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November 07-08, 2017 Singapore

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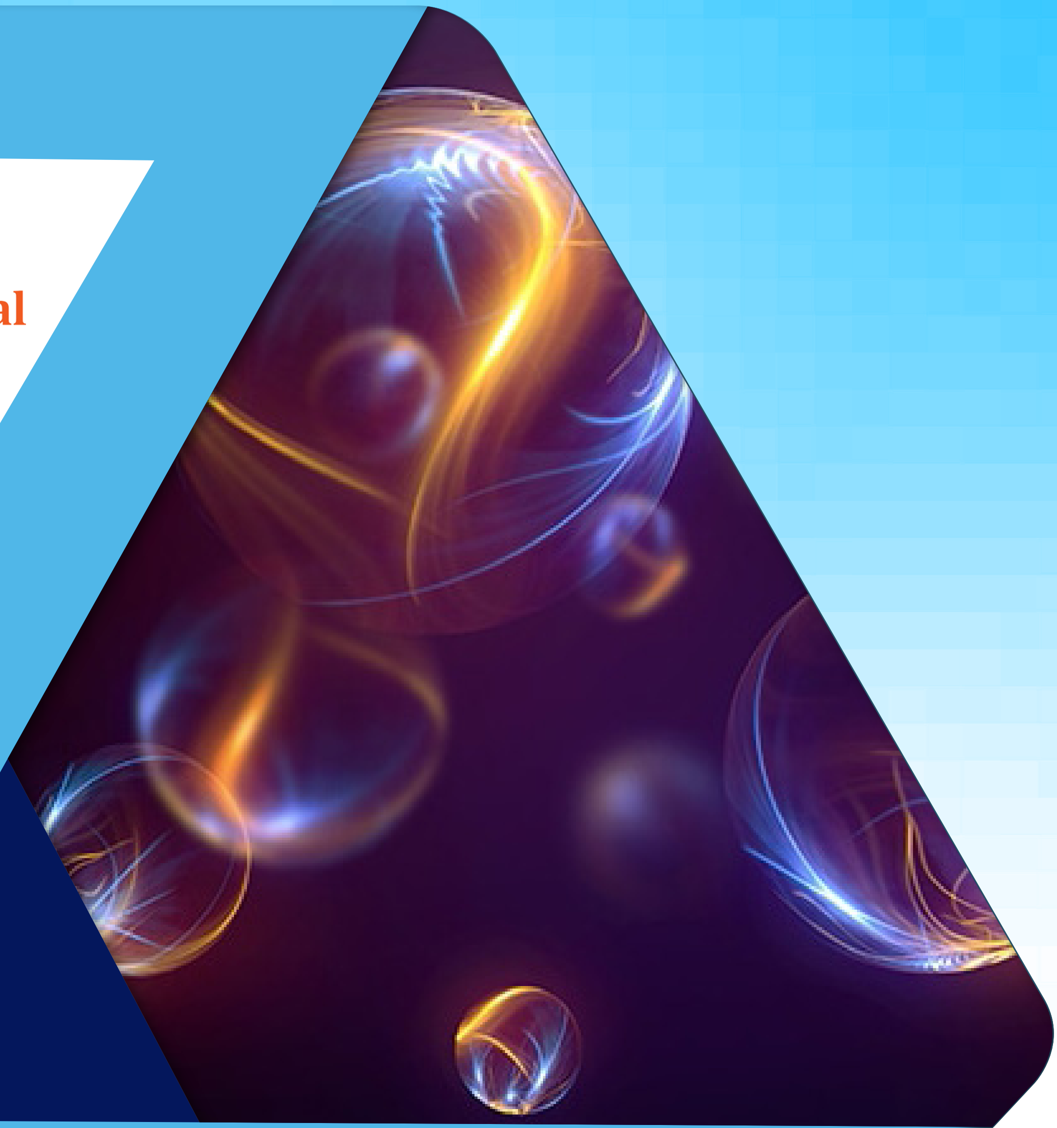

NANOMATERIALS MEETINGS 2017

DAY 1
KEYNOTE FORUM

INTERNATIONAL MEETING ON

ADVANCED NANOMATERIALS AND NANOTECHNOLOGY

NOVEMBER 07-08, 2017 SINGAPORE

Meetings International

Wei Min Huang, Nano Res Appl 2017, 3:4
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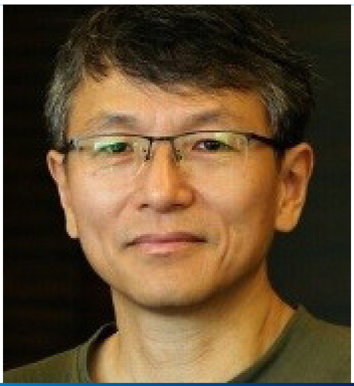
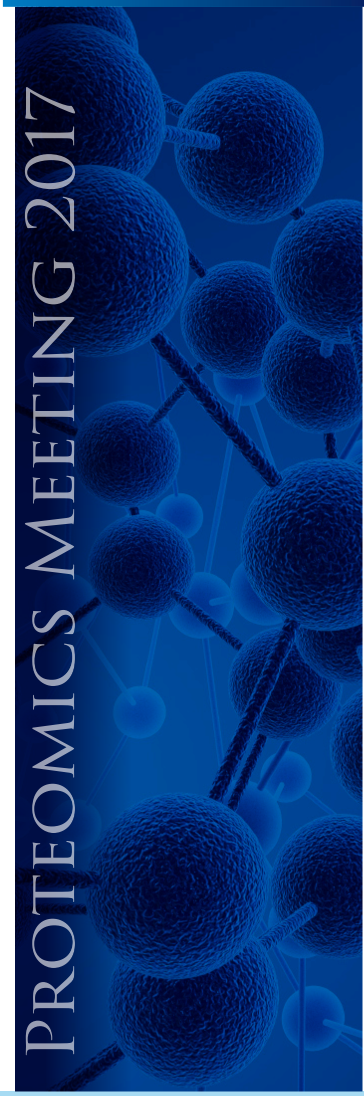
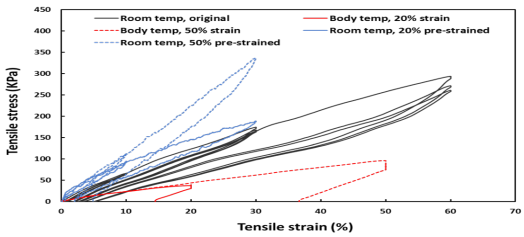


Wei Min Huang

Nanyang Technological University, Singapore



Rubber-like shape memory polymer programmable at body/room temperature: Features and applications in comfort fitting



The shape memory effect (SME) refers to an interesting phenomenon that a piece of quasi-plastically deformed material is able to recover the original permanent shape, but only if the right stimulus is applied. Such a phenomenon has been found in a range of materials, such as, metal/alloy, polymer and ceramic etc., which are technically called shape memory material (SMM). Thus, those SMMs activated upon heating are termed heating-responsive SMM. Although at high temperatures, most shape memory polymers (SMPs) could be very soft and highly elastic, at low temperatures/room temperature, they are normally much harder than ordinary rubber-band and some of them are indeed very brittle. So far, limited rubber-like SMPs (at room temperature) have been reported in the literature. In a hybrid made of silicone and melting glue is demonstrated to be rubber-like at room temperature even after being programmed with significant quasi-plastic deformation. However, it must be programmed at high temperatures, which is well above our body temperature. Similarly, the elastic shape memory foam reported in requires to be programmed at high temperatures as well. Comforting fitting is required in many applications for the purpose of personalization. And in many occasions, it is required to be contacted directly with part of the human body for perfect fitting. Hence, programming of the SMP must be carried out at around body temperature and enough time window for programming (e.g., 3-5 min) is also required. In this talk, we present our most recent progress in this research field. In addition, potential applications for comfort fitting are discussed and demonstrated by prototypes.

Recent Publications

1. Wang T, Huang W, Aw J, He L and Vettorello M (2017) Comfort Fitting Using Shape Memory Polymeric Foam. *Journal of Testing and Evaluation*; 45: 1201-12.
2. Sun L, Huang W, Wang T, Chen H, Renata C, He L, et al. (2017) An overview of elastic polymeric shape memory materials for comfort fitting. Mater Des.; 136: 238-48.

Biography

Wei Min Huang is currently an Associate Professor at the School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore. With over 20 years of experience on various shape memory materials (alloy, polymer, composite and hybrid), he has published over 180 papers in journals, such as Accounts of Chemical Research, Advanced Drug Delivery Reviews and Materials Today and has been invited to review manuscripts from over 200 international journals (including Progress in Polymer Science, Nature Communications, Advanced Materials and Advanced functional materials, etc.), project proposals from American Chemical Society, Hong Kong Research Grants Council, etc. and book proposals from CRC and Elsevier. He has published two books entitled "Thin Film Shape Memory Alloys: Fundamentals and Device Applications" and "Polyurethane Shape Memory Polymers" and is currently on the Editorial Board for many journals.

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Shweta Agarwala
Nanyang Technological University, Singapore

PROTEOMICS MEETING 2017

Convergence of biological and electronics materials for bioelectronic platforms

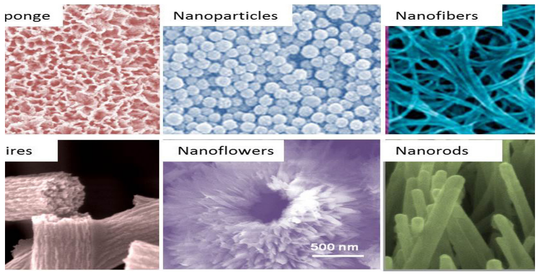

Figure-1: Shotgun proteomics data generation

Bringing together electronics and biology materials on a single platform can pave for highly sensitive and novel biomedical devices and clinical applications. Different morphologies, materials and composites are being combined to have added functionalities and customized interfaces for various bio-medical and bioengineering applications. The field of bioelectronics is further fueled by innovations in electronics, biotechnology and has received a strong boost with the advent of 3D bioprinting technology. 3D printing is driving the bio-medical industry with specifications such as user customization, cost-effectiveness and short response time. The talk will focus on novel bio- and electronic materials and processes to bring them together for added functionality and wider applications. The talk will bring to light formulation of the electronic nano- and biomaterials and how to synergistically incorporate them on a single platform to perform pre-defined tasks and provide information relevant to instrument novel biomedical devices. The talk will also discuss leveraging on 3D printing techniques for tissue engineering and biocompatible biomedical platforms. We report printing, optimization and characterization of electronic tracks on bio-scaffolds for making complete bio-medical devices to understand printing capability on such platforms. The platforms provide biocompatible, flexible and robust base for the electronic circuits to be laid down. The fabricated devices and platforms are compatible with cells and tissues are cheap, easy to fabricate and do not require any post-processing.

Recent Publications

1. Goh G D, Agarwala S, Goh G L, Dikshit V, Yeong W Y and Harper C (2017) Additive manufacturing in unmanned aerial vehicles (UAVs): challenges and potential. Aerospace Science and Technology; 63: 140-151.
2. Sing S L, Wang S, Agarwala S, Wiria F E, Ha T M H, Yeong W Y (2017) Fabrication of titanium based biphasic scaffold using selective laser melting and collagen immersion. International Journal of Bioprinting; 3: 1-7

Biography

Shweta Agarwala has obtained her PhD in Electronics Engineering in 2012 from National University of Singapore (NUS) on nanostructured materials for dye-sensitized solar cells. Currently, she is a Researcher at SC3DP, NTU. Her research is aimed at printed electronics, 3D printing, bioprinting and bioelectronics platforms for electronics, biomedical and aerospace applications.

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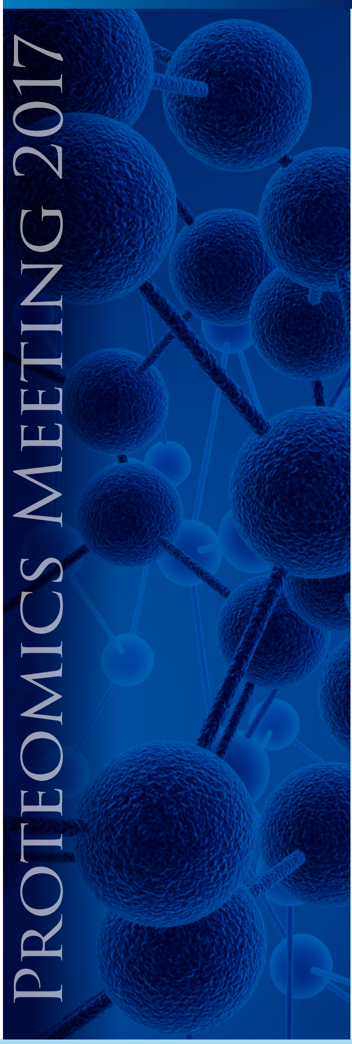
A K Raychaudhuri

S. N. Bose National Centre for Basic Sciences, India



Ultrahigh responsivity near infrared photo detectors based on single semiconductor nanowires

In this report, we show that ultra-high responsivity (R>105-106 A/Watts) Near Infra-Red (NIR) photodetectors can be made from single strand of nanowires of semiconductors like Si, Ge or molecular materials like Cu:TCNQ. The nanowires used were all grown by vapor phase methods and the single nanowire devices were fabricated on SiO2/Si substrate where the electrical leads were made using a combination of optical lithography and nanolithography tools such as electron beam lithography and lift off or focused ion beam or focused electron beam deposition methods. The typical device lengths are in the range of 1-5 microns and then nanowire strands have a diameter <100 nm. The distance between the electrodes was brought down to below 300 nm. In case of the molecular material Cu: TCNQ, which gives a narrowband detector, a peak responsivity of 10^4-10^5 A/W can be reached at 405nm with nanowire of diameter 30nm. In case of Si nanowires (diameter ~80-100nm), the response is broad band and a responsivity >10^4 A/W can be reached over the wavelength of 500nm to 1150 nm. For Ge nanowires, the response can be seen even over broader wavelength region extending well into the NIR region limited by the band-width of Ge (1850 nm). The peak responsivity in this case can reach even 10^6 A/W at wavelength range 800 nm-1000 nm. Though not very large reasonable responsivity, can also be seen from single strands of Y-junction CNT. The ultra-high sensitivity in single nanowire devices are contributed by a number of factors that include: (1) very close distance between electrodes, (2) small diameter allowing for photo-transistor effects at the surface of nanowires and (3) diffusion of photo generated carriers lowering the Schottky barrier at the contact interface.

Recent Publications

1. K Das, S Mukherjee, S Manna, S K Ray and A K Raychaudhuri (2014) Single Si nanowire (diameter ≤100 nm) based polarization sensitive near-infrared photodetector with ultra-high responsivity. RSC Nanoscale; 6: 1123.
2. Sudeshna Samanta, Deepika Saini, Achintya Singha, Kaustuv Das, P R Bandaru, A M Rao, and A K Raychaudhuri (2016) Photoresponse of a Single Y-Junction Carbon Nanotube. ACS Applied Materials and Interfaces; 8: 19024.

Biography

A K Raychaudhuri has obtained his MSc from IIT Kanpur and PhD from Cornell University, Ithaca, USA. He had Post-doctoral experience at the Max Planck Institute, Stuttgart as an Alexander von Humboldt Fellow. He has worked as a Professor at Indian Institute Science Bangalore, the Director of National Physical Laboratory, New Delhi and as the Director of S. N. Bose National Centre for Basic Sciences, Kolkata, where he is currently a Distinguished Professor Emeritus and J C Bose Fellow. His research interests cover condensed matter physics and materials physics. His current research mainly focuses on nanomaterials that include nanofabrications using nanolithography techniques such as use of electron-beam and ion-beam lithography for fabrication of single nanowires based devices including ultra-high responsivity single nanowire photodetectors. He is a Fellow of all the Science Academies in India and is a winner of the S S Bhatnagar Award in Physical Sciences in 1994.

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NANOMATERIALS MEETINGS 2017

DAY 2
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K N Shinde

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PROTEOMICS MEETING 2017

Luminescence in nanosized vanadate phosphor

Recently, rare earth doped vanadate phosphors have paid considerable attention owing to their long-wavelength excitation properties, which enable their use in LEDs, fluorescent lamps and flat panel displays. The luminescence performance of a material can be enhanced significantly by the suitable selection of host material. Since the white light-emitting diodes (WLEDs) gaining much more attention. Generation of the white light by combining an ultraviolet (UV) LED and appropriate phosphors is most desirable. Hence, it is essential to develop efficient phosphors to convert the near-UV pump light with a range of 300-400 nm into the visible wavelength. In order to fabricate excellent WLEDs, the excitation wavelength of the red phosphors should match the emission of the near UV-LEDs (350-410 nm) or blue LEDs (440-470 nm). Therefore, the phosphor materials play an important role in WLEDs. Most vanadates exhibit intense broadband emission from 400 nm to 700 nm under UV excitation because of tetrahedral VO4 with Td symmetry. The broadband emission spectra of vanadate phosphors are due to the charge transfer (CT) of an electron from the oxygen 2p orbital to the vacant 3d orbital of V^{5+} in tetrahedral VO_4 with Td symmetry. The luminescence is attributed to the ${}^3T_2 \rightarrow {}^1A_1$ and ${}^3T_1 \rightarrow {}^1A_1$ transitions. The preparation and photoluminescent properties of orthovanadate are M3–3x/2(VO4)2:xEu(0.01≤x≤0.09 for M=Ca and 0.03 for M=Sr and Ba) reported. The vanadate phosphors powder is synthesized using the solution combustion method. These phosphors are annealed at different temperatures and the impact of temperature is clearly seen on particle size. The particles become larger with increasing temperature and reach maximum at 1050, 1150 and 1250°C for Ca, Sr and Ba host, respectively. Eventually, the photoluminescence properties of these compounds under near UV-excitation are expected to make them applicable as efficient and novel luminescent materials for white light LED.

Biography

K N Shinde has completed his PhD from RTM Nagpur University, India and Postdoctoral studies in Nanotechnology and Advanced Materials Engineering, Sejong University, Seoul, South Korea. Presently, he is an Assistant Professor and the Director of R&D at N.S. Science and Arts College, India. He has published more than 50 papers in reputed journals and serving as an Editorial/Reviewer of international journals. His research interests are synthesis of nanocrystalline materials and exploring novel materials and study their PL properties. He has published a book entitled *Phosphate Phosphors for Solid State* Lighting with international publisher Springer series in material science. He is an active member of International Centre for Diffraction Data (ICDD), USA.

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