ASIA NANO FORUM NEWSLETTER

(ISSUE 23 - Special Edition)

ANF Young Scientist Program 2014

- Nanotechnology in Society, for Society -

Group Project Executive Summary

ANF Secretariat, Singapore
May 2014

Editors:
Hongfang JIN
Lerwen LIU

Organized by :

Aisa Nano Forum
Young Scientist
Program 2014

January 23 -31, 2014，Tsukuba, Japan

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Introduction

ANF Young Scientist Program

ANF Young Scientist Program was launched during Jan 23-31, 2014 in Tsukuba, Japan, to attract more distinguished and passionate young scientists and form the Asia Nano Forum youth leadership towards the sustainability of Asia Nano Forum.

The program focuses on the theme of "nano enabled innovation and application towards sustainability". The program consists of site visits, group projects, Workshop on Nanotechnology in Society and For Society, and ANF Young Scientist Workshop for Leading the Next Generation –, including invited talks and posters presentations. The program was organized by the Nanotechnology Platform Japan. The participants had the opportunity to conduct site visits of National Institute of Advanced Industrial Science and Technology (AIST), RIKEN, and National Institute for Materials Science (NIMS) located in Tsukuba.

The host of the program provided participants their accommodations for 10 nights at the AIST guest house (from January 22- February 1, 2014) and meals in Tsukuba. There are up to 2 invited participants from each ANF member economy who are motivated early career researchers with leadership and team work quality. Some of the participants had joined Asia Nanotech Camps (ANC) in the past.

Organizer and Co-Organizer:

The Asia Nano Forum (ANF) is a network organization, founded in May 2004, to promote excellence in research and development, as well as sustainable development of nanotechnology within the Asian region. This collaborative network seeks to benefit its member economies educationally, socially, environmentally and economically by fostering collaboration and acting as a focus for regional and global nanotechnology issues. Asia Nano Forum (ANF) Network is supported by 15 economies in the Asia Pacific Region including Australia, China, Hong Kong, India, Indonesia, Iran, Korea, Japan, Malaysia, New Zealand, Singapore, Taiwan, Thailand, UAE and Vietnam. Austria is now an observer member from Europe.

The "Nanotechnology Platform Japan" is a program launched in July 2012. Its aim is to create a "platform," for shared use of the advanced nanotechnology-related equipment at universities and research institutes throughout Japan. This Platform gives all researchers in industry, academia, and government agencies an equal opportunity to use essential infrastructures for R&D. As a distinctive feature of the Nanotechnology Platform, 3 networks have been created in respective fields (Microstructural Characterization, Nanofabrication, and Molecule & Material Synthesis) so that users can take the shortest, most appropriate approach to advanced nanotechnology. This enables more and better use of the "eyes" and "hands" that are necessary for the advancement of nanotechnology.

Nano Fabrication Platform Japan was constructed to further advance the level of science and technology in Japan, and to achieve the promotion of industry science and technology, where advanced research equipment can be shared with numerous researchers from all over the country and build the system that can proactively stimulate 'Creation of Innovation'. Nano Fabrication platform Japan has a framework that allows open access under-one-roof, and aims to build innovative research and development system that supports science and technology in different areas, human resource development, and support the network for problem-solving.

Host Coordinators:

TAKEMURA, Masahiro
National Institute for Materials Science

AKINAGA, Hiroyuki
Nano Fabrication Platform Japan
National Institute of Advanced Industrial Science and Technology

Welcome address

On behalf of the organizing committee members, it was a great pleasure to have successfully held the Asia Nano Forum Young Scientist Program in Tsukuba, Japan. During ten days from January 22 to February 1, 2014, twenty young scientists coming from Asia Pacific and Middle East economies participated in the workshops and had group discussion resulting in summarizing presentations with specific topics on contribution of nanotechnology to society. The summary presentations at the end of the workshop were made with the strong collaboration of the participants of different economies. Furthermore, the mutual understandings between youngers were encouraged by laboratory tours and attending Nanotech 2014 exposition and symposium after the workshop.

We are sure that the experience in Tsukuba will be useful for young scientists attended in the ANF program to make network among researchers as well as proceeding their future research work.

NODA, Tetsuji
Managing Director,
Center for Nanotechnology Platform,
National Institute for Materials Science

Gallery

Discussion

Lab Tour

Networking

Award

Group Project Discussion

Program

Jan.22nd (Wed)	Arrival of Participants
Jan.23nd (Thu)-24th (Fri)	[program by Nanotechnology Platform Japan] Seminar and site visit of member institutes of Nanotechnology Platform Japan
Jan.25th (Sat)	Free
Jan.26th (Sun)	Arrival of Participants Evening： Networking
Jan.27th (Mon)	Site visit of AIST and NIMS Evening: Banquet
Jan.28th (Tue)	ANF Young Scientist Workshop for Leading the Next Generation Morning: Invited Talk Afternoon: Group Project Oral Presentation Round Table: Young scientists and ANF executive committee
Jan.29th (Wed)	Visit nanotech Japan 2014 at Tokyo Big Sight
Jan.30th (Thu)	Visit nanotech Japan 2014 at Tokyo Big Sight Evening: Banquet at Big Sight
Jan.31th (Fri)	Site visit of RIKEN
Feb.1st (Sat)	Departure

ANF Young Scientist Program Workshop - Nanotechnology in Society, for Society

Date: Jan. 23rd, 2014
Place: Room D821-1, Building 2-1D, Tsukuba Central 2, AIST
Organized by Nanofabrication Platform in cooperation with Nanotechnology Platform, MEXT, Japan

Program: The workshop consists of 6 lectures and 1 group discussion. The lecture slot (60 min) includes the talk of invited lecturers (30 – 40 min), Q&A (about 10 min).

8:30 – 8:50	Registration
8:50 – 9:00	Welcome Address Dr. Seigo Kanemaru, Director, Nanoelectronics Research Institute, AIST
9:00 – 10:00	"More-than" VLSI Devices by MEMS-born Technology Dr. Yoshio Mita, Associate Professor, Department of Electrical Engineering and Information Systems (EEIS), Graduate School of Engineering, the University of Tokyo, UT-VDEC Nanotechnology Platform Manager
10:00 – 11:00	Smart Microfluidic and Analytical Devices Based on Electrochemical Principles Dr. Masatoshi Yokokawa, Assistant Professor, Graduate School of Pure and Applied Science, University of Tsukuba, Japan
11:00 – 12:00	Terahertz Devices using Semiconductor Nanostructures: An Approach with Resonant Tunneling Diodes Dr. Masahiro Asada, Professor, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan
12:00 – 13:30	Lunch Grouping and Networking (Lab. Tour: Nano Processing Facility)
13:30 – 14.30	Organic Materials Melt by Light: Photo Induced Crystal-to-Liquid Phase Transition of Azobenzene Dr. Yasuo Norikane, Senior Researcher, Electronics and Photonics Research Institute, National Institute

	of Advanced Industrial Science and Technology (AIST)
14:30 – 15:30	Diamond Devices -Deep UV Detector, Heterojunction FET, and MEMS Switches Dr. Yasuo Koide, Platform director / Group leader, National Institute for Materials Science (NIMS)
15:30 – 16:30	Recent Advances and Prospects in Emerging Functional-Oxide Nanoelectronics Dr. Hiro Akinaga, Principal Research Manager, Nanoelectronics Research Institute, National Institute of Advanced Industrial Science and Technology (AIST)
16:30 -16:40	Closing Speech Dr. Tetsuji Noda, Director, Nanotechnology Platform Center, NIMS
16:40 - 17:30	Group Photographing & Group Discussion

ANF Young Scientist Workshop for Leading the Next Generation

Date: Jan. 28, 2014
Place: TIA Nano Hall, Building 7E, Tsukuba West, AIST
Organized by Nanofabrication Platform, Organized in cooperation with Nanotechnology Platform, MEXT, Japan

9:00 – 9:15	Opening
9:15 – 10:00	Invited talk (1): Preparation of Carbon Nanomaterial – Semiconductor Nanocomposites and Photocatalytic Degradation of Organic Dyes Weon Bae KO, Professor, Department of Chemistry, Sahmyook University, Korea
10:00 – 10: 45	Invited talk (2): Application of Graphene to Transistors and Interconnects for Future LSIs Shintaro SATO, Group Leader, Collaborative Research Team Green Nanoelectronics Center (GNC) Nanoelectronics Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Fujitsu Laboratories Ltd., Japan
10:45 – 11:00	Break
11:00 – 11:45	Invited talk (3): A State-of-the-Art Scanning Probe Microscopy Ryohei KOKAWA, Manager, Application Center, Shimadzu Corporation, Japan
11:45 – 12:30	Group Photographing & Poster preparation
12:30 – 14:00	Lunch
14:00 – 16:00	Presentations by Young Scientists (6 Groups), 15 min presentation + 5 min Q&A / Group
16:00 – 17:30	Poster Viewing with Coffee
17:30	Wrap-Up and Award ceremony

Invited Speakers

Group Project Competition

Introduction

All participants are divided into 6 groups each with 3-4 participants from different economies to work on group project competition titled “Nanotechnology in Society, for Society”.

Evaluation Panel:

Dr. Lerwen LIU, Managing Director of NanoGlobe and Secretary of Asia Nano Forum.

Dr.Rezal Khairi AHMAD, Chief Executive Officer of NanoMalaysia Berhad, Malaysia

Dr. Ali BEITOLLAHI, Director of International Collaboration of Iran Nanotechnology Initiative Council, Iran

Dr. David MENDELS, Professor& Head of Center, Surya University, Indonasia

Mr. Shig OKAYA, Counsellor, Tsukuba Innovation Arena Headquarters, National Institute of Advanced Industrial Science and Technology (AIST), Japan

Prof. Weon Bae KO, Professor of Sahmyook University, Korea


Asia Nano Forum Summit
presents
The First Prize
to
for the group presentation,
“Nanotechnology in Society, for Society”,
at the ANFoS Young Scientist Workshop,
for Leading the Next Generation.
ANF
President, Asia Nano Forum
Director,
Center for Nanotechnology Platform
January 28, 2014, Japan

Award Certificat

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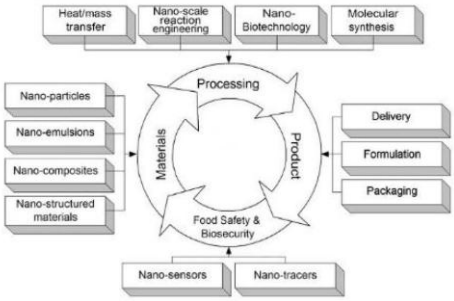
Projects Executive Summary

First Prize – Group N: No Nano No Food - How Does Nanotechnology Innovate the Factory Manufacturing?

Team: Mina AMIRMZALAGHANI (*Iran)*, Youngjo YANG (*Korea)*, Hung-Li TSAI (*Taiwan)*, Eri AMASAWA (*Japan)*

How does nanotechnology innovate the factory manufacturing?



Nanosensors in factory manufacturing

1. What is the current problem?
   Low efficiency due to low sensitivity, slow detection and non portable.
2. How nanotechnology can solve this problem:
   - Nano Material Sensors
   Using nanomaterials can increase the surface area ⇨greater number of interactions ⇨ higher sensitivity and faster detection.
   - Nano Detectors
   High frequency imaging & spectroscopy and nanoscale electronics means more information of products

Nanomaterials in factory manufacturing

1. Creation of functional products
   - Nanoscale characterization
   - Exploit nanoscale morphology
2. Adding nanoparticles to materials
   - Antibacterial silver nanoparticles integrated into textile
   - Nanoparticles to food
3. Nutritious and delicious
   - Low-fat
   - Nanoencapsulated ingredients and additives to food
   - Nanodelivery
4. What is micelle or liposome?
5. How to increase bioavailability

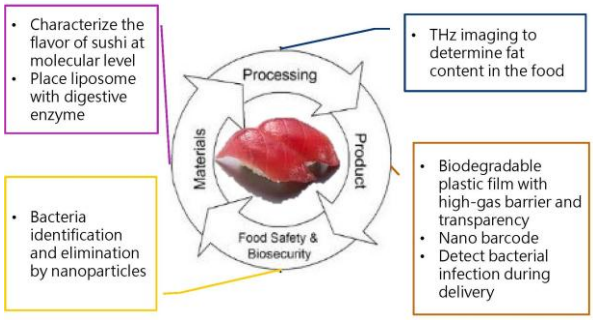
Processing in factory manufacturing

Type	Product name	Nano content	Puporse
Cooking equipment	Oilfresh	Nanoceramic catalytic pellets with billions of pores	Prevent oil from break down and improve heat conductivity
			
Food contact material	Antibacterial kitchenware, Nanocaretech	Nanoparticle of silver	Inhibit bacteria growth
			

Type	Nanotech	Nano content	Puporse
Heat	Nanofluid	A fluid containing nanometer-sized particles	Increase heat transfer
Isolation	Nanofiltration	Filtration membrane with nano pores	Concentration or demineralization
Preservation	Nanobiotechnology	Enzyme modification	Prolong food taste

Product packaging and delivery

Proposal Objective: Manufacture safe, healthy and tasty sushi that can be distributed from Japan and accepted by rest of the world



Biography

Mina AMIRMAZLAGHANIani received the B.S. degree and M.S. degree in electrical engineering from K.N.Toosi University of Technology, Tehran, Iran, in 2007 and 2009, and now, is working toward the Ph.D. degree in graphene-based detectors at K.N.Toosi University of Technology. During 2013, She as with the Terahertz and Millimetre Wave Laboratory, Department of Microtechnology and Nanoscience, Chalmers University of Technology, as a visiting researcher.

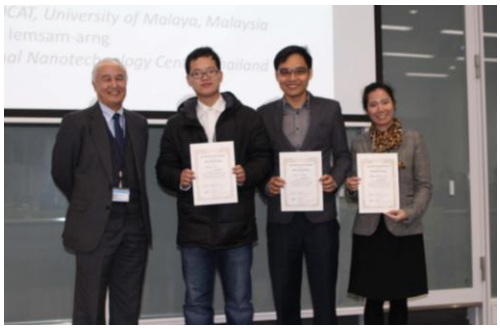
Youngjo YANG is a Ph.D. candidate in Dept. of Chemical & Biomolecular Engineering, KAIST, Daejeon, Korea. His Polymer Electroluminescence Display and Polymer Solar Cells, Colloidal Crystals, Soft Lithography and Nano-patterning, Metal Nanocrystals .

Hung-Li TSAI is a Ph.D. candidate in Taipei Medical University Medical Science Institute, Taiwan. His major research subject is stem cell biology. He wants to provide contribution in regenerative medicine and tissue engineering. He had ever studied optical application of quantum dots in medical imaging.

Eri AMASAQA received Master of Science in Engineering degree from Mechanical Engineering, University of Washington, and Seattle in 2013. She is currently a PhD candidate in Tokyo University, Graduate Program on Sustainability Science.

Second Prize – Group S: Sensotoronic – Nanotechnology for Societal Risk Management

Team: Xiuming SUN (China), Juan Joon CHING (Malaysia), Jayanant Iemsam-arng (Thailand)



Introduction: Definition

Challenges:

Nature	Health	Social	Environmental
Earthquakes	Food Safety	Terrorism/Riots	Energy Crisis
Floods	Water Crisis	Ethnic conflict	Air Pollution
Drought	Illness	Population explosion	Deforestation

Prevention: Reducing the probability of risk

- Societal Safety Issue
  - Public Security: urgent and important
  - Most of terrorist attacks used explosive/toxic materials
  - Drawback of current Strategies: time consuming / human error / limited area
  - New "NANO" Prevention Strategy

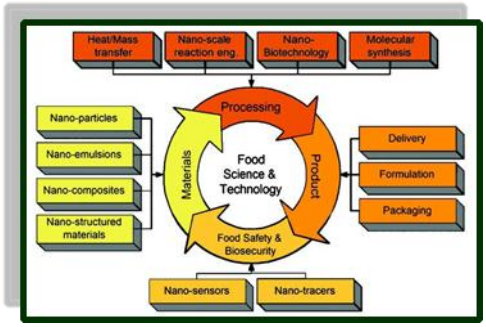
Nano Sensor

- Detection of various explosive compounds
- High sensitivity: parts per quadrillion (ppq)
- Small size, low power consumption

SMART SRM System

- Smart Sensing
- Automatic Warning
- Quick Response

- Life & Health
  - The basic living demands: EAT DRINK !!!
  - FOOD safety: **Nanotagging for food**



  - Water source crisis: **Purified water**
    - The use of antimicrobial nanocoating to ceramic filter
    - No traces of silver in drinking water
    - A national relief effort to provide drinking water to rural community : sufficiency / cleanliness

Future Plan

- Internet of things: based on NANO sensors
- Sensing the world, creating a new social system

Conclusion - PREVENTION IS BETTER THAN CURE

Based on nanosensors

- Key strategy: prevention
  - Society & safety
  - Food & health

- Nanotechnology creates novel SRM system
- Nanotechnology minimizes possible risks
- Nanotechnology builds smart sensing world

Biography

Xuming SUN received the B.S. degree in electronic science and technology from Chongqing University, Chongqing, China, in 2009. He is currently pursuing the Ph.D. degree in microelectronics and solid state electronics at

Peking University, Beijing, China. His research interests include design and fabrication of micro energy devices, MEMS inductors and wireless power transfer systems. He has already published 4 SCI papers in J Microelectromech. S., J Micromech. Microeng. and Sens. Actuators A: Phys, as well as several conference papers.

Juan Joon CHING is an Associate Professor of Catalysis at Nanotechnology and Catalysis Research Centre (NANOCAT), University of Malaysia, Malaysia and also appointed as a Senior Research Fellow (Adjunct) position at Monash University Sunway Campus. He holds a key position as Chairman of Environment and Green Chemistry Section at Malaysia Institute of Chemistry (IKM). He has been actively involved in various research activities and has published extensively in major journals. Most of his research activities are focused on nano-structure of catalyst which mainly related to environmental issue and also converting waste to energy.

Jayanant Iemsam-arng is a young researcher at National Nanotechnology Center, National Science and Technology Development Agency, Thailand. She joined the AFS exchange program in Italy in 1999. She was back to Thailand and pursued her study in Pharmacy emphasizing on pharmacognosy and bioequivalence. In 2008, she was a successful candidate for the Royal Thai Scholarship and obtained her PhD from the University College London (UCL) School of Pharmacy, (London, UK) focusing on the nanomedicine of gene and drug in 2012.In 2013, she started her research position with NANOTEC in nanocosmeceutical laboratory

Third Prize – Group P: Pleasant - Nanotechnology for Reliability and Durability of Products

Team: Dr. Fu-Yun ZHU(China), Dr. Julie Juliewatty MIHAMED *(Malaysia)*, Dr. Samatcha Vorathamrong (Thailand)

Nanotechnology for Reliability and Durability of Products

Durabilty and reliability are currently main issues in technology development. Both are involved with the ability to withstand physical or chemical damage for a period of time. Originally, improvement in durability and reliability were done by changing the component materials, this improvement is limited by natural properties of every materials. But with recent emergence of nanotechnology, dealing with durability and reliability problems will never be the same as before.

Nanotechnology is technology to manipulate objects in nano-scale, this can considerably affect the properties of materials. With the assistance of nanotechnology, durability and reliability of products can be enhanced by using new materials that created by controlling ground basis structures of materials which is called nanomaterials or blending the conventional materials with nanomaterials. Examples can be seen below :

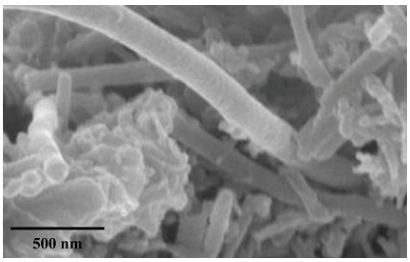
Carbon nanotubes cable wires

Carbon nanotubes are nanomaterials with cylindrical shape. Due to the nanostructures that are different from other conventional carbon forms, carbon nanotubes have many interesting properties, such as high physical strength, high electrical conductivity, and low weight. Using carbon nanotubes will make cable wires much more stronger, thinner, and higher electrical conductance than conventional copper wires.

Carbon nanotubes cable wires （Source）

Nanoconcrete

Strength enhancement of concrete can be obtained by adding nanomaterials to conventional concrete during the manufacturing process to create concrete nano composites. There are many types of materials that can be used as reinforced materials for concrete, such as nanosilica, carbon nanofibers, or carbon nanotubes.



SEM image of concrete reinforced with nanofibers (Crack free concrete made with nanofiber reinforcement)

Conclusion

Nanotechnology can increase durability and reliability of products by two main methods, directly using nanomaterials, or blending nanomaterials with conventional materials to create reinforced composites. The study of nanotechnology in material enhancement is necessary for future development.

Biography

Fu-Yun ZHU received the B.S. degree in electronic science and technology from Tianjin University, Tianjin, China, in 2010. She is currently pursuing the Ph.D. degree in microelectronics and solid state electronics at Peking University, Beijing, China. Her research interests include fabrication, modeling and simulation of micro/nano structures, 3D reconstruction of surface morphology.

Julie Juliewatty MOHAMED is a lecturer at School of Materials Engineering, Universiti Sains Malaysia since 2008. Teaches, researches and supervises postgraduate and undergraduates candidates in electroceramic materials (dielectric and piezoelectric), and intermetallic composites. Member of the Malaysian Institute of Materials (MIM), Board of Engineer (BEM), Institute of Engineer Malaysia (IEM). Has numerous publications in international journals and conference proceedings. Areas of research are piezoelectric and dielectric electroceramic, intermetallic and composites materials.

Samatcha VORATHAMRONG, is a Ph.D. student from Chulalongkorn University, Semiconductor Development Research Laboratory, Department of Electrical Engineering since 2013. His interests are in Quantum and Nanoelectronics, studies in candidate materials to replace silicon, and photovoltaic researches. Samatcha hopes that improvement in this research field can cause the big impact on technology developments of the world.

Group A: Atom - How Does NANOTECHNOLOGY Solve the Environmental issues?

Team: Jiangbo(Tim) ZHAO (Australia), Eng-Poh NG (Malaysia), Youngjo KIM (Korea), Patchareewan PRONGJIT (Thailand)

Introduction

The environmental issues have been disturbing the world, although many conventional techniques were developed to safeguard the earth. To address the global environmental problems, including the waste exhaust, pesticide misuse, deforestation, over-growing population, water logging and salinity, and food shortage, new and sustainable methods are highly needed. Nowadays, the nanotechnology as the state-of-art technologies is showing the powerful capabilities and promising to provide the green solutions to a broad range of environmental problems.

Oil spill is widely acknowledged to be a severe problem in ocean environment. Inevitably, the spill has raised concerns worldwide about the detrimental environmental impacts of the problem caused by oil tanker accidents at sea. As a result, such catastrophes cause havoc to marine ecology. In recent years, hydrophobic aerogel nanoporous material has emerged as a potential candidate for solving this problem. The so-called Aeroclay sponge© has been proven to effectively remove spilled oil with extremely high oil adsorption capacity. Furthermore, the oil-soaked aerogel sponge can be easily regenerated and recycled for many adsorption cycles without performance loss. Although the application of nanotechnology for oil spill cleanup is still in its nascent stage, it offers great promise for the future.

In the last decades, there has been particularly growing interest worldwide in exploring ways of improving biodegradable property of plastic bag. Conventional plastic bags are non-biodegradable and it is a serious threat to natural ecosystems. By using nanotechnology, it provides a potential solution for minimizing environmental pollution at the same time as producing high-added value products. For instance, metal oxide nanoparticles have been introduced into cellulosic plastics to foster biodegradation and to enhance mechanical properties of the plastics. The technology is seen as a jumping point for a better future where plastic bags can be used without harming the environment.

Advances in nanomaterials also allow them to be formulated into numerous applications such as layer coatings for environmental protection. Thousands of coating applications for a specific purpose (e.g. rust inhibition, dust removal, UV-protection) are present in our daily lives. Examples of these

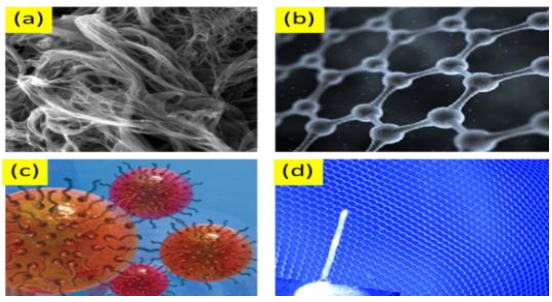


Figure 1: Nanoparticles for water remediation including (a) nanofiltration membranes, (b) nanocatalysts, (c) magnetic nanoparticles, and (d) nanosensors.

applications include coatings for wood floors, glasses, metals, electronic circuits, automotives and so forth. Particularly, clay

nanoparticles are recently used as a coating/bond coat to a polymer matrix composite. By simply introducing trace amount (~2%) of clay-based nanoparticles, the physico-chemical properties of polymer coatings are significantly improved, resulting in coatings that are tough, durable and scratch resistant

Nanotechnology for water remediation

Nanotechnology can impact water remediation applications. Nanoparticles are shown in Figure1 has important for water remediation. There are many kinds of nanoparticles to use for water remediation. For example, nanofiltration membranes, these act as physical barrier and selectively reject substances smaller than their pores, and so remove harmful pollutants and retain useful nutrients present in water. Nanocatalysts are particles with catalytic properties that can chemically break down pollutants. Magnetic nanoparticles have large surface areas relative to their mass and easily bind with chemicals. Their ability to bind with contaminants, such as arsenic or oil, which can be easily removed using a magnet, makes them an appealing solution for water treatment. Moreover, nanotechnology is being used to develop small and portable sensors with enhanced capabilities for detecting biological and chemical contaminants at very low concentration levels in the environment, including in water. In addition, nanotechnology has the potential to increasing potable water supplies, desalination of sea water and safety of industrial effluent.

Nanotechnology for sustainable & renewable energy

We still gain most of energy from fossil fuels such as coal, oil, and natural gas. The burning of fossil fuels produces a large amount of carbon dioxide (CO2) and raises serious environmental concerns. Carbon dioxide enhances radiative forcing and contributes to global warming, causing the average

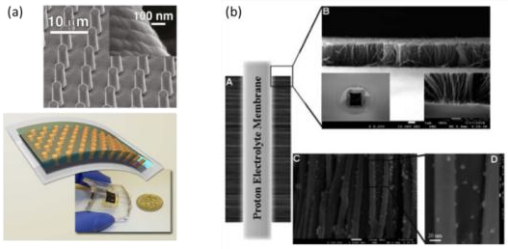


Figure 2: Nanostructured energy conversion devices

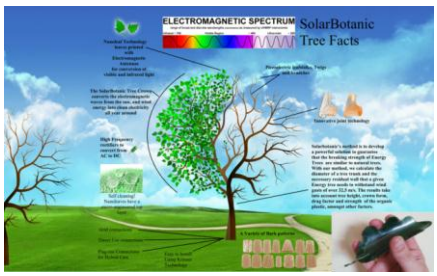


Figure 3: Nanoleaf tree designed by Solar Botanic (UK)

Conclusion

Nanotechnology has promise to improve the life quality, brings the green and sustainable approach, enhances the efficiency for environmental remediation, and pushes forward to the detection capability and sensing limit.

Biography

Jiangbo ZHAO joined the Institute for Photonics and Advanced Sensing (IPAS) at the University of Adelaide as a postdoctoral fellow. He is working on incorporating nanoparticles into glass, motivated by harnessing the unique nanoscale properties into practical photonic devices. He completed the PhD degree in Oct. 2013 at the Advanced Cytometry Laboratories, Macquarie University, Sydney. His PhD research looks at the creation of bright upconversion nanocrystals, which are materials that can convert infrared radiation into visible luminescence, and he has explored promising applications in areas such as bioimaging, biosensing and display technologies

Eng-Poh NG received his BSc (first class honors) degree (2004) in industrial chemistry and MSc in chemistry (2006) from the Universiti Teknologi Malaysia, Malaysia. He obtained his PhD degree in 2009 from University of Mulhouse, Alsace, France under the supervision of Dr Svetlana Mintova. After postdoctoral work in the University of Caen, France, he was appointed as a senior lecturer (2010) at the Universiti Sains Malaysia. His main research interests are synthesis and application of nanosized silica-based materials for catalysis, adsorbents and emerging applications**.**

Youngjo KIM is a Ph.D. candidate at department of electrical and computer engineering in Ajou University (Suwon, Korea). He has been also working in Korea Advanced Nano Fab Center (KANC) as a research assistant. He has been studying about high efficiency III-V and Ge solar cells grown by MOCVD. He is also interested in novel anti-reflection techniques using surface nanopatterning and nanoparticles coating

Patchareewan PRONGJIT is a Ph.D. student at department of Electrical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand, Her current research interests are nanostructure fabrications such as quantum dots, quantum rings grown by molecular beam epitaxy (MBE), and applications of semiconductor nanostructures.

Group Y: Yield Extreme Nanotech (¥EN) - The Societal Role of Nanotechnology

Team: Hsin-Feng HSU(Taiwan), Tan Lee HENG(Singapore), Tsz Nok NG (Hong Kong)

Introduction

Nanotechnology is encountered all around our daily lives. For example, the LED display, image sensors in camera, solid-state-hard disk, etc. Behind the scenes, these commercial products have been gone through a very delicate design and longtime developmental process. One of the most important factors that determine nanotechnology progress is the availability of nanotechnology user facility.

User facility functioned differently for people in different sectors. If the researcher is from the universities, research institute or general public, user facility helps to bring the idea into proof-of-concept. Industry is another sector. The user facility can provides the platform to commercialize the developed technologies into the market. As a result, user facility plays an important role in developing nanotechnology for a better world. Nonetheless, cost for maintaining these user facility equipment, tools, space and manpower are huge. If one would like to "**Y**ield **E**xtreme **N**anotechnology", one needs **YEN** (Japan currency). Therefore, the societal role of nanotechnology user facility is a question that we have to address. How can we effectively develop nanotechnology user facility in the society?

Networking

Since 2000, there is a rapid expansion of large-scale nanotechnology user facilities. There are establishment of nanotechnology user facilities worldwide, providing fabrication and characterization access. For example, nanoscale computation network, was created in 2002, National Nanotechnology Infrastructure Network was redesigned in 2003, providing democratic and global access to nanotechnology knowledge and tools in United States. In Taiwan, the Instruments Information Systems was built to share equipment funded by NSC. It's a good system established for users to utilize facilities more efficiently. This system was built based on different organizations. Unfortunately, this system is not extensive to include all major centers and there are little or no collaborations and interactions between the centers.

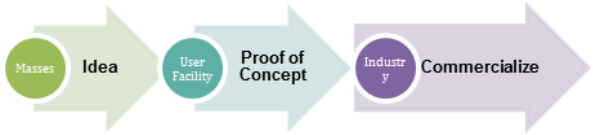
We proposed to establish an international networking system where universities, research centers and individuals from different economies can access and engage in a partnership scheme. This can be physically categorized into 2 areas which are inside an area and between areas. If the demands for the user facilities are within an area, such as between cities and also within a city, integration and sharing of scientific resources into a centralized scientific hub will reap multiple benefits. Users will be equipped to have more options to the equipment and tools that are available for usage. If it is between areas such as between countries and distance is an issue, net-based remote control of equipment and engineers support at user centers could reduce travel requirements. An online networking system between user facility and users could be available where the users can have easy access to the equipment and tools. Users could then request, monitor, process and even evaluate his procedures remotely through this system with help of user facility technicians and engineers. With a strong IT infrastructure support, user facilities could be more easily available for access regardless of the travelling distance.

Problems arising and solving

Here is another kind of situation which often happens. A new idea was proposed which needs non-standard process to implement. In most facility centers, the process will be prohibited which can cause obstacles to the research progress. Thus, we propose user facility sharing system should provide a more comprehensive coverage for standard, non-standard, clean and contaminated processes. In addition, regular training and upgrading for technicians and engineers should be emphasized to enhance their technical capability. The user facility should also provide alternative solutions to users whenever there are problems such as long waiting time for equipment and tools usage, equipment and tools downtime etc.

Future

The current role of user facility is seen as a center for science and technology development. Universities and research centers could expand this current role into a broader prospect. It can be made easily available in a society, where research programs and activities are easily accessible for the masses. In the future, we hope that nanotechnology user facility can be available to anyone who has an idea or interest. The facility is a platform where the user can proof his concept and further develop it for commercialization.



Biography

Hsin-Feng HSU was born in Taiwan in 1981. He received the B.S degree in Department of Electronics Engineering and the M.S degree in Institute of Electronics from National Chiao Tung University, Hsinchu, Taiwan. He now is a Ph.D student in Institute of Electronics, National Chiao Tung University. His major studies are nanophotonics and biophotonics.

Tan Lee KHENG joined A*Star Singapore, Institute of Materials Research and Engineering (IMRE) in year 2005. She is currently a senior specialist and also a PhD student (Chemistry) in National University of Singapore. Her research interests are focus on nanofabrication,

particularly template-assisted nanoporous anodic alumina growth of nanomaterials using Atomic Layer Deposition (ALD) technique.

Tsz Nok NG, received his bachelor degree in Chemical and Environmental Engineering and Mphil degree in Chemical and Biomolecualr engineering from the Hong Kong University of Science and technology in 2009 and 2011 respectively. He then pursue his study in Chemical and Biomolecular Engineering as a Ph.D student in the same university. His research focus on porous material, in particular mesoporous silica and MOF, and their applications in microfluidic device.

Group F: Future - How to promote Nanotechnology education for Children?

Team: Sharmin KHARRAZI (Iran), Tristan Tan Tsai YUAN g(Singapore), Chun-Yu CHANG (Taiwan), Chung V. HOANG(Vietnam)

Introduction

Our project was on education in nanotechnology and we decided to split the age groups of our target audience into 3 groups: young children (age 6-12), secondary school children (12-16) and pre-university teenagers (16-18). The types of demonstrations and level of scientific detail could then be tailored to each specific group.

Proposal

For young children, we had two objectives: To simply introduce them to concepts of nanoscience, especially those which are nature inspired, and to excite them enough so that they come up with questions. Examples from nature that would be engaging are photonic crystals from butterfly and bird wings, lotus effect (super hydrophobicity) and the gecko effect (Van der Waals attraction). Simple demonstrations could include self assembly of colorless silica spheres into photonic crystals which is visually exciting for children.

Children at secondary school age are able to understand more detailed nanoscience concepts and also start to understand applications of nanotechnology such as environmental remediation, superhydrophobic surfaces, cosmetics, antireflective coatings etc. We felt that liaising with schools to introduce nanotech concepts into curriculum would be an effective way of introducing nano concepts to them. Experiments they could do would be making hydrophobic/hydrophilic class and photochemical degredation of organic dyes with nano titanium dioxide. Other things they could be introduced to are semiconductor and metal nanoparticles to demonstrate size effects.

Finally, for pre-university kids, our target group would be students interested to do science in university. To let the kids get some hands on research experience, funding common research centers that are affiliated with universities and run by a few professors, teaching assistants, and technicians would allow children to gain some experience in the lab before they decide on their university course.

Summary

To promote the education of nanotechnology for children, we can do different efforts for four groups of age:

under 6 years old	Getting familiar with simple terms and names
6 to 12 years old	Parents: teaching Kids: toys
12 to 16 years old	Schools can teach them the nanoscience from nature or the application in daily life
16 to 18 years old	Common research centers for nanoscience

Biography

Chung Vu HOANG completed his undergrad (majored in engineering physics) and master studies (in materials science) from Hanoi University of Technology in 2003 and 2006, respectively. He then moved to Germany for a PhD study at Heidelberg University and was conferred the PhD degree in physics in 2010. From 2010 to 2012, he was a research fellow working at the National Institute for Materials Science, NIMS, Japan. Since 2013, he started to work as a researcher at Lab. of Energy Materials and Devices, Institute of Materials Science, Vietnam Academy of Science and Technology, Hanoi, Vietnam. He is the fellowship holder of Daimler Benz (Germany) and JSPS (Japan) foundations. Currently, he is working on the energy harvesting materials. His main research focused on the fundamental study of self-assembled plasmonics nanoparticles and hybrid materials composed of plasmonics nanoantennas and free-standing semiconductor nanowires towards applications in artificial photocatalysis, solarcell and smart windows.

Chun-Yu CHANG is a PhD student in the department of material science and engineering of National Taiwan University My master degree thesis was focusing on achieving high efficiency isoindigo based polymer solar cells.

Tristan Tan Tsai YUAN received my BSc in chemistry from National University of Singapore. He joined the Institute of Materials Research and Engineering in Singapore as a research assistant in 2011 and work in projects under Professor Andy Hor and Dr Chin Jia min. His research interests include synthesis of novel metal organic frameworks (MOFs) as well as the development of strategies for controlling the micro and nano morphologies of MOF crystals to give novel properties to prototypical MOFs. His other research interest includes the bottom up fabrication of porous polymer films using breath figures and their use as sensors as well as templates for the fabrication of other structures.

Sharmin KHARRAZI received her Ph.D. in Physics from University of Pune, India in 2007. She worked on Magnetic nanostructures and photoelectron spectroscopy and spectromicroscopy of nanostructures. She is now assistant professor of Medical Nanotechnology at Tehran University of Medical Sciences, Iran. Her research is focused on the development of new methods for chemical synthesis of metallic nanoparticles of controlled size, shape and surface charge and investigating their biocompatibility and applications in fabrication of SPR biosensors. In 2010 she joined the Iranian Light Source Facility (ILSF) as scientific coordinator (part time) and in 2011 she started a small knowledge-based company on producing colloidal metallic nanoparticles. Since 2010 she has been a member of Nanotechnology committee of the Khwarizmi International Award (KIA), Iran.