2) and zinc oxide (ZnO) are semiconducting compounds that have been widely used in advanced oxidation processes, especially in Photocatalysis with environmental applications. Another interesting application that has been barely explored, is the use of such nano – structured semiconductors as catalysts in the synthesis of organic compounds. It is well known that these metal oxides, must be activated with ultraviolet light, limiting the applications and sustainability of the materials. Metal doping of these oxides is a suitable strategy used in order to produce visible light active materials. In this work, we report on the synthesis, characterization and evaluation of the photocatalytic activity of Ag@TiO_2 and Ag@ZnO. Previous studies from our research group have demonstrated the nanometric nature of Ag@TiO_2, and its excellent antimicrobial activity under visible light. With the expectation to expand our knowledge and applications of these materials, this work aims to the implementation of Green routes (Photo – catalysis activated by visible light using both catalysts) for the synthesis of organic compounds (Aldehydes and ketones, mainly. Ag@TiO_2 was synthesized using a sol-gel-technique; whereas Ag@ZnO was synthesized using a solvothermal approach. The materials were characterized by means of SEM, Raman, and XRD. Purity, composition, crystallinity and nanometric nature of the materials was demonstrated. The photocatalytic activity of the materials was evaluated under visible light. Different carbonyl compounds have been synthesized. The yields are high (above 65%), separation and reuse of the catalysts are simple. Currently, we are evaluating the purity of the products and analyzing differences on the efficency of the catalysts. We are also evaluating the synthesis of commercially valuable products (e.g., vanillin, biodiesel).

Keywords: silver doped oxides, photocatalysis, organic synthesis

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STRUCTURAL, OPTICAL AND TRANSPORT PROPERTIES OF POLYMORPHOUS SILICON THIN FILMS FOR APPLICATIONS IN SOLAR CELLS

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It has been shown that thin film of polymorphous silicon (pm-Si:H) materials have considerable adventages in absorption, photoconductivity and photostability with respect to conventional amorphous silicon, because pm-Si:H has nanometer sized crystalline Si inclusions embedded in an amorphous silicon matrix. These are attractive properties for the photovoltaic industry. The structure of pm-Si:H improves the transport properties with respect to amorphous silicon, even after being in a prolonged exposure to solar radiation. In this work pm-Si:H was synthesized by plasma enhanced chemical vapor deposition PECVD. Dichlorosilane was used as silicon precursor gas diluted in H_2 and Ar. In order to obtain different structural configurations of pm-Si:H films, the H_2 flow rate was varied 20 to 100 sccm and the deposition temperature was varied 150°C to 300°C. The films were characterized by Raman spectroscopy and UV-visible transmission/reflection. Transport properties were also studied by photoconductivity measurements. The crystalline fraction, the size of the Si nanocrystals and the optical gap was obtained for each sample. These structural and optical properties were correlated to the observed transport properties. The possible application of these materials to solar cell structures is also discussed

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Keywords: celdas solares

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THIN FILMS OF CdS:O NANOSTRUCTURED DEPOSITED BY USING THE RF-SPUTTERING REACTIVE TECHNIQUE

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In this work, we present the effects on thin films of CdS: O nanostructured with variation of oxygen concentration during its deposit using RF-sputtering technique. The films were deposited on Corning glass substrates (1 in^2) a CdS ceramic target with 99.99% purity, by using a gas mixture of Ar + O_2. Deposition was performance at room temperature with a working pressure of 25 mTorr and a sputtered power of 40 Watts. Thin films with different oxygen content were prepared by varying the oxygen concentration in the reactive atmosphere during deposition in a range 1% to 1.5% with respect to the total mass flow Ar + O_2. The structural and morphological properties were characterized by using X-ray Diffraction (XRD) and field emission scanning electron microscopy (FE-SEM), respectively. The diffraction patterns showed that samples prepared with oxygen concentration less to 1.1% are crystalline and present the hexagonal structure CdS (h-CdS), while samples with oxygen concentrations greater than 1.1% are nanostructured; all crystalline films were oriented preferentially along the (002) plane. Also it was observed a decrease in the crystallite size in a range 5.9 nm to 4.3 nm, which can be correlated in the micrographs. SEM images show that is possible to obtain nanostructured thin films of CdS:O with variable grain size in a range 20nm to 70nm. The grain size decrease when the oxygen percentage raises, all samples present high uniformity.

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Keywords: CdS:O, nanostructured, structural properties

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NANOSTRUCTURED As_2Te_3/Cu BILAYER FOR BACK CONTACT APPLICATION IN CdTe-BASED SOLAR CELLS

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The CdS/CdTe thin film junction is an important system for photovoltaic energy conversion. In CdS/CdTe solar cells the back contact is a critical step; it must form an ohmic contact to CdTe in order to allow an efficient extraction of photogenerated charge carriers. In this work, we report our results in the study of As_2Te_3 nanostructured thin films, developed in order to be used as a buffer layer of Cu back contact. Both As_2Te_3 and Cu thin films were prepared by the rf-sputtering technique in Ar atmosphere onto CdTe films. SEM micrographs showed that nanostructure of As_2Te_3 thin films is changed by the growth temperature; the grain size decreases as temperature is increased and the surface becomes more rough. In the case of films prepared under room temperature, they are not continuous, as opposite to films prepared at 200°C, which cover the CdTe grains. After deposition of Cu thin films onto CdTe/As_2Te_3, the surface morphology is changed; the grain size of the As_2Te_3/Cu bilayers decreases and grain shape transforms. XRD analysis showed the formation of the As_2Te_3 compound in the films, but crystallinity is increased as the growth temperature is raised. It also showed that Cu reacts with Te in the As_2Te_3/Cu bilayer, forming Cu-Te compounds. A CdS/CdTe solar cell with nanostructured As_2Te_3/Cu bilayer was tested, achieving 12%.

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Keywords: As_2Te_3/Cu, characterization, solar cell

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STUDY OF NANOMETRICS GRAINS IN SOLAR CELLS CdTe ACTIVATED BY A GAS MIXTURE OF N_2-O_2-$CHClF_2$

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In this work, we have studied the effect of activation in solar cells CdS/CdTe by a gas mixture N_2-O_2-$CHClF_2$. SEM micrographs showed nanoparticles of CdO on surface of the CdTe. Also was observed the restructuring of CdTe in the form of sheets 20 to 50 nanometers in thickness, located between CdTe grains. Preliminary results of solar cells with 9.7% efficiency were obtained when it is activated by a gas mixture with the 12% partial pressure of CHClF2. Activation was made with a gases mixture of oxygen, nitrogen and CHClF2 into a quartz tube at 400°C for 30 minutes and total pressure 200 mbar. The complementary pressure of gas mixture was formed by 80% N_2 and 20% O_2. The solar cells were manufactured using layers of ZnO/CdS/CdTe deposited on the front contact of ITO. Both thin films ZnO and CdS were deposited by RF-Sputtering technique. While the CdTe layer was deposited by CSS technique. The back contact of solar cells has a bilayer of Cu/Mo, also deposited by RF-Sputtering technique. The effect of the gas mixtures on the parameters of the solar cell is discussed.

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Keywords: solar cell, gas mixture, activation process

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FACET-DEPENDENT CATALYTIC ACTIVITY OF NANOSHEETS-ASSEMBLED BiOI MICROSPHERES: REMOVAL OF AQUEOUS ENDOCRINE DISRUPTORS

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Photocatalysts with different exposed facets often exhibit different photochemical performances, but the underlying mechanisms are not fully understood. We synthesized two nanosheets-assembled bismuth oxyiodide (BiOI) microspheres with exposed (110) facets and (001) facets, respectively, to further investigate facet-dependent photocatalytic activity. Our experimental results showed that the BiOI microspheres with exposed (110) facets exhibited much greater catalytic activity than the one with exposed (001) facets in the degradation of bisphenol A (a model endocrine disruptor) under visible light irradiation. Density functional theory calculation revealed that the (110) facets can adsorb a greater amount of O_2 and thus form more $O_2^{\bullet-}$ and •OH radicals than the (001) facets. The electron spin resonance spectroscopy and radical scavenging experiments verified that the BiOI microspheres with exposed (110) facets could produce a greater amount of $O_2^{\bullet-}$ radicals than the one with exposed (001) facets, and more importantly, between the two BiOI products only the one with exposed (110) facets could generate •OH radicals directly. The facet-dependent radical formation mechanisms were previously unidentified. The findings of this study may have important implications for the understanding of facet-dependent photochemical performance of photocatalysts and for the design of novel catalytic materials with inorganic nanostructures.

Keywords: Facet-Dependent Catalytic Activity, Nanosheets-Assembled Microspheres, Photodegradation

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ABNORMAL DIELECTRIC RELAXATION IN NANOCRYSTALLINE $LaFeO_3$

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Nanocrystalline $LaFeO_3$ powders have been prepared by a polymerized complex method to investigate their magnetic and dielectric properties. Weak ferromagnetic behaviors and finite exchange bias (EB) effects were observed for the samples at room temperature, which can be well interpreted by a core/shell model. Dielectric spectra showed frequency dependent broad transitions between 300 and 600 K. Real and imaginary dielectric data were fitted with Vogel–Fulcher relationship and Arrhenius Law, respectively. The results implied that the dielectric relaxation behavior between 300 and 600K is a thermal activated process, which should be related to the point defects. Another dielectric peak observed at about 750 K was driven by magnetic-dielectric coupling effect.

Keywords: LaFeO3, dielectric relaxation, magnetic-dielectric coupling

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TiO_2 CATALYST TREATMENT FOR HYDROCARBON CONTAMINATED SOIL REMEDIATION

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Soil pollution by petroleum hydrocarbons can occur through accidental spills, during refining, exploration, production, and tank leakage. Petroleum pollution can have negative impacts on local soil ecosystems and human health (Adeniyi and Afolabi, 2002; Das et al., 2010). Environmental weathering processes such as volatilization, biodegradation, and dissolution attenuate lighter and chemically simpler components of crude oil, while leaving behind heavy hydrocarbon that are generally recalcitrant to the processes due to their relatively large and complex chemical structures (i.e., these molecules are hydrophobic, poorly soluble, and poorly available to microbiological attack). Photocatalysis as an oxidation process, can be able to transform heavy hydrocarbons to more water soluble, less toxic, and more bioavailable forms (Goi et al., 2006; Rittmann et al., 2002).

The present work show the use of TiO_2 as a photocatalyst for either directly decrease total petroleum hydrocarbon (TPH) residuals or accelerate the natural process that do so, or to combine with other processes like bioremediation. Compare to other technologies, TiO_2 photocatalytic oxidation have several advantages:(a) TiO_2 is an environmental friendly, health safe and cost effective material, (b) TiO_2 is a very effective photocatalyst that can continuous produce free radicals after one addition; (c) TiO_2 photocatalyst can be activated by sunlight; (d) TiO2 photocatalysis can be applied directly to soil without interfere to other bioprocess like landfarming or composting.

Contaminated soil from an aged oil spill site was used. The soil was first placed for three days under laboratory fume hood to volatilize any labile hydrocarbons, and moisture was adjusted at 50% Water Holding Capacity (WHC). From adjusted soil, samples of 80g each were treated as follow.

Treated soil. Soil sample with TiO_2 added on the surface and exposed to sunlight
Untreated soil. Soil sample was only exposed to sunlight
Dark control. Soil sample with TiO_2 added on the surface and covered to avoid contact with sunlight
All experiments were done in duplicate and were exposed to sunlight for 2, 4, 8, 12 and 24hours. After sunlight reaction, samples were extracted and were evaluated by the Gas Chromatography. With an exposure time of two hours, TPH removal of 32% was obtained.

Keywords: photocatalysis, hydrocarbons, soil

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PIEZOTRONICS AND PIEZO-PHOTOTRONICS

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Piezoelectricity, a phenomenon known for centuries, is an effect that is about the production of electrical potential in a substance as the pressure on it changes. Wurtzite structures such as ZnO, GaN, InN and ZnS, due to the polarization of ions in a crystal that has non-central symmetry, a piezoelectric potential *(piezopotential)* is created in the crystal by applying a stress. The effect of piezopotential to the transport behavior of charge carriers is significant due to their multiple functionalities of piezoelectricity, semiconductor and photon excitation. By utilizing the advantages offered by these properties, a few new fields have been created. Electronics fabricated by using inner-crystal piezopotential as a "gate" voltage to tune/control the charge transport behavior is named *piezotronics,* with applications in strain/force/pressure triggered/controlled electronic devices, sensors and logic units. *Piezo-phototronic effect* is a result of three-way coupling among piezoelectricity, photonic excitation and semiconductor transport, which allows tuning and controlling of electro-optical processes by strain induced piezopotential. The objective of this talk is to introduce the fundamentals of piezotronics and piezo-phototronics and to give an updated progress about their applications in energy science (LED, solar) and sensors (photon detector and human-CMOS interfacing).

Keywords: piezopotential, Wurtzite, Piezoelectricity

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NANOPHOTONICS FOR LIGHTING AND SOLAR CELLS APPLICATIONS

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Optical and electronics properties of semiconductor nanocrystals or quantum dots (QDs) and ceramic nanocrystals can be tuned by controlling the size and composition, such characteristics make them excellent candidate for the fabrication of optoelectronic devices such as displays, solid-state lighting, photodetectors and solar cells devices. Here in this work, it is discussed the electronic properties of such functional nanomaterials and proposed different architecture to optimize the charge transport and then enhancing the efficiency of LEDs and solar cells based on QDs and ceramic nanocrystals. Hybrid QD-LED and pLED combined with nanocrystals were proposed and analyzed the electro- and photo-luminescence properties in terms of size and composition of nanocrystals, and the appropriate architecture that include organic and inorganic hole and electron transport film to maximize the emission efficiency. The QD sensitized solar cells (QDSSC) is composed of a titanium dioxide (TiO_2) film that was synthesized with QDs by different methods such as successive ionic layer adsorption and reaction (SILAR), electrophoresis (EP) and colloidal nanoparticles. Titanium dioxide (TiO_2) films consisting of a 150 nm compact layer, a 6 µm layer made of 40 nm TiO_2 nanoparticles (NPs) and a 7 µm scattering layer made of 400 nm TiO_2 NPs, were composited with several QDs such as CdS, CdSe, PbS, ZnS, and Bi2S3. Multisensitized configurations such as PbS/CdS/ZnS and CdS/CdSe/CdTe/Zns were analyzed obtaining a photoconversion efficiency larger than 5%. This efficiency is due to the high photocurrent and FF improvement obtained by the correct combination of near infrared and visible light photoabsorption.

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Keywords: QDs, solar cells, QD-LED

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COMPOSITE AND HIERARCHICAL STRUCTURES IN ELECTRODE MATERIALS

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Lithium ion-batteries (LIBs) have been extensively used in various fields such as powering of electric vehicles, computers and electronic devices. The key components in LIBs include the electrodes, the separator and the electrolyte. To enhance the performance of the electrode materials in LIBs, composite and hierarchical structures have been introduced and manipulated. A V_2O_5 nanocomposite containing nano-sized V_2O_5 and carbon sheets have been achieved through a melting-diffusion technique followed by calcination. The composite exhibits high capacity and cycling stability used as a cathode material for LIBs. Hierarchical structures of MoO_2 and MoO_2/Mo_2C were formed when MoO_3 was reacted with mesoporous carbon at elevated temperatures, and the resulting solids show superior properties as anode materials for LIBs. Polypyrrole has been deposited on the surface of hollow silicon with mesopores to improve the capacity and cycling stability of the latter.

Apart from those for LIBs, electrode materials used in fuel cells and in electrolysis of water have also been prepared and manipulated. A graphene/C-fiber composite material was obtained through complexation of 1- and 2-dimensional carbon species, and this material catalyzes the oxygen reduction reaction (ORR) effectively when used as an electrode for fuel cell. A nano-Co entrapped in N-containing graphene sheet also catalyzes the ORR efficiently, whereas a MoS_2/graphene composite is distinctly active for catalyzing the hydrogen evolution reaction in the electrolysis of water.

Keywords: Composite, Hierarchical structure, Electrode materials

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LARGE-SCALE STORAGE FOR SUSTAINABLE ENERGY: INNOVATION ON MATERIALS AND DEVICE DESIGN

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México is facing the challenge of providing 25% of its electricity by renewable energy sources in less than 3 years. This commitment presents a major challenge in energy storage, due to (i) the possibility of an autonomous energy supply system based on sustainable sources such as solar panels and wind-generators, and (ii) the need of stability on the electrical power grid if those devices based on intermittent sources are connected. To respond to this challenge, innovation on material and device design is mandatory. At our institute, we are developing expertise and infrastructure on electrochemical and thermal energy storage. Electrochemical power sources such as batteries, fuel cells, super-capacitors, and photovoltaic devices have been studied for various groups at IER-UNAM, mostly without the constrain of load-levelling applications. Our expertise on carbon-based composites, one-dimensional core-shell structures, polyoxometalates, porous Si, and TiO_2, will be extended to other inorganic and organic materials, and complemented with numerical simulation studies, to accelerate the development of high performance materials and bridge the gap between nanoscale materials and macroscale devices. The most recent advances of our efforts will be presented and discussed in detail during the talk.

Keywords: Large-scale storage, sustainable energy, nanomaterials

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CdTe/CdS SOLAR CELL ACTIVATED WITH $MgCl_2$

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In previous works, we reported high efficiency CdTe solar cells of 0.21 cm^2 area, which were obtained using Argon–$CHClF_2$ gas mixture and oxygen in the activation processes[1]. In order to understand the influence of each component of this gas mixture, we prepared three sets of samples with different mixtures. It was shown that the oxygen incorporation to Argon–$CHClF_2$ gas mixture leads to significant improvement in the Jo, Jsc and Voc parameters, as well as the spectral shift to lower energy and higher EQE amplitude. These changes are strongly correlated with the PL spectra[2]. Keeping our work in the technological procedures of CdS/CdTe solar cells; we investigated the effect of annealing in $CHClF_2$–O_2 gas mixture on morphological and chemical properties of thin films CdTe deposited by conventional close space sublimation (CSS). Annealing was done at 400 °C for 5 min in a mixture of $CHClF_2$ and O_2 with partial pressures of 50 and 160 mbar, respectively, and to reach a total pressure of 800 mbar the annealing chamber was filled with Ar. effects of thermal annealing under Ar–$CHClF_2$–O_2 gas mixture on the morphological and chemical properties of CdTe thin films grown by the CSS process were investigated. This annealing resulted in the formation of $CdCl_2$ grains distributed along the grain boundaries and forming clusters in the thin film surface. The inclusion of O_2 gas in the annealing atmosphere promoted the incorporation of Cl in the bulk of the film.
Additionally, in this work, the CdTe/CdS solar cell activation was performed with $MgCl_2$ saturated solution. The annealing was performed at 400 °C in dry air for 30 minutes. The ZnO, CdS and back contact films were prepared by RF sputtering, while the CdTe film was deposited by conventional CSS. The solar cell activated with $MgCl_2$ had an efficiency of 11%; open circuit voltage, short circuit current and fill factor were 822 mV, 18.21 mA/cm^2 and 72.6%, respectively, in an device with area of 0.5 cm^2. The FE-SEM image and the XRD analysis showed MgO formation on CdTe surface after activation process.
Acknowledgements: This work was supported by CONACYT-SENER-SUSTAINABLE ENERGY (Mexico) under the CeMIE-Sol PY-207450/25 agreement. The measurements were carried out in LANNBIO CINVESTAV-Merida with the support of the Yucatan FOMIX-2008-108160, CONACYT LAB-2009-01 and CB2012 No. 123913 / 178947 projects. The authors thanks W. Cauich, D. HUerta and D. Aguilar by thecnical support and L. Pinelo for her help as a secretarial assistant. E. Hernandez-Rodriguez acknowledges the financial support of CONACYT-Mexico for postdoctoral stay at the CINVESTAV-Merida (205 760).
Keywords: CdS/CdTe Solar Cells, Different Activation Process, High efficiency

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RECENT DEVELOPMENT OF FUNCTIONAL CRYSTALS IN CHINA

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Crystals are long distance order solid materials in which those possess functional properties such as laser, nonlinear optical, piezo-electrical etc. are called functional crystals. Artificial crystals are high tech materials with high purity and perfection made for desired applications, such applications include mainly functional properties which can realize transformations of different energy forms e.g. sonic, light, heat, electrical, magnetic and force and so on. In modern science and technology, they are playing key roles, and are called functional crystals. Functional crystals can be divided to laser, NLO, electro-optical, piezoelectric, pyroelectric, and so on according its main effect and application. In addition, the most of substrates for semi-conductors are also functional crystals. Although the volume of the crystal in the equipment is small, but the function of the crystal is very important.

Large size and high quality garnet, including neodymium and other rare earth ions doped crystals are still keep the priority position for the applications of laser medium. The research and testing application of transparent laser ceramics and micro-crystalline glasses are going forward. A series of micro-chip laser crystals are developed to meet the needs of miniature lasers. Different kinds of nonlinear optical crystals which can be well used in near IR- visible – ultraviolet spectroscopic regions are developed meeting the requirements and new nonlinear optical crystals can be used in far infrared to THz regions are the topics for recent developments in this field. To meet the ever growing needs in mid-IR e.g. near 2μm, directly pumped laser crystals and Raman shift crystals and mid-IR NLO crystals are three ways to achieve. Along with the development of large size KDP and DKDP crystals, large size LBO and YCOB crystals are attracted many attentions. And more attention would be paid for crystal growth technology in order to mass produce high quality crystal in low costs.

Scintillator crystals are very important in high energy physics and medical diagnosis. The development in this field focus on the design and growth of new crystals with excellent properties and expending the applications.

Now days, the intension of microstructure physics becomes more abundant with strong application background than ever before. The microstructure photo-electronic functional materials is the cross section of material science, condense state physics and photo-electronic technology with deep scientific and application contents. A big progress in the research on dielectric superlattice has been made in both fundamental and technology recent years. In this review, the recent progress of functional crystals in China is summarized, especially for those used in applications.

Keywords: Functional crystals, growth, application

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SOLAR ENERGY CONVERSION SYSTEMS BASED ON PHOTOELECTROCHEMISTRY AT NANOMATERIALS

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In this presentation, an overview will be given of the research in our group in the Department of Applied Physics at CINVESTAV-Mérida in the general theme of conversion of solar energy using nanomaterials. In particular, research focuses on three subjects: (i) conversion to electricity (photovoltaics) using ZnO and TiO_2 nanomaterials and photoelectrochemistry, as in the dye-sensitized solar cell; (ii) conversion to (electro)chemical energy in the form of the clean fuel hydrogen by solar water splitting using novel metal oxide nanomaterials; (iii) conversion to heat for processes using thin, selective coatings.

In the first subject, several examples will be presented of the influence of nanomaterial morphology on the electron transport and recombination mechanisms, of the effect of the dye binding chemistry on ZnO, and the effect of redox couple on cell voltage. We have also modeled cell performance using either the continuity equation for electrons or random walk simulations, and some results will be presented, including an extension to organic photovoltaics. Initial results on the fabrication of larger area sub-modules will be shown. We have also started research on the perovskite-based solar cells, and preliminary results will be presented. In the second subject, the principles governing solar water splitting will be discussed, and initial results on novel metal oxide materials for photoreduction and photooxidation will be presented. In the third subject, the conversion of solar energy to usable heat using thin, selective coatings prepared by electrodeposition and sputtering will be discussed, and results electrodeposited coatings will be presented.

Keywords: dye-sensitized solar cell, water splitting, selective coatings

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FLEXIBILITY-BASED ORDERLY STRUCTURE ARRAYS FOR ENERGY STORAGE APPLICATION

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Lightweight and flexibility is one of the most important development trend of portable electronics, and energy storage device is the core-block of the portable electronic products. Therefore, whether flexible portable electronics become popular depends on improving the technology, especially by developing the flexible high-performance energy storage devices. Supercapacitors are a new type of energy storage device between static capacitor and secondary batteries. the promising application of supercapacitors in the fields such as mobile telecommunication, information technology, consumer electronics, electric vehicle, aviation, and military force, have been attracting more and more attention throughout the world. Herein, we firstly report a cost-effective and simple strategy for direct growth of hierarchical $ZnCo_2O_4/MnO_2$ composite nanocone forests (NCFs), and their application as a binder-free electrode for high-performance supercapacitors. $ZnCo_2O_4$ NCFs were synthesized on a 3D porous Ni foam via a hydrothermal process, on top of which a MnO_2 film was deposited in a carbon-assisted reaction process. MnO_2 was chosen as the “shell” for its low cost, low toxicity and natural abundance. The unique hierarchical core/shell hetero-nanostructure is expected to deliver exceptional electrochemical performance. $ZnCo_2O_4/MnO_2$ nanocone forests with a mesoporous, hierarchical core-shell structure and a large surface area were hydrothermally grown on 3D nickel foam. The supercapacitor electrodes prepared from the unique structure exhibits exceptional specific capacitances of 2339 and 1526 F g^{-1} at current densities of 1 and 10 A g^{-1}, respectively, and long-term capacity retention of ~95.9% after 3000 cycles at 2 A g^{-1}.

Keywords: Supercapacitors, high-performance energy, nanocone forests

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MONODISPERSE CdS SPHERES SYNTHESIZED BY MICROEAVE HEATING FOR HYBRID SOLAR CELL APPLICATIONS

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Cadmium sulfide (CdS) has showed to be a good electron conductor for solar cell applications. In the case of CdS nanoparticles (CdS-n), the particle size and properties depend largely on the synthesis methodologies. In this work, CdS-n were synthetized by microwave heating using thioacetamide (TA) or thiourea (TU) as sulfur sources. The obtained CdS-n(TA) showed a random distribution of hexagonal particles and contained TA residues. The residue impurities originated the charge carrier recombination process and caused a low photovoltage (V_{oc}, 0.3 V) in the hybrid solar cells formed by the inorganic particles of CdS-n(TA) and poly(3-hexylthiophene) (P3HT). Under similar synthesis conditions, in contrast, CdS-n synthesized with TU consisted of monodisperse spheres of size of 40 to 140 nm as the solution pH was low (8.4–8.8). The efficient and uniform heating by microwave chemistry accelerated the hydrolysis of thiourea in pH lower than 9 and produced monodisperse spherical CdS-n(TU) nanoparticles. Furthermore, they showed a good dispersion in the nonpolar P3HT solution, leading to a V_{oc} of about 0.6–0.8 V in the resulting CdS-n(TU) : P3HT solar cells. The results of this work suggest that the reagent source and solution pH in microwave synthesis are two important parameters that influence the physicochemical properties of the semiconductor products, as well as the photovoltaic performance of the corresponding hybrid solar cells.

Keywords: CdS nanoparticles, microwave heating, hybrid solar cells

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SOLVOTHERMAL SYNTHESIS OF HIGHLY VISIBLE-LIGHT-RESPONSIVE PERFORMANCE HETEROJUNCTION COMPOSED OF ONE-DIMENSIONAL TiO_2 NANOTUBES AND TWO-DIMENSIONAL BiOBr NANOPLATES

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Over the past decades, titanium dioxide (TiO_2) has caused significant attentions because of its widespread application in pollution abatement and exploitation of new energy resources due to their chemical and thermal stability, nontoxic. However, TiO_2 has no light absorption within the visible-light region and the high recombination rate of the photogenerated electron-hole pairs which greatly its practical application. To solve the problem above, many efforts have focused on the synthesis of various composites which incorporate with high performance visible-light-responsive semiconductors based on TiO_2. Furthermore, another promising approach is constructing one-dimensional (1D) nanotubes which show distinct chemical and unique structural behavior and ascendant photocatalysis activity compared with those of bulk materials.
Herein, we for the first time report a new facile and efficient method for preparing a novel finned-tube structured TiO_2@BiOBr heterojunctions (TBNTs) which the tunable uniform lamellar structured BiOBr nanoplates burgeoning the surface of 1D TiO_2 nanotubes. As clearly revealed by images of scanning electron microscopy (SEM), we successfully prepared the finned-tube structured TiO_2@BiOBr heterojunction photocatalyst. The surface of sulfonated TiO_2 nanotubes was uniformly assembled by BiOBr nanoplates. The images of and transmission electron microscopy (TEM) further confirmed that the TBNTs have hollow structure. Notably, the as-prepared TBNTs exhibit exceptional visible light photocatalytic activity and cycling capacity than the mechanical mixture of TiO_2-BiOBr, pure BiOBr nanoplates and TiO_2 nanotubes. This is due to the TBNTs consisting of the hollow nanotubes and nanoplates not only provides a large specific surface area, but also reduces the scattering of incident light as well as facilitates the mass transfer of contamination. Besides, the heterojunction displays better visible light response ability and facilitates photoinduced charge transfer and restrain photogenerated electron-hole pair recombination, both of them lead to the highly photocatalytic properties of the sample under visible light irradiation.

Keywords: TiO2@BiOBr, Heterojunction, Photocatalysis

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CARBON NANOMATERIALS FOR WATER REMEDIATION

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The Division of Environmental Sciences of IPICYT conducts projects related to the development and implementation of systems for treating effluents, emissions and industrial waste in order to mitigate environmental pollution and to generate alternative sources of energy. Much of the scientific work of the research group of Biological Processes and Environmental Engineering is related to the handling, use, treatment and reuse of water resources. Herein we present some approaches to surface modification of carbon materials with metal nanostructures, emphasizing those developed for water remediation. Throughout the presentation of carbon materials, examples related to the arsenic and fluoride removal from water will be mentioned [1,2].
On the other hand, the textural properties and surface chemistry of pristine and modified carbon materials are of obvious importance to electrochemistry. These materials have been used in analytical electrochemistry [3] and electrocatalytic activity for electron transfer reactions relevant to biological processes [4]. The terms adsorption and (electro)catalysis are going to be used herein to note some factors relevant for remediation or detection.
Another promising area for future advances in carbon materials that we have recently started is micro- or nanostructuring of thin films. With electrochemical methods permitting design and microfabrication of carbon thin films at the nanometric level and the variety of surface modifications there is a wealth of opportunities for nanoscale electrochemical devices, environmental barriers against corrosion and nanocomposites for energy storage based on carbon materials.

Keywords: Carbon based materials, water remediation, adsorbed materials

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BEHAVIORS OF NANO-SIZE TE PRECIPITATES IN CdZnTe AS X-RAY RADIATION DETECTOR MATERIALS

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Te nano-size precipitates are often observed in telluride II-VI stoichiometry compounds due to the high solubility of Te at high temperature in the crystal, which decrease greatly with lowering the temperature. Since II-VI compound semiconductors are normally used for several important opto-electronic devices and Te precipitates apply significant negative effects, the behavior as well as the underlining principles of Te precipitates in this kind of materials are of great importance for both the basic researches and the engineering applications. In the present talk, the origination and the evolution of Te precipitates will discussed based on the experimental observation taking CdZnTe as example. The precipitates first appear as disks through the accumulation of the point defects, especially Cd vacancies and Te anti-sites, which then grow into particles of nano-size as a kind of coherent precipitates during the post growth cooling process. In the annealing process, these precipitates will grow in size and evolution in morphologies through migration, combination and Ostwald ripening. At high temperature over the melting point of Te, these precipitates will be melted and change their form into polyhedrons depending mainly on the properties of the surrounding matrix. In the inhomogeneous thermal field, they will migrate upward the temperature gradient. The effects of the precipitates on the physical properties of some typical II-VI compounds will be also discussed.

Keywords: Te precipitate, nano-size, II-VI compound

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COLLOIDAL METAL NANOCRYSTALS FOR PLASMONIC CATALYSIS

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In this presentation, I will describe the synthesis of colloidal gold nanocrystals and discuss their plasmonic catalysis. I will mainly describe the syntheses of gold nanospheres, nanorods and nanobipyramids. Their syntheses are all based on seed-mediated growth. Fine size tuning is realized through mild oxidation and anisotropic overgrowth, which allows for precise control of the plasmon resonance energies. All of gold nanocrystals have very narrow size distributions. Their sizes and thus their localized plasmon energies can be readily varied over broad ranges by carefully controlling the synthetic conditions. I will present the attractive plasmonic features of these gold nanocrystals, including their tunable plasmon wavelengths over a wide spectral range, extremely large absorption/scattering cross-sections, and large enhancements of local electric fields and densities of photonic states.
The efficient use of solar energy has received wide interests due to the increasing energy and environmental concerns. Besides the tremendous efforts made on improving the efficiencies of photovoltaic devices, the exploration of new harvesting means will also be essential. A potential means in chemistry is sunlight-driven catalytic reactions. I will then describe the direct harvesting of light from the visible to near-infrared region for chemical reactions by use of plasmonic Au/Pd nanostructures, which serve simultaneously as an energy converter and a catalyst for Suzuki coupling reactions. The plasmonic excitation enables and accelerates the targeted catalytic reaction through plasmonic photocatalysis and plasmonic photothermal heating. The intimate integration of the plasmonic energy converter and the catalyst facilitates the efficient light energy conversion and utilization. Moreover, we have developed a general approach for uniformly coating semiconducting titania and ceria on monometallic and bimetallic Au-based nanocrystals through controlled heterogeneous nucleation and growth. Hybridization of gold and semiconductors in a nanoscale core/shell architecture can offer large active interfacial areas between the two types of materials and avoid aggregation and reshaping of the core plasmonic nanocrystal. Our method allows for control of the shape, size, and type of the metal core as well as the thickness of the semiconductor shell. Under resonant excitation, (gold nanorod core)/(titania shell) nanostructures can efficiently utilize photons with energies below the band gap of titania. They generate reactive oxygen species at efficiencies nearly 5 times those of the corresponding uncoated gold nanorods. (Gold nanocrystal core)/(ceria shell) nanostructures have been examined as the photocatalysts for the selective oxidation of benzyl alcohol to benzaldehyde under both broadband and monochromatic light. Our results demonstrate the visible-light-driven catalytic activity and reveal the synergistic effect on the enhanced catalysis of the gold/ceria nanostructures.

Keywords: Gold nanocrystals, Plasmon, Plasmonic catalysis

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HYDROGEN ISOTOPE SEPARATION IN METAL-ORGANIC FRAMEWORKS

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It is well-known that metal organic frameworks (MOFs) are interesting hydrogen storage materials due to their large surface area and partially due to strong adsorption sites. Due to the rather weak interaction between hydrogen and the framework and the low weight of hydrogen, quantum effects are very important for these systems. As hydrogen and deuterium have a very large mass ratio, their quantum effects, i.e. their zero-point energies, can differ substantially if adsorbed at particular sites in some framework materials.
In this presentation we will discuss two hydrogen separation mechanisms: In the first one [1], we observe a gating effect in a particular MOF – MFU-4 – in order to preferentially allow D_2 to penetrate into and through the framework. In the second one [2], observed in CPO-27 and MFU-4l, we use the zero point energy difference to preferentially adsorb D_2 over H_2. A temperature swing process, working at high temperatures (~100K), is proposed to separate deuterium hydrogen flue gas. Finally, we discuss tuning of our materials in order to enhance the hydrogen isotope separation.
Keywords: isotope separation, metal-organic framework, quantum effects

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SURFACE PLASMON ENHANCED OPTOELECTRONIC PROPERTIES OF SEMICONDUCTOR MATERIALS AND DEVICES

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Localized surface plasmons (LSPs) in conventional systems is a behavior of the collective oscillations of conduction electron in the metal nanoparticles when illuminated and excited by a proper wavelength light, and the resonance excitation of the LSPs induces large enhancement and confinement of local electric field in the vicinity of the metal nanostructures. And the LSPs have formed the basis of a wide range of nanophotonic research and technologies such as subwavelength optical waveguilding, light emitters and photovoltaic cells, surface plasmon enhanced fluorescence. In this review, we first introduce the intercoupling between the few-layer graphene and the LSPs of Ag nanoparticles, we found that the surface Raman intensity of graphene was increased nearly 7-times by the near enhanced electric fields of plasmonic Ag nanoparticles and meanwhile, the LSPs resonances of Ag exhibits a remarkable redshift and a 13-nm broading.

The graphene/metal nanoparticles hybrid structures can be adopted to enhance the emission of some semiconductors such as the ZnO nanorods, the InAs quantum dots, etc. We have found that the band edge emission of the ZnO nanorods/graphene hybrid structures with Au nanospheres was increased by approximately three times and the defect-related emission was significantly reduced compared with the prestine ZnO nanorods arrays. And for the InAs quantum dots, the optical properties can be significantly improved by incorporating the LSPs mechanism together with the graphene. Furthermore, efficiency of the solar cells especially the III-V GaAs-based solar cells can be obviously improved by light absorption enhancement via coupling with the plasmonic metal nanoparticles.

Keywords: Surface plasmon, Electric field enhancement, Optoelectronic properties

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PLASMONIC PROPERTIES OF ORDERED ARRAYS OF Ag AND Au NANOSTRUCTURES EMBEDDED IN SILICA FABRICATED BY A COMBINACIÓN OF NANOSPHERE LITHOGRAPHY WITH ION IMPLANTATION

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Colloidal silica particles are being intensively studied due to their potential applications in catalysis, intelligent materials, optoelectronic devices, photonic bandgap crystals, masks for lithographic nanopatterning. In nanoscale electronic, photonic and plasmonic devices, feature dimensions shrink towards a critical limit, and new experimental approaches have to be explored in lithographic patterning to create ordered arrays of metallic nanostructures with useful optical properties. Nanosphere lithography uses self-assembled monolayers of spherical submicrometer-sized silica particles prepared by sol-gel and deposited onto silica glass plates. This silica monolayer is then used as a mask to create regular arrays of nanoscale features in the sample by 1-2 MeV Ag and Au ion implantation. By this way, after removal of the silica particles and an adequate thermal annealing of the as-implanted samples, the formation of Ag or Au nano-objects embedded in silica plates was confirmed by the presence of the surface plasmon resonance in the optical absorption spectra. The size and shape of the array of metallic nanostructures were studied by electron microscopy. The amount of implanted ions was measured by Rutherford Backscattering Spectrometry. The long range order of the metallic nanoparticle assembly and its plasmonic properties were characterized by a Fast Fourier Transform study and optical absorption measurements, respectively.

Keywords: ion implantation, nanosphere lithography, plasmonic nanostructures

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NANOSCIENCE AND NANOTECHNOLOGY IN CHINA

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In the recent decade, the interdisciplinary field of nanoscience and nanotechnology has developed rapidly in China. In fact, China surpassed USA and took the global leadership around 2010/2011 in annual outputs of scientific publications in this field. Quality of works published by scientists in China has also been improving continuously and consistently. However, China still has to catch up in practical translation of research results into production and business. Comparison and analysis of this development trend with the counterparts in Mexico may likely enhance the efficiency of Mexico-China partnership in nanoscience and nanotechnology.

Keywords: Nanoscience, Nanotechnology, China

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NANOMXCN

Mexico-China Workshop on Nano: Materials/Science/Technology

August 10 - 17 . 2015 / Mexico

MEXICO - CHINA - HK

VISION

The vision of **NANOMXCN** is to promote academic and research collaboration between China, including Hong Kong and Mexico.

It is expected that this workshop could become the first of a series of scientific workshops and meetings hosted alternatively by both countries, that will result in a long term sustained effort to increase the scientific cooperation in nanomaterials, nanoscience and nanotechnology for critical applications of common interests to Mexico and China.

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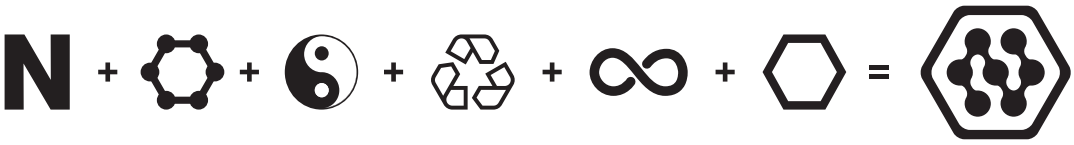

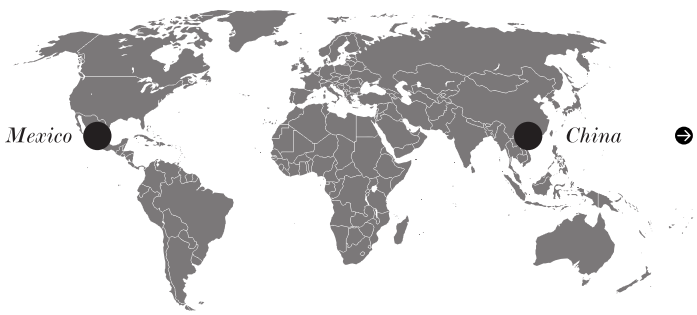

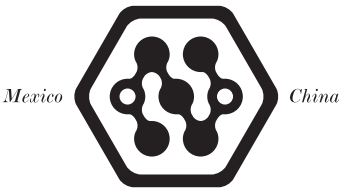

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