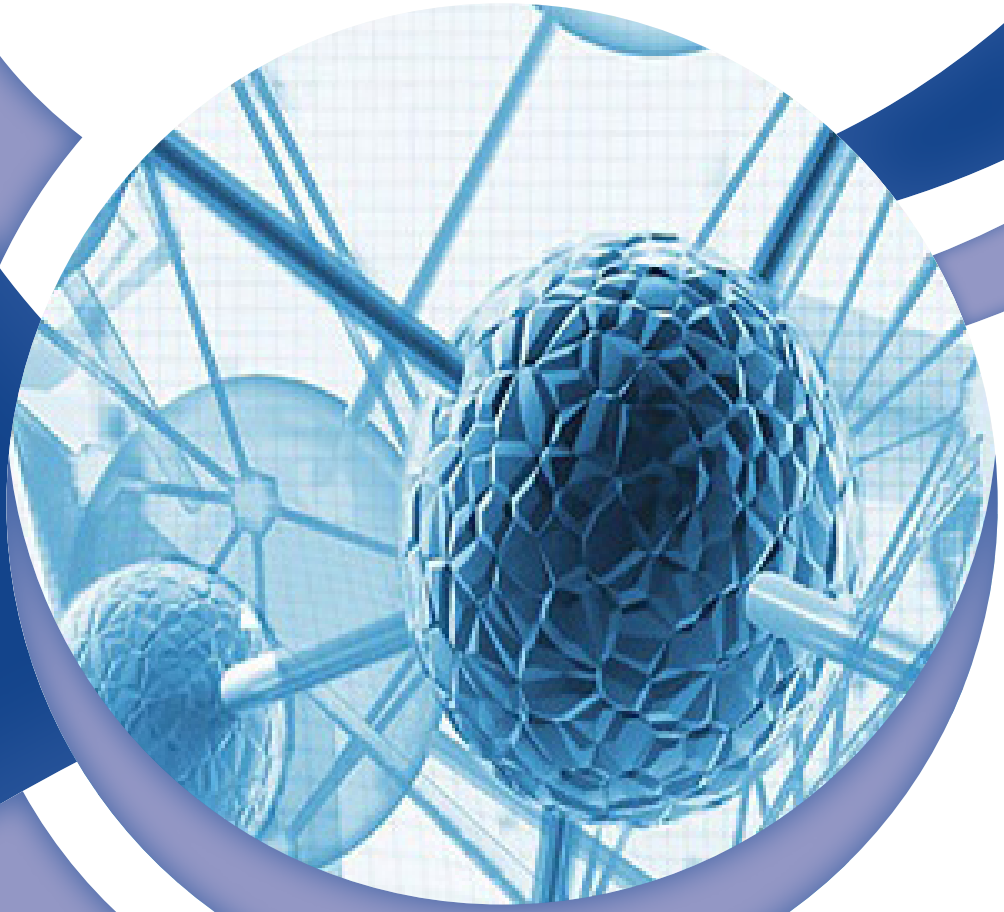

2nd World Congress on

Nanoscience and Nanotechnology

August 10-11, 2018 Osaka, Japan

Scientific Tracks & Abstracts

Day 1

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Hao Yu, J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

2nd World Congress on
NANOSCIENCE AND NANOTECHNOLOGY
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Dynamic magnetization of single domain nanomagnet

Hao Yu
Xi'an Jiaotong-Liverpool University, China

The dynamic magnetization of nanomagnets is significant to spintronic devices in terms of high speed and high-density storage technology or logic applications. The dynamics of the macrospin model of a single-domain nanomagnet is investigated in both analytical and numerical methods based on the Landau-Lifshitz-Gilbert equation which is a nonlinear differential equation describing the evolution of magnetization vector. The dynamic hysteresis, namely the magnetic switching under high frequency magnetic field with/without spin transfer torque is analyzed in terms of the evolution of the geometry of loop. The shape of static hysteresis loop is determined by the parameter of damping, meanwhile the shape evolution of dynamic hysteresis loop is dependent on the magnitude of field and frequency. Frequency dependent response with resonant peak has been found in the dispersion curve. The phase diagram is obtained to be able to have a clear picture of the dynamic magnetization of nanomagnets driven by periodic field or current.

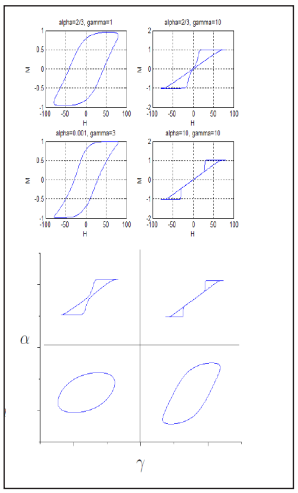

Figure-1: Phase transition of hysteresis due to γ and α.

Recent Publications

1. Yongping Liu, Dongchang Wu, Fenfen Wei, Tao Kong, Hao Yu, Jinping Zhang and Guosheng Cheng (2012) Potassium element modulation of optical and electrical properties of the quasi-one-dimensional KxBi1-xFeO3-y system. *CrystEngComm;* 14: 7189-7194.
2. X W Dong, Y J Wu, J G Wan, T Wei, Z H Zhang, S Chen, H Yu and J M Liu (2008) Phase shift of electric-field-induced magnetization in magnetoelectric laminate composite. *Journal of Physics D: Applied Physics;* 41(3): 035003.

Biography

Hao Yu is an Associate Professor at Xi'an Jiaotong-Liverpool University. He has received his PhD degree in Condensed Matter Physics from Nanjing University in 2007. He had worked for Suzhou Institute of Nano-Tech and Nano-Bionics of Chinese Academy of Sciences from 2007 to 2009. He had joined Xi'an Jiaotong-Liverpool University in February 2010. His research interests include spintronics and complex network.

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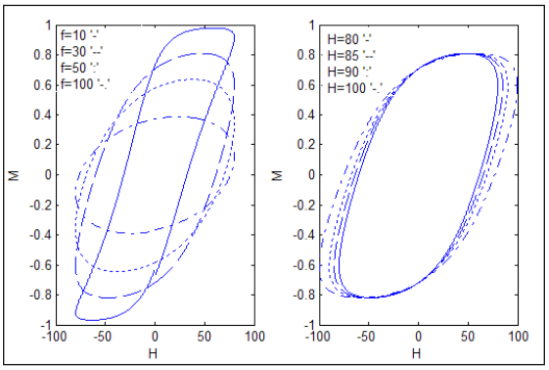

Figure-2: Hysteresis evolution in terms of frequency (f) and field (H).

Jin Zhang, J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

Engineering carbon-based nanostructures for DNA sensor

Jin Zhang
Western University, Canada

Carbon-based nanomaterials including graphene, graphene oxide and carbon quantum dots have shown special luminescence properties. This paper focuses on building an aptamer sensor by using Carbon quantum dots (C-dots) and graphene oxide nanosheet. C-dots were synthesized by microwave-assisted process. The average particle size of C-dots is estimated at 23±5 nm. The fluorescence emission of C-dots shifts from 450 to 600 nm when excitation increases from 350-450 nm. The target-DNA is conjugated onto C-dots by different strategies. Meanwhile, the capture-DNA is modified on the surface of graphene oxide. The target-DNA conjugated with carbon dots can be hybridized with the capture-DNA conjugated with graphene oxide by hydrogen bonds between adenine and thymine, which can cause the fluorescence quench of C-dots. The fluorescence intensity of C-dots modified with target-DNA as a function of the concentration of capture-DNA modified graphene oxide nanosheet is investigated. The results indicate that this solution-based sensor can quickly measure the target-DNA in the range of 1 μg/mL to 100 μg/mL.

Biography

Jin Zhang is a tenured Associate Professor in the Department of Chemical and Biochemical Engineering in the University of Western Ontario, Canada. Her research activities are related to the development of new biocompatible nanocomposites with enhanced chemical and physical properties. He has published over 66 peer-reviewed papers, including Biosensor and Bioelectronics, *Journal of European Cells and Materials, Journal of Nanobiotechnology, Journal of Chemistry Materials B,* etc. She has 3 issued patents and one patent application. She has gained many awards, including early Research Award of Ontario, the Grand Challenges Canada-Canadian Rising Stars in Global Health, outstanding mid-career achievements in Nanoscience and Nanotechnology in Ontario, etc.

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Jonathan P Hill, J Nanomed Nanotechnol 2018, Volume 9
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Self-assembly of porphyrin and heteroacene organic nanostructures

Jonathan P Hill
National Institute for Materials Science, Japan

Supramolecular arrangement of porphyrins and other molecules has great potential in the fields of molecular information storage and sensing due to their ease of deposition and good chemical and thermal stabilities. In particular, porphyrins of relatively large molecular weights can be applied in thermal deposition while tetrapyrrole molecules have had an extensive synthetic chemistry developed which enables synthesis of complex derivatives. In this work, we present complementary examples of porphyrin nanoarchitectonics. Starting from simple symmetrical phenol derivatives, we describe the effects of steric hindrance about the respective hydroxyl groups and also the effects of conformational variation on the self-assembly structures. We also investigated fabrication of binary molecular monolayers using two different porphyrin molecules Tetrakis (3, 5-di-t-butyl-4-hydroxyphenyl) porphyrin and Tetrakis (4-pyridyl) porphyrin by deposition in ultrahigh vacuum. This leads to 2 unusual heteromolecular monolayer structures were observed with one exhibiting good separation of molecules within the monolayer. Meanwhile, a synthetic nanoarchitectonic approach was used to prepare self-assembled molecular nanowires at a mica substrate. The nanowires could be observed growing using Atomic Force Microscopy (AFM) and the network structures of the nanowires can be influenced by manipulation using the AFM probe tip. Formation of molecular monolayers with chromophores positioned remote from the substrate surface will also be discussed. Additionally, the synthesis and self-assembly at surfaces of novel heteroacenes will be described and the potential importance of these materials in several applications will be discussed.

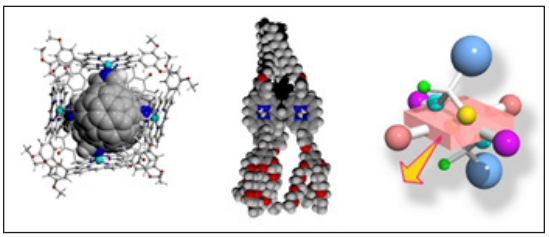

Figure-1: Self-assembled nanostructured aggregates of porphyrins, fullerenes and other chromophores.

Recent Publications

1. Webre W A, Gobeze H B, Shao S, Karr P A, Ariga K, Hill J P, D'Souza F (2018) Fluoride-ion-binding promoted photo-induced charge separation in a self-assembled C60 alkylcation bound bis-crown ether-oxoporphyrinogen supramolecule. *Chemical Communications*. DOI: 10.1039/C7CC09524D.
2. Kong H, Yang S, Gao H, Timmer A, Hill J P, Díaz Arado O, Mönig H, Huang X, Tang Q, Ji Q, Liu W, Fuchs H (2017) Substrate-mediated C-C and C-H coupling after dehalogenation. *Journal of American Chemical Society*; 139: 3669-3675.

Biography

Jonathan P Hill is Chief Scientist at the Supermolecules Group, National Institute for Materials Science, Japan. His main research interests are the synthesis and assembly of organic molecular and nanostructures for potential applications in molecular electronics, sensing and related fields. He is co-author of more than 350 published papers and 20 patents on these subjects. He is also an author of more than 300 invited and contributed presentations at international conferences and university seminars.

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Notes:

Seung Hwan Ko, J Nanomed Nanotechnol 2018, Volume 9
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Flexible sensors and actuators by metal nanowire percolation networks

Seung Hwan Ko
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It is well expected that the future electronics will be in the form of wearable electronics. Google's smart glass and Apple's iWatch are the first generations of wearable electronics. However, they are still mainly composed of rigid electronics even though human body is soft and elastic. To realize more meaningful and practical wearable electronics, electronic components should be stretchable or at least flexible. We have developed various hierarchical multi-scale hybrid nanocomposites for highly stretchable, highly flexible or highly transparent conductors ultimately applied for wearable electronics applications. The hybrid nanocomposite combine the enhanced mechanical compliance, electrical conductivity and optical transparency of small CNTs (d~1.2 nm) and the enhanced electrical conductivity of relatively bigger AgNW (d~150 nm) backbone to provide efficient multi-scale electron transport path with AgNW current backbone collector and local CNT percolation network. Additionally, this approach combines materials that stretch and structure that stretch strategies to demonstrate highly stretchable conductor. As a feasibility test of our hierarchical multi-scale hybrid nanocomposite stretchable and transparent conductor research, we have demonstrated a highly stretchable LED circuit and a touch panel. This is just a very tiny fraction of application area of our works. We expect our approach can be applied to huge range of wearable electronics elements such as high performance displays, solar cells, sensors, touch screens in flexible and stretchable forms and ultimately to all future electronics. Therefore, this research results have a great ripple effect on various future electronics development and will be sustainably studied. Considering the huge impact, originality and advantages of our research results, this paper provides basic research results and becomes a classical reference for future wearable electronics field.

Recent Publications

1. J H Park, S Han, D Kim, B K You, S Hong, J Seo, J Kwon, C K Jeong, H J Park, T S Kim, S H Ko and K J Lee (2017) Plasmonic-tuned flash cu nano-welding for ultrafast photochemical-reducing and interlocking on flexible plastics. *Advanced Functional Materials*; 27(29): 1701138.
2. K K Kim, S Hong, H M Cho, J Lee, Y D Suh, J Ham and S H Ko (2015) Highly sensitive and stretchable multi-dimensional strain sensor with prestrained anisotropic metal nano-wire percolation networks. *Nano Letters;* 15(8): 5240-5247.

Biography

Seung Hwan Ko is a Professor in Applied Nano and Thermal Science Lab, Mechanical Engineering Department, Seoul National University, Republic of Korea. Before joining Seoul National University, he was a Faculty at Graduate School of EEWS (Energy, Environment, Water and Sustainability), KI Nano-century and Department of Mechanical Engineering at KAIST (Korea Advanced Institute of Science and Technology), Republic of Korea. He has completed his PhD degree in Mechanical Engineering from University of California, Berkeley in 2006. He has worked as a Researcher at Lawrence Berkeley National Lab until 2009. His research interest is laser assisted nano/micro-fabrication process development, laser nano-material interaction, low temperature process development for flexible, stretchable and wearable electronics and crack assisted nano-manufacturing.

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Angeline Poulon Quintin, J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

Innovative fast supercritical fluids synthesis of thermoelectric $CoSb_3$ nanoparticles

Angeline Poulon Quintin[1,2]
[1]Institute of Chemistry of Condensed Matter of Bordeaux, France
[2]University of Bordeaux, France

Thermoelectric (TE) materials have received a lot of interest for decades for power generation applications in waste heat recovery or energy harvesting by conversion of waste thermal energy into useful electricity. The performance of TE devices depends on the dimensionless figure of merit $ZT=(\alpha^2\sigma/\kappa)\,T$, where α is the Seebeck coefficient, σ and κ the electrical and thermal conductivities, respectively and T is the absolute temperature. Many TE materials have been developed such as Bi_2Te_3, PbTe, Mg_2Si, Zn_4Sb_3, filled skutterudites and SiGe. Among them, skutterudite compounds MX_3 (M=Co, Rh or Ir; X=P, As or Sb) crystalized in the bcc structure Im3 are promising TE materials. The binary skutterudite CoSb3 exhibits a large Seebeck coefficient and a high electrical conductivity. However, its high thermal conductivity makes it difficult to be an efficient TE material. Nanostructuration is an effective approach to lower thermal conductivity. While physical methods allow high purity microparticles synthesis, solution routes are the most effective methods to produce $CoSb_3$ nanoparticles with a few nanometer size and have advantages of low cost, low processing temperature (<300 °C) and high reproducibility, allowing possible large-scale production, even if they suffer from long reaction time, multiple reaction steps and impurity presence. Supercritical fluid routes have emerged from the two last decades as novel efficient approaches to synthetize metal nanoparticles with the control of their physicochemical properties as size, morphology, crystallographic structure and composition. We report the first fast and continuous supercritical fluids synthesis of cobalt antimony intermetallic nanoparticles (4-5 nm) with a high reliability.

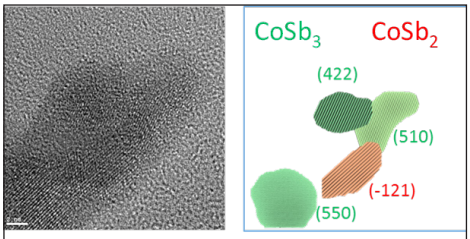

Fig 1. HR-TEM image of cobalt antimony nanoparticles synthetized and their composition and orientation after mathematical treatment.

Recent Publications

1. S Allain, S Gaudez, G Geandier, J C Hell, M Gouné, F Danoix, M Soler, S Aoued and A Poulon Quintin (2018) Internal stresses and carbon enrichment in austenite of quenching and partitioning steels from high energy X-Ray diffraction experiments. *Materials Science and Engineering A*; 710: 245-250.
2. F Balima, F Bellin, D Michau, O Viraphong, A Poulon Quintin, U C Chung, A Dourfaye and A Largeteau (2018) High pressure pulsed electric current activated belt type (HP-SPS) for material processing. *Materials and Design*; 139: 541-548.

Biography

Angeline Poulon Quintin is an Associate Professor at the University of Bordeaux and ICMCB. She has a long experience in the correlation between process parameters, microstructure and properties of structural and functional materials. Her current interests range from the search for innovative multifunctional coatings to the development of green processes to elaborate intermetallic compounds for applications in energy, aerospace and aeronautical industries. She is a Specialist in fine characterization with an extended recognized experience in electronic microscopy and physico-chemical techniques. She has co-authored 31 peer-reviewed articles, 37 oral presentations, 12 invited conferences and 4 patents.

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Haruki Yamane et al., J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

Magneto-plasmonics on perpendicular magnetic nanostructures consisting of CoPt nano-layer and noble-metal nanoparticles

Haruki Yamane[1] and Masanobu Kobayashi[2]
[1]Akita Industrial Technology Center, Japan
[2]Chiba Institute of Technology, Japan

The interaction between Magneto-Optical (MO) activities and plasmons has been intensively investigated from fundamental and applied viewpoints. Improvement of the MO effect is desirable in practical applications such as information storage systems, telecommunications and chemical and biological sensors. In this presentation, the MO properties of perpendicular magnetic nanostructures consisting of a hexagonal close-packed Co80Pt20 nano-layer and noble-metal (Ag or Au) nanoparticles were investigated under polar Kerr measurement conditions. The samples exhibited an unusual MO hysteresis loop in which the Kerr rotation angle increased at a low magnetic field; this effect was observed at a different wavelength region for the CoPt-Ag and CoPt-Au samples. The nanostructures consisted of two magnetic regions of CoPt layers formed on the nanoparticles and on the underlayer. The increase in the Kerr angle was induced by the antiparallel magnetic alignment of these CoPt layers. The opposite MO polarity on the CoPt nanostructures was suggested also in a micro-MO observation using scanning near-field polarized optical microscopy. The Ag and Au nanoparticles induced the MO phase reversal at a different wavelength region for each plasmon excitation. The MO behaviors on the CoPt nanostructure are attributed to the influence of localized surface plasmons excited on the noble-metal nanoparticles. The magneto-plasmonic activities on the nanostructures were also changed by the underlayer material and the external environmental conditions. We have demonstrated the magneto-plasmon sensor consisting of the CoPt-Ag by detecting the change in external environment (optical index) and a new detection parameter using MO activities has been proposed. The perpendicular magnetic nanostructures are expected to provide a new type of probe for chemical and biological sensing applications.

Recent Publications

1. H Yamane, K Takeda and M Kobayashi (2016) Magneto-optical enhancement and chemical sensing applications of perpendicular magnetic CoPt/Ag stacked structures with a ZnO intermediate layer, materials transactions. *The Japan Institute of Metals;* 57: 892-897.
2. H Yamane, K Takeda and M Kobayashi (2015) Magneto-plasmonics on perpendicular magnetic CoPt-Ag nanostructures with ZnO intermediate thin layers. *Applied Physics Letters*; 106: 052409.

Biography

Haruki Yamane has completed his BSc degree in Physics from Ehime University in 1987 and his PhD from School of Engineering, University of Tokyo in 1996. His research interests include magnetic properties of nanostructures and photonic devices using magneto-optical activities. He is a Member of the Japan Society of Applied Physics, The Magnetic Society of Japan and The Japan Institute of Metals and Materials. Currently he is working as a Research Officer at Akita Industrial Technology Center, Japan.

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Skin inspired electronic skins for wearable healthcare devices

Hyunhyub Ko
Ulsan National Institute of Science and Technology, Republic of Korea

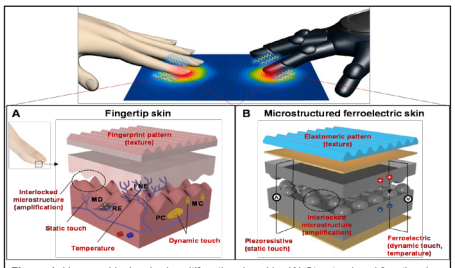

Figure 1. Human skin–inspired multifunctional e-skin. (A) Structural and functional characteristics of human fingertips. (B) Flexible and multimodal ferroelectric e-skin.

Flexible physical sensors with high sensitivities have gained great attentions in the fields of wearable devices, robotic skins and biomedical diagnostics. In human fingertip skins, fingerprint patterns and interlocked epidermal-dermal micro-ridges have critical roles in amplifying and transferring tactile signals to various mechanoreceptors, enabling spatio-temporal perception of various static and dynamic tactile signals. Here, mimicking the structures and functions of fingertip skin, we introduce highly-sensitive, multifunctional and stretchable electronic skins. Inspired by the interlocked microstructures found in epidermal-dermal ridges in human skin, piezoresistive interlocked micro-domes are employed for the demonstration of stress-direction-sensitive, stretchable electronic skins. We show that interlocked micro-dome arrays possess highly direction-sensitive detection capability of various mechanical stimuli including normal, shear, stretching, bending and twisting forces. We also demonstrate that ferroelectric skins with fingerprint-like patterns and interlocked microstructures can detect and discriminate multiple spatio-temporal tactile stimuli including static and dynamic pressure, vibration and temperature with high sensitivities. For applications, we demonstrate that stretchable electronic skins attached on the human skin can be used as wearable healthcare monitoring devices, which are able to distinguish various mechanical stimuli applied in different directions, selectively monitor different intensities and directions of air flows and vibrations, and sensitively monitor human breathing flows and voice vibrations. In addition, dynamic touch sensing ability is employed for the precise detection of acoustic sounds, and discrimination of various surface textures. Finally, for multifunctional wearable and skin-attachable devices, we show smart adhesive pads with temperature-responsive adhesion properties and force-dependent color changing touch screens based on mechanochromic surface coatings.

Recent Publications

1. Y Lee and H Ko et al. (2018) Flexible Ferroelectric Sensors with Ultrahigh Pressure Sensitivity and Linear Response over Exceptionally Broad Pressure Range. *ACS Nano;* 12: 4045.
2. M Ha and H Ko et al. (2018) Skin-Inspired Hierarchical Polymer Architectures with Gradient Stiffness for Spacer-Free, Ultrathin and Highly-Sensitive Triboelectric Sensors. *ACS Nano*; 12: 3964.

Biography

Hyunhyub Ko is currently an Associate Professor in Energy and Chemical Engineering at Ulsan National Institute of Science and Technology. He has received his PhD in Materials Science and Engineering from Georgia Institute of Technology in 2008, MS in Materials Science and Engineering from Iowa State University in 2004, MS in Chemical Engineering from Yonsei University in 2001 and BS in Chemical Engineering from Chung-Ang University in 1999. From 2008 to 2010, he worked at University of California, Berkeley as a Postdoctoral Fellow in the Department of Electrical Engineering and Computer Sciences. His research interests are in the area of functional nano-materials for flexible electronics, sensors and energy devices.

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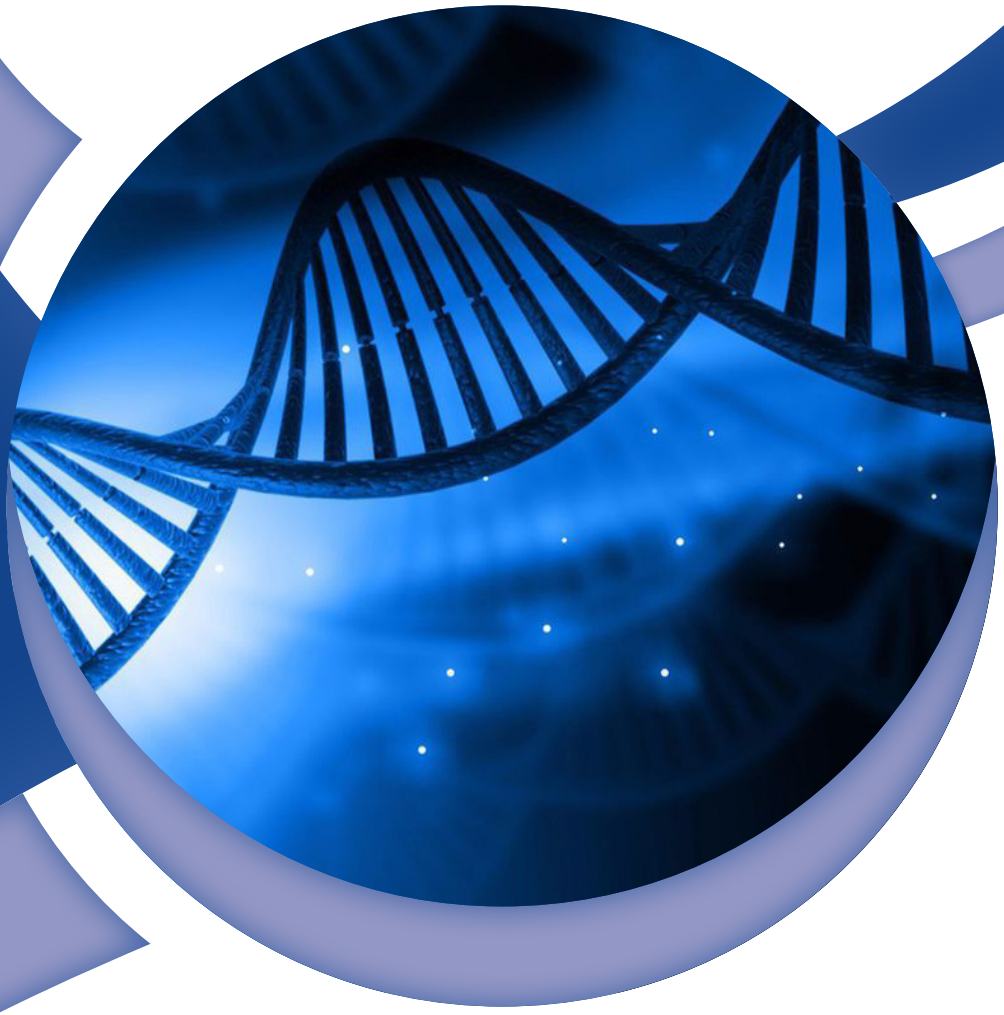

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Video Presentation

Day 2

Shengyong Xu et al., J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

Impacts of nanoscale events on the neural functions of lives

Shengyong Xu and Jingjing Xu
Peking University, China

In this talk, we will show that synapse may play a crucial role in memory function and brain working mechanism. We presented a model, stating that data for memory are stored and retrieved in the form of a strongly connected network of neurosomes, patterns of which form topological 2D codes in layered neurons in a brain. In different reaction modes, a chemical synapse or a mixed synapse could turn into an electrical synapse. These transitions, together with an echoing process between 2 neighboring layers of neurosomes could establish temporary memory and long-term memory information in the forms of neurosome-based 2D codes. The size of a synapse is only around one micrometer and the gap between 2 connecting synapses is of nanometer scale. Why some connections could last for 10-50 years, while some others only last for seconds? Are there reverse processes so that strongly connected synapses could depart, thus leading to fresh functions of a brain? These are interesting open questions. We will also show that a transient ion current passing through a protein channel embedded in a membrane creates a pulsed, soliton-like Electromagnetic (EM) wave. These kinds of EM pulses propagate well in the networks of dielectric phosphorous lipid bilayers. In an electrolyte-membrane-electrolyte structure defined as soft-material waveguide, an EM wave may transmit with a higher efficiency than in cytoplasm. Such a scenario explains better phenomena observed in the nature, such as the simultaneous phenomenon observed in prey behavior of flytraps and discharge of electric eels, where a big amount of reactors in a biosystem almost simultaneously respond to a single input signal and complete reactions within milliseconds. We will also discuss the impacts of nanoscale events on the neural functions of lives.

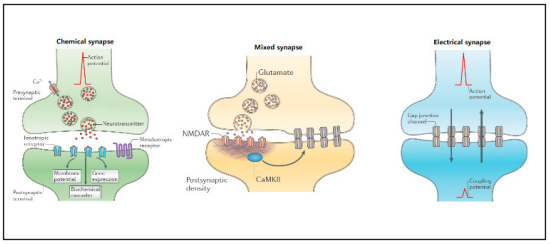

Figure-1: Schematic models for 3 major types of synapses: Chemical, Mixed and Electrical synapses. Under certain conditions, these synapse may transform from one type to the other, thus leading to significant impacts on the neural functions of lives, e.g., in establishing a piece of memory.

Recent Publications

1. J J Xu, F Yang, D H Han and S Y Xu (2018) Phenomena of synchronized response in biosystems and the possible mechanism. *Biochemical and Biophysical Research Communications*; 496(2): 661-666.

Biography

Shengyong Xu has completed his BSc in Physics from Peking University in 1988 and PhD degree from Department of Physics, National University of Singapore in 1999. He is currently a Professor with Department of Electronics, School of Electronics Engineering and Computer Sciences, Peking University. He has published more than 200 journal and conference papers. His group currently works on the physics mechanism of electrical communication among neuron cells and normal cells, brain modeling, memory mechanism of a brain, temperature sensing at the cell and sub-cell levels, etc.

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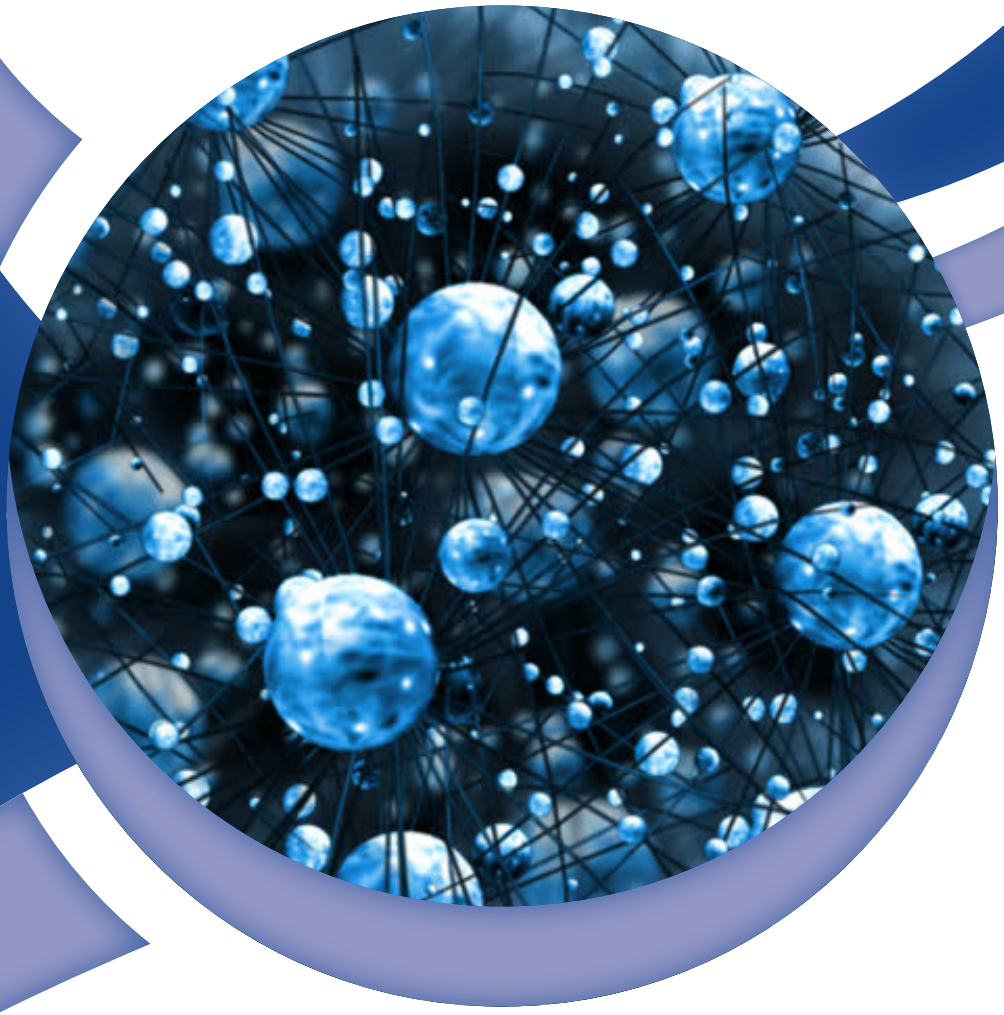

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Young Researchers Forum

Day 2

Yubiao Niu et al., J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C6-082

Enhanced catalytic activity of MoS_2 nanoclusters for the hydrogen evolution reaction by Ni-doping and sulfur enrichment

Yubiao Niu[1], Richard E Palmer[1], Daniel Escalera-López[2] and Neil V Rees[2]
[1]Swansea University Bay Campus, UK
[2]University of Birmingham, UK

The discovery of highly active and low-cost electrochemical catalysts is a crucial challenge for the development of efficient hydrogen technologies. Molybdenum disulfide (MoS_2) is an earth-abundant material and considered as a promising candidate for electrocatalytic applications such as the Hydrogen Evolution Reaction (HER). DFT calculations have demonstrated that transition metal (Fe, Co, Ni) doping of MoS_2 should increase the activity in the HER. Here we report a novel one-step strategy for the preparation of Ni-doped transition metal-MoS_{2-x} hybrid clusters based on dual-target magnetron sputtering and gas condensation. The structure and composition of the clusters are analyzed by aberration-corrected Scanning Transmission Electron Microscope (STEM) in High-Angle Annular Dark Field (HAADF) mode coupled with EDX. From the electrochemical measurements, the Ni-MoS_{2-x} nanoclusters display a favorable 100 mV shift in the HER onset potential and an almost 3-fold increase in exchange current density compared with undoped MoS_2 clusters. It is believed that sulfur atoms at the edge sites of the MoS_2 layers make the main contribution to the HER catalytic activity. Thus we have also explored sulfur-enrichment of (mass-selected) MoS_{2-x} clusters via sulfur evaporation and cluster annealing under vacuum conditions. Sulfur addition leads to MoS_{2+x} clusters with well-developed crystalline structure instead of poorly ordered layer structures and significantly enhances the activity in the HER, with 200 mV shifts to lower HER onset potentials and more than 30-fold increase in exchange current density.

Recent Publications

1. D Escalera-López, Y Niu, S Park, M Isaacs, K Wilson, R E Palmer, N V Rees (2018) Hydrogen evolution enhancement of ultra-low loading, size-selected molybdenum sulfide nanoclusters by sulfur enrichment. *Applied Catalysis B: Environmental;* 235: 84-91.
2. Y Niu, P Schlexer, B Sebok, I Chorkendorff, G Pacchioni, R E Palmer (2018) Reduced Sintering of Mass-selected Au Clusters on SiO2 by Alloying with Ti: An Aberration-corrected STEM and Computational Study. *Nanoscale*; 10: 2363-2370.

Biography

Yubiao Niu is a Research Officer in Nanomaterials Lab of Swansea University. His research interest focuses on the development of innovative nanomaterials from earth-abundant materials for heterogeneous catalysis to alleviate the problems with the availability of precious metals as catalyst including the fabrication of nanomaterials, the fundamental studies of nanostructures and the catalytic measurements. He has expertise in nanocluster fabrication with cluster beam source and (aberration-corrected) Scanning Transmission Electron Microscopy (STEM) together with Energy Dispersive X-ray (EDX) spectroscopy and Electron Energy Loss Spectroscopy (EELS).

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Awais Ali et al., J Nanomed Nanotechnol 2018, Volume 9
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$ZnMoS_4$ nanorods grown on Ni foam for high performance hybrid-supercapacitors

Awais Ali, Ganesh Dhakal and Jae-Jin Shim
Yeungnam University, Republic of Korea

Supercapacitors, also known as electrochemical capacitors, are a new type of energy storage device which bridges the gap between rechargeable batteries and conventional dielectric capacitors. Batteries and supercapacitors are currently the primary choices offering reliable and convenient accessible energy storage. As for energy storage devices, electrochemical supercapacitors provide a higher power density and modest energy density as compared with batteries. Recently, carbon-based nanomaterial, such as activated carbon, carbon nanotubes, carbon nanofibers and graphene has been studied for supercapacitor electrodes. Among them, activated carbons are still attractive because of its low cost and well-established electrochemical properties. Metal oxides and their composites have become attractive in various applications for new generation nano-electronic devices including supercapacitors and lithium-ion batteries. Among these, metal sulfides are also known to be electrochemically active materials for supercapacitor applications. $ZnMoS_4$ nanorods were successfully synthesized on 3D-Ni-foam (NF) by one step hydrothermal process. The $ZnMoS_4$ nanorod grown on NF delivers good specific capacitance. The hybrid-supercapacitor with splendid electrochemical performance is rationally demonstrated by employing $ZnMoS_4$ and activated carbon as the positive and negative electrode respectively. Hybrid-supercapacitor shows good energy density, power density and excellent cycling stability. These results suggested that the binder free $ZnMoS_4$ nanorods are a suitable battery type positive electrode for high-performance hybrid-supercapacitors.

Biography

Awais Ali is a PhD student in the School of Chemical Engineering, Yeungnam University, Republic of Korea. His research focuses on energy storage devices, especially supercapacitors. His work is on improving the energy storage capacity using different metal sulfides. His research focuses on making materials that can store more energy and can show long cycling stability (charge-discharge).

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Ganesh Dhakal et al., J Nanomed Nanotechnol 2018, Volume 9
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Enhancement of electrochemical performance of Co_3O_4 at Ni foam electrode using redox-additive electrolyte

Ganesh Dhakal, Awais Ali and Jae-Jin Shim
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With the development of the science and technology, people in era are more fascinated to use the portable, highly efficient and safe electronic device. To fulfill all this demand of the growing population in a single device is a challenging issue and is limited by the energy storage device. Among the energy storage device, supercapacitor is emerging energy storage device due to their distinctive features of rapid charging and discharging process, long cycle life, high specific power, low maintenance and environment friendly. So, to address this issue, Co_3O_4 at nickel foam carrying plate-like (Co_3O_4-P) and grass-like (Co_3O_4-G) morphologies were prepared as the binder-free supercapacitor electrode materials by varying temperature. The physicochemical properties of as-prepared electrodes are characterized using scanning electron microscopy, high-resolution transmission electron microscopy, X-ray diffraction, Fourier-transform infrared spectroscopy, X-ray photoelectron spectroscopy. For the first time, we tested the electrochemical performance of the electrodes using Redox-Additive Electrolyte (RAE). The homogeneously grown grass like microstructure (Co_3O_4-G) favors the superior electrochemical performance as compared to those plates like structure (Co_3O_4-P) in KOH. Furthermore, we have improved the electrochemical performance of the Co_3O_4-G by using a redox-additive electrolyte in KOH solution. Remarkably, just by varying the concentration of the RAE in KOH, the specific capacitance of Co_3O_4-G increased by 4-fold. Irrespective of the various morphologies of the electrode materials under investigation, the concentration of RAE plays a vital role in influencing the electrochemical performance of the system.

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Biography

Ganesh Dhakal is a PhD student in the School of Chemical Engineering, Yeungnam University, Republic of Korea. He is primarily concerned in energy storage devices such as supercapacitors. His research work focuses on enhancing the electrochemical performance of the supercapacitors using different electrolytes.

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Preliminary discussion and verification for far infrared radiation energy

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Far-infrared radiation energy can enhance the disturbance of fluid molecules and their collision with surrounding objects, thereby promoting energy transfer. However, the far-infrared radiation energy of such materials still requires verification. In this study, 2.5 wt.% far-infrared radiation materials (FIRMs; namely Al_2O_3, ZnO, ZrO_2 and SiO_2), artificial far-infrared ceramics, TiO2, graphite and multi-walled carbon nanotubes were added to acrylic paints to form Far-Infrared Coatings (FIRCs). These FIRCs were coated on stainless steel plates and mounted in PMMA cuvettes. Each cuvette was then filled with 2 mL of 0.2 wt.% Al_2O_3/water nano-fluid (AWNF) as a spectrometer sample and the absorbance of the samples was measured initially and after 24 hours at different ambient temperatures (30 °C, 40 °C, 50 °C and 60 °C). The far-infrared radiation energy intensity of each sample was evaluated based on the difference in AWNF absorbance before and after standing for 24 hours. The results showed that FIRCs with different FIRMs could improve AWNF suspension performance at different ambient temperatures in most cases. Among these FIRMs, ZnO had the strongest effect on improved AWNF suspension performance. However, FIRCs with different FIRMs still varied considerably at different ambient temperatures in terms of improved AWNF suspension performance. This phenomenon indicates that ambient temperature also affects the far-infrared radiation energy intensity of FIRMs.

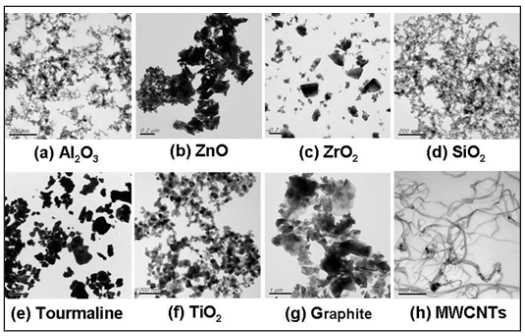

Figure-1: TEM images of FIRMs.

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Biography

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