

Asia Nano Forum NEWSLETTER

(Issue No. 17)

ANF Secretariat, Singapore

JULY 2012

Editor:

Hongfang JIN

Lerwen LIU

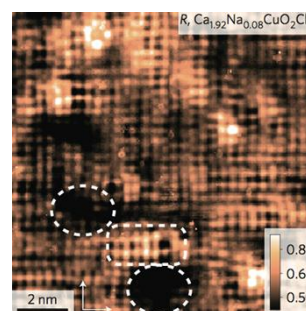
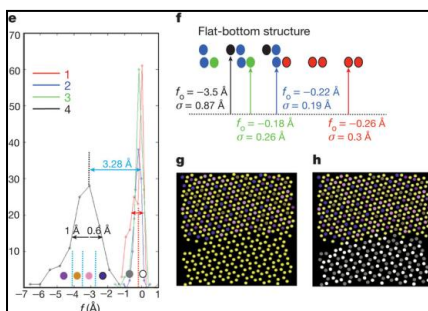
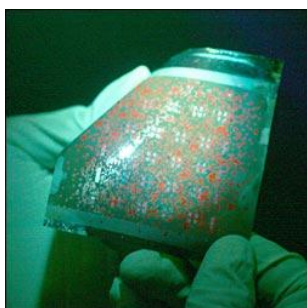
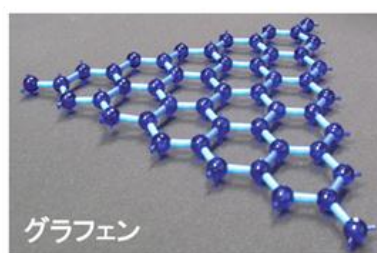
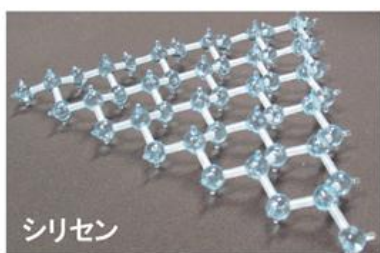


Table of Contents

NEWS	3
✧ Partnerships/Collaborations	3
✧ Commercialization and Business	4
✧ New Education/Research Programs	8
RESEARCH BREAKTHROUGH	12
NEW PUBLICATIONS.....	18
EVENTS.....	20

NEWS

✧ Partnerships/Collaborations

Korea (Source: NNPC)

◆ *The 9th Korea-U.S. Nano Forum*

National Nanotechnology Policy Center(NNPC) of Korea held the 9th Korea-U.S. NanoForum from June 4th & 5th at Hanyang University in Seoul. The NanoForum focused on Exploring New Direction for Convergence of Nano Science and Technology to Applications. The program of this forum was consisted of 3 technical sessions, poster session, and group discussions for the recommendation to the governments. The details of 3 technical sessions are as below:

- i) Nanoscale Fundamentals and Basic Tools for NT Convergence
- ii) Nanotechnology for Sustainability and Energy Resources
- iii) Applications

In this Forum, 35 speakers(20 Professors and Directors, 15 Young Scientists) from Korea and

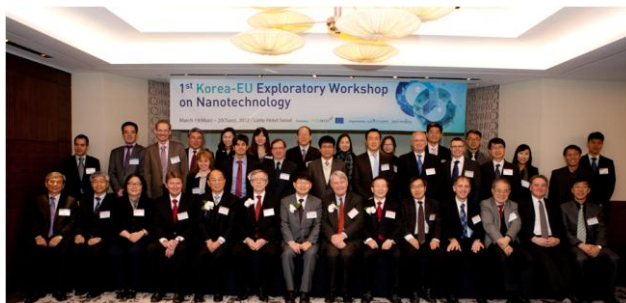


USA., and more than 80 people(VIPs, Government officials, Researchers and invited audience) were participated. The Korea-U.S. NanoForum is being held annually with alternating host since 2003 for promoting collaboration of policy and R&D on Nanotechnology area, in accordance to the agreements made during the 5th meeting of the Korea-U.S. Joint Committee on Scientific and Technological Cooperation in Seoul on October 30th & 31st, 2002.

This Forum is organized by the NNPC(Korea) under Korea Institute of Science & Technology Information(KISTI) and Carnegie Mellon University(USA), and hosted by Ministry of Education, Science & Technology(MEST) of Korea and National Science Foundation(NSF) of USA.

◆ *The 1st Korea-EU Exploratory Workshop on Nanotechnology*

The 1st Korea-EU Exploratory Workshop on Nanotechnology was held from March 19th & 20th in Seoul, which was organized by the National Nanotechnology Policy Center (NNPC) of Korea under Korea Institute of Science and Technology Information(KISTI), and supported by the Ministry of Education, Science &



Technology(MEST) of Korea and European Commission(EC). The main focus of this Workshop is introducing Nanotechnology policies and Nano Energy R&D progresses on both sides. The program of this workshop was consisted of 2 policy sessions, 3 technical sessions for finding new opportunities on Nanotechnology area by promoting information exchange and research networking between Korea and European Union.

The 15 speakers from both sides, and more than 60 people (VIPs, Government officials, Researchers and invited audience) were participated in this workshop. The Korea-EU Workshop on Nanotechnology is being held annually with alternating host for promoting the collaboration for R&D and policy on Nanotechnology, in accordance to the agreements made during the 3rd meeting of the Korea-EU Joint Committee on Science and Technology Cooperation which was held in Seoul from July 7th & 8th, 2011.

Taiwan (Source: NPNT)

- ◆ *The 9th Cross-Strait Workshop on Nano Science and Technology, Taiwan*

The 9th Cross-Strait Workshop on “Nano Science and Technology” (CSWNST9) was held at the National Cheng Kung University, Tainan, Taiwan from April 22 to April 25, 2012. The event was covered with oral and poster sessions. (Photo source: National Program on Nanotechnology)



- ◆ *APEC Subcommittee on Standards and Conformance 9th Conference on Standards and Conformance in the Field of Innovations and Related Good Practices, Russia*

Dr. Tsung-Tsan Su, Ph.D. Vice President & Gen. Director, Industrial Technology Research Institute (ITRI), Program Co-Director of National Program on Nanotechnology (NPNT), was invited to join the APEC Subcommittee on Standards and Conformance from May 22 to May 23, 2012 in Kazan, Russia. Dr. Su made a speech of “Experience of ANF Economies in Standardization in Field of Nanotechnology” in the session that has interested attendees in nanoMark, a certification system in Taiwan. A constructive communication with the participants from APEC Economy members was made in this talk. Photo source: National Program on Nanotechnology



✧ Commercialization and Business

India (Source: ARCI)

- ◆ *Industrial Nanotech, Inc. will shortly open its Corporate Sales Office in India.*

Industrial Nanotech, Inc. (Pink Sheets: INTK), one of the pioneers in the development of nanotechnology based techniques for energy saving, is soon going to open its Corporate Sales Office in India. The company is planning to establish its first centre near to Bengaluru and planning to expand its dimension to north and west India in near future. Industrial Nanotech, Inc had already launched its energy saving product Nansulate® and other protective coatings in

India which has great success in reducing the energy costs. This initiative step will definitely boost up the marketing and launching of new products in India. ([Source](#))

Singapore

- ◆ *Keep the Continuous Competitiveness of Southeast Asia Semiconductor Industry - Highlight of Semicon Singapore 2012* (Source: NanoGlobe)

Semicon Singapore 2012 held during April 24 to 26, 2012 is a carnival of Southeast Asia Semiconductor Industry, attracting over 6000 visitors and over 100 companies worldwide to experience cool products, scout new technologies and explore business opportunities. Semicon Singapore Forums include technical sessions such as LED Forum, MEMS Forum, 3D-IC Forum, Assembly Packaging Forum, Wafer Fab Efficiency Forum, and Product Test Forum, and business events such as Southeast Asia Entrepreneurship Seminar, Market Trends Briefing, Southeast Asia Manufacturing Business Leader Summit.

MEMS continue to be one of the popular themes of Semicon Singapore and attracted more and more pioneers to this feast. MEMS Forum on April 26th brings together leading players in the MEMS academia and industry including IME, BOSCH, Global Foundries, Applied Materials, Convertor, Sand 9, OPUS Microsystem, EVG, and Kionix to share their strategies to bridge the gap from R&D to manufacturing and a business model that minimizes risk and cost for companies who want to move beyond proof-of-concept (POC) to volume production,



paving the way for prototype-stage devices to make a successful transition to volume manufacturing. Equipment cost, yield and throughput are the key factors limiting the reduction of MEMS product cost. To solve this problem, tools and process needs to be upgraded for the next generation of MEMS production. Now Applied Materials is supplying 200mm MEMS equipment to help MEMS device manufacturers reduce the production cost, and Global Foundries is transitioning to 200mm MEMS manufacturing. The flourishing consumer electronics market is driving the volume production of MEMS components. To meet the increasingly high requirements of these consumer applications, MEMS R&D and industry are developing new materials and cutting-edge technologies to reach the next generation of MEMS devices' requirement on scale, functionality and sensing accuracy. For an instance, BOSCH can provide the 10 DoF solutions as the sensor technology. IME and Applied Materials are developing new materials for high power device and improving DRIE technologies and TSV process to increase the yield and production throughput of sub-micro MEMS fabrication.

- ◆ *Singapore-made anti-reflective plastics to be commercialised* (Source: IMRE)

Researchers from A*STAR's Institute of Materials Research and Engineering (IMRE) and their commercial partners have developed a new plastic that reflects just 0.09 – 0.2% of the visible light hitting its surface. This matches or better existing anti-reflective and anti-glare plastics in the market, which typically have reported reflectivity of around 1% of visible light. Such plastics are used in anything from TV displays to windows and even solar cells. Because of the unique nanotechnology method used, the new plastic developed by IMRE maintains very low reflectivity (<0.7%)

at angles up to 45°. This means that TV viewers can have wider viewing angles with less glare and organic solar cells have larger areas for light absorption.

“The new plastic was made possible because of the unique nanoimprint expertise that we have developed at IMRE,” said Dr. Low Hong Yee, the senior scientist who is leading the research. Several companies are in the process of licensing the anti-reflective nanostructure technology from Exploit Technologies Pte Ltd, the technology transfer arm of A*STAR. “We are also developing complementary research that allows the technology to be easily ramped-up to an industrial scale,” explained Dr. Low.

This plastic material is the first successful result of the IMRE-led Industrial Consortium On Nanoimprint (ICON), which partners local and overseas companies to promote the manufacturing of nanoimprint technology. Nanoimprinting relies on engineering the physical aspects of the plastics rather than using harmful chemicals to change the properties of the plastic. The technology has allowed the researchers to create very unique, complex hierarchical ‘moth eye-like’ anti-reflective structures where nanometer-sized structures are placed on top of other microstructures - different from how other similar plastics are made. This formed special patterns that are better at reducing glare and reflection and provides wider viewing angles than the current available plastics.

“This is an exciting innovation – mimicking nature through the nanoimprint technology to solve real world problems. I am very pleased that the collaboration with industry has helped move this R&D from the laboratory to application in the industry, said Prof Andy Hor, IMRE’s Executive Director. He adds, “The development of the new plastic is a testament to the strength of Singapore’s advanced R&D capabilities, the benefits of nanoimprint technology and the confidence that companies place on our technologies.”

“The outstanding results from this consortium work will benefit our company's expansion into new markets such as in the touchscreen panel and solar business sectors,” said Mr Wilson Kim Woo Yong, Director, Global Marketing from Young Chang Chemical Co., Ltd.

“We have been very impressed with the developed technology and with the excellent team of researchers working on the anti-reflective structures”, said Mr. Tatsuo Shirahama, President from Innox Co. Ltd.

“The results from the consortium work are key in the decision making for our future strategic planning,” said Dr. Yuji Akatsu, Business Unit Manager from the Nanotechnology business unit, Advanced Products Business Headquarters, NTT-AT.

Taiwan (Source: NPNT)

♦ *2012 ITRI Patent Transaction*

Since 2003, Industrial Technology Research Institute (ITRI) has built up a high-quality platform for the sale of patent in Taiwan. The “2012 ITRI Patent Transaction” collects patents mainly from Taiwanese companies and ITRI, hoping to match Taiwanese sellers with international buyers. The sale collection consists of around 600 patents and patent applications that included technology areas such as LED, 3D, Display, GPS and Semiconductor.

The auction information: [Link](#)

♦ *MOEA, nanoMark Progress*

- Passed 38 certification standards
- 38 Companies with 1109 products



Recent approval of nanoMark product certificate regulations:

Product Category	Product Type	Product No.	Date of Approval
Certification Specifications of Nano Metal Oxide Transparent Heat Insulation Film	Building Materials	TN-34	12/29/2011
Certification Specifications of Nano Silver Antibacterial Sanitary Ceramic Ware	Building Materials	TN-35	12/29/2011
Certification Specifications of Nano Silver Antibacterial Plastic Toilet Lid	Building Materials	TN-36	12/29/2011
Certification Specifications of Nano Metal Oxide Thermal Clothing Textiles	Textiles	TN-37	12/29/2011
Certification Specifications of Nano Silver Antibacterial Plastic Toilet Tank Parts	Building Materials	TN-38	12/29/2011

Information Source: nanoMark, MOEA; ITRI

Thailand (Source: NANOTEC)

♦ “SOS water”- solar powered water purification unit

Researchers at NANOTEC developed solar powered water purification unit “SOS water” which combines the use of antimicrobial nanocoating to ceramic filters. Antimicrobial nanocoating ceramic filter increased an extra security by killing or incapacitating bacteria left in the water and prevented the growth of mold and algae in the body of the filter. The project was implemented as a result of the need to provide drinking water to communities affected by the 2011 mega flooding in Thailand. The researchers adapted the antimicrobial nanocoating know-how for water filtration and assembled into a mobile solar-operating system (SOS) water purification.

The raw water goes through 6 filtration steps one of which is the antimicrobial nanocoating ceramic filtration unit. The quality of drinking water meets the standard of drinking water by Department of Health, Ministry of Public Health, Thailand. The SOS water system is capable of producing 200 litres of drinking water per hour and easily integrated into a pick-up, light truck, a trailer or a flat hull boat.



The researchers collaborated with the Thai Red Cross Society to do field testing of prototype SOS water the result of which was outstanding. NANOTEC donated the SOS water unit to HRH Princess Maha Chakri Sirindhorn, Executive Vice President of the Thai Red Cross Society on June 28, 2012 for community relief effort.

“The 2011 flood in Thailand was an eye opener for both the public



Left to Right: Prof. Sirirung Songsivilai, Executive Director of NANOTEC, Lt. Gen. Dr. Amnat Barlee, Director of Relief and Community Health Bureau, The Thai Red Cross Society and Dr. Plodprasob Suraswadi, Minister of Science and Technology.

and the government sectors and we are glad to be in a position to utilize our research capabilities to help minimize the suffering of communities during the recent flooding” said Prof. Sirirung Songsivilai, Executive Director of NANOTEC. “It is our hope that the SOS water will become a must-have item for national relief effort and rural community use”.

✧ New Education/Research Programs

India (Source:ARCI)

◆ *Two new streams by Nanotechnology Centre, Jamia Millia Islamia University*

NEW DELHI: Jamia Millia Islamia University has announced to start two new programs: 1) Post graduate course of M.Tech. in nanotechnology, 2) PhD programme in Nanoscience from this year. These courses will be regulated by Centre for Nanoscience and Nanotechnology at this university which was inaugurated in December, 2011. Curriculum for M. Tech course will cover four semesters and is going to open from upcoming session. Total twenty seats will be offered this year which will be filled by competition exams. ([Source](#))

◆ *New short term courses by CRSS, Kolkatta*

KOLKATTA: The Centre for Research in Nanoscience and Nanotechnology, University of Calcutta has started new short- term training courses in advanced sciences. The courses include fields like advanced cytometry, identification, characterization and quantification of cellular components where nanoscience has vast application. Besides this, it is also organizing various workshops and seminars on imaging technique in biological and cellular research and cell sorting. This institute is also extending its infrastructural facilities to carry out advanced researches. ([Source](#))

◆ *IIT-Delhi has announced to open its new campus at Sonipat, Haryana*

SONIPAT/NEW DELHI: IIT-Delhi is soon going to set up its new campus as extension of older one at Sonipat, Haryana. This new 2,000-acre campus will be built like Education City. IIT-Delhi is planning to open many new higher education courses like nano-technology, bio-medical engineering, bio-technology, defense research, film and media studies in this campus. ([Source](#))

◆ *Inauguration of Centre for Nano-technology at NIE*

MYSORE: The National Institute of Engineering, Mysore has established one new research Centre for Nano-technology (CNT) in its main campus. The main focus of CNT will be on research fields like characterization of structural and mechanical properties of nanomaterials and its applications. The centre is already equipped with highly sophisticated instruments like Phenom Scanning Electron Microscope, Atomic Force Microscope and X-Ray Diffractometer, Spin Coater, Electrochemical Analyser, Annealing Vacuum Furnace and Wear Test Rig etc. Related to this, recently the centre has got two projects. One project is funded by the Nano Mission of the Ministry of Science and Technology, Government of India worth Rs 1.86-crore for ‘Characterisation of composite materials and application of nano materials for sustainable energy’. The other one is funded by the Vision Group on Science and Technology (VGST), Department of Science and Technology, Government of Karnataka., is a Rs 60-lakh project on

‘Development of CIGS-based nano materials for photovoltaics’. Besides studies, this centre is also focusing on the development of Industry- Institute collaborations and International collaborative research. ([Sources](#))

✧ General News

Australia (Source: ANU)

◆ *New Publication: NanoQ Magazine*

The purpose of NanoQ (two issues per year) is to highlight recent developments in the field in Australia and also to provide information of interest to policy makers and the public. There has been a significant amount of public interest in nanotechnology with reports in the media creating hype as well as scare. Enhancing public awareness of nanotechnology is important for the acceptance of the technology by the wider community while addressing issues of public concern in terms of health, safety and environment.

All issues can be accessed on the Australian Nanotechnology Network website: [Link](#)

India (Source: ARCI)

◆ *India holds 7th rank globally in the field of nanotechnology*

NEW DELHI: Mr. Sujit Bhattacharya at National Institute of Science, Technology and Development has measured the growth of India in field of nanotechnology. The results were analyzed since 2000 with respect to; 1) Products and processes, 2) publications, 3) patents and 4) Standards, developed in the field of nanotechnology. Reports showed that India is occupying seventh place for publications. Similarly, India is occupying for the fourth place in terms of patent applications filed. Survey reported that country like India is more focusing on the issues like water solutions, drug delivery and the environmental problems based on nanotechnology. This survey has reported India at the 7th place in field of nanotechnology worldwide. ([Source](#))

Singapore (Source: IMRE)

◆ *M3 conference promotes inter-disciplinary research*

Molecular materials research is not just one science but an intersection of a number of scientific disciplines. It is such interdisciplinary R&D that is fuelling some of today’ s innovations – from artificial cell membranes that speed up drug discovery to ultrahigh-density memory devices, and even super strong but light weight composite materials. Some 120 top international scientists including Nobel Laureates, Prof Ada Yonath and Prof Kurt Wuthrich, who were awarded Nobel Prizes in Chemistry in 2009 and 2002, respectively, were in Singapore from 9-11 January to talk about inter-disciplinary science at the M3 conference organised by IMRE.

“Molecular materials research is the marriage of traditional materials engineering and modern molecular science, and is a way to inject new designs and innovations in materials for novel technological applications,” said Prof Andy Hor, IMRE’ s Executive Director. The speakers covered research topics related to Materials Synthesis, Assembly & Device Fabrication, Energy & Sustainable Materials, Optical & Electronic Materials, and Materials for Imaging & Sensing. Companies such as Mitsui Chemicals, 3M, Aixtron and those involved in the molecular materials value chain also participated in the conference as speakers and exhibitors.

Thailand (Source: NANOTEC)

◆ *Conference on nanotechnology for benefits of mankind*

NanoThailand 2012 conference was successfully held on April 9-11, 2012 at Pullman Khon Kaen Raja Orchid Hotel, Khon Kaen, Thailand. The event was organized by the Nanotechnology Association of Thailand, NANOTEC, and the Integrated Nanotechnology Research Center of Khon Kaen University.

The conception of NanoThailand 2012: “Nanotechnology for the Benefits of Mankind” is to be a premier international conference and exhibition in Nanotechnology, bringing together world-leading researchers, Thai scientists, entrepreneurs, business partners and exhibitors, in several focused areas of science and technology at the nanoscale. It was aimed as a platform to disseminate the latest research results, allow cross-disciplinary exchange of knowledge to further advance both technological areas and to showcase their latest inventions and innovations. In the foreseeable, not too distant future, Nanotechnology will significantly impact various large industries and SMEs domestically, regionally and beyond.



◆ *Public Forum on NanoSafety*

NANOTEC in collaboration with The United Nations Institute for Training and Research (UNITAR), and the Swiss Confederation organized the Nano Inception/Awareness Raising Workshop at Thailand Science Park on 27 June 2012. The aim of the public forum was to focus on nanosafety, nanoethics, and updated on the status of the Thailand National NanoSafety Strategic Plan. The event was represented by Mr. Lukas Gasser, Minister (Swiss Confederation), Dr. Sirasak Teparkum, Deputy Executive Director (NANOTEC) and Mr. Georg Karlaganis, Training Advisor (UNITAR).



NANOTEC recognizes the importance of public input and participation on matters related to nanosafety and for this reason it is organizing several public workshops to address this topic.

A previous workshop was held early this year in Bangkok. The objective of the workshop sessions was to seek public perception on nanosafety strategic plan. The workshop allowed representatives from the public sector to submit their comments to the Secretariat of the Nanosafety Strategic Plan Working Group. The final outcome of these discussions was to explore ways to finalize the draft national Nanosafety Strategic Plan. This is a Thailand initiative that requires the support and input of all public and private sectors.

◆ *Smart Glass technology wins “Rocket Pitch” award*

A group of researchers from Organic Nanomaterials Laboratory at NANOTEC won the recent “Rocket Pitch” category at the annual NSTDA Idea To Product (I2P) 2012 Competition. The NANOTEC team headed by Dr. Udom Asawapirom pitched the idea of “Smart Glass” technology to groups of independent judges from academic and private sector.

Smart Glass technology refers to electrically switchable glass which changes light transmission properties when voltage is applied. The Smart Glass technology which the NANOTEC team pitched involves the use of polymer film as sensing components. The main benefit of Smart Glass technology is to responds to environmental temperatures, making it a promising material for energy efficient windows.

The Annual NSTDA Idea to Product (I2P) Competition organized by Technology Management Center (TMC) is early-stage technology commercialization plan competitions that aim for unique product ideas with clear market demand that use innovative technologies. The goal is education and developing the next generation of technology entrepreneurs. The program is particularly interested in matching technologies resulting from research projects with potential markets. The team members must consist of researchers and Business Management students. The judges come from both the private and public sector.



A group of NANOTEC researchers from the Organic Nanomaterials Laboratory who won the “Rocket Pitch” category at the annual NSTDA Idea To Product (I2P) Competition.

RESEARCH BREAKTHROUGHS

India (Source: ARCI)

- ◆ *Researchers use nanotech to keep fruits fresh*

NEW DELHI: Researchers from Tamil Nadu Agricultural University (TNAU), University of Guelph in Canada, The Industrial Technology Institute (ITI) in Sri Lanka, and MYRADA, a non-governmental organization from southern India have made a tie- up for the development of packaging material by using nanotechnology. Mr. K. S. Subramanian, Head of this research project claims that this nano- based film material will be helpful in extending the shelf- life of fruits and vegetables by approximately 21 days. The main losses in crops are due to lack of proper post harvest maintenance and improper cold storage facilities. Researchers from Canada have developed a synthetic agent 'hexanal' which prolongs the life of fruits and vegetables by inhibiting the enzyme phospholipase- D. TNAU is targeting to test the effect of natural plant fiber impregnated with this chemical which slowly releases it onto the substance. However, Sri- Lankan scientists are experimenting on incorporation of hexanal with natural wax so that it can be developed in to a nano- coating material. Another team at Institute of Life Science, Ahmedabad is planning to perform studies on the environmental issue of this packaging material and its impact on ecosystem. This novel nano-film will get ready by the first half of 2014. ([Source](#))

- ◆ *New Nano- Silver Sanitary wares*

KOCHI: H & R Johnson one of the leading company engaged in manufacturing tiles, bath and kitchen wares has introduced a wide range of anti-bacterial sanitary wares based on Silver Nanotechnology and is going to be launched countrywide in a short time. This new germ free sanitary ware has special ceramic glaze coating of Ag nano particles on the surface which can prevent the division and growth of microbes. There are 38 unique nano based bathroom products which has potential against 650 types of bacteria. This product is already been launched in two states; Tamil Nadu and Maharashtra in India. ([Source](#))

- ◆ *Synthesis of AuNPs from Fungal source and its efficacy for Mosquito larvae*

AGRA: Researchers from Environmental and Advanced Parasitology and Vector Control Biotechnology Laboratories, Dayalbagh, Agra have found a new way to synthesize Au NPs using fungus *Aspergillus niger*. TEM and SEM imaging techniques had confirmed the synthesis of AuNPs with different shapes and size up to 10–30 nm. Further, the larvicidal activity of AuNPs was tested for different larval stages of *A. stephensi*, *C. quinquefasciatus*, and *A. aegypti* at different time intervals like 24, 48, and 72 hours. It was found that the AuNPs were most effective for *C. quinquefasciatus* larve showing 100% mortality after 48 hrs. This research has opened the new gateway to control mosquitoes in eco- friendly manner. ([Source](#))

- ◆ *Nano mark to authenticate Banarasi silk*

VARANASI: The Silk Mark Organization of India (SMOI) has introduced a new nano- particle embedded fusion label hallmark to bonafide Banarasi silk. This technology is sponsored by Central Silk Board, India. The new nano-based hallmark is attached with the silk fabric using a hot plate machine which makes it enduring. It can also be visible under

Infrared light. The label also contains a five digits computerized code which if send to SMOI as text message, can give the information regarding manufacturer and authorized seller of genuine silk. SMOI is going to start this facility soon. This technique will help out in possible ways to bypass Chinese silk or synthetic material present in market. ([Source](#))

Japan (Source: Nanonet Japan)

♦ *The World's First Sterilizable Flexible Organic Transistors - A path to the development of implantable devices*

The University of Tokyo (Tokyo, Japan) and the Japan Science and Technology Agency (JST) announced on 6th March 2012 that an international research team led by Professor Takao Someya has succeeded in manufacturing the world's first flexible organic transistor on a polymeric film. This organic transistor is robust under high temperature medical sterilization processes. The high thermal stability of the gate layer was confirmed by a cooperative structural analysis using a synchrotron radiation beam at Brookhaven National Laboratory's (BNL) Synchrotron Light Source (NSLS). The study is reported in BNL News and published online in *Nature Communications* on 6th March 2012*. This research is carried out as an ERATO Project of JST.

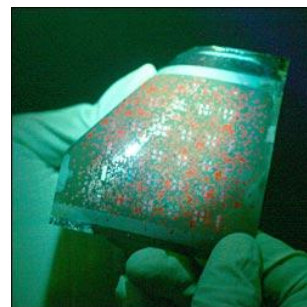


Figure 1: A highly thermostable organic transistor manufactured on a thin plastic film. The team succeeded in building a low drive-voltage and a high thermostable organic circuit on a plastic film by using SAM molecule for the gate insulator, and high heat resistant semiconductors for semiconductor layer.

In a serious aging society with a declining birth rate, electronics are increasing their importance in health and medical areas. On this background, the expectation is getting higher on a flexible organic transistor, which is a soft electronic switch. Manufacturing of a flexible transistor on a bio-compatible polymeric film is not too difficult. For practical implementation, however, high temperature stability and low operating voltages are challenging problems with the best match of its softness and bio-compatibility. The international research team has succeeded in manufacturing an organic transistor on a polymeric film that has a high thermal stability up to 150 °C or higher and the low driving voltage of 2 V with high mobility of $1.2 \text{ cm}^2 \text{V}^{-1} \text{s}^{-1}$ at the same time. The new type organic transistor can be sterilized in a standard sterilization process (150 °C heat treatment). The key technology to realize the heat resistant organic transistor with low driving voltage is the development of a new insulating film comprising an ultra-thin ($\sim 2 \text{ nm}$) and densely packed layer named self-assembled monolayer (SAM).

Research team seems to expect such applications as long implantable devices and some medical devices like a smart catheter, and thin film medical sensors.

* Kazunori Kuribara, He Wang, Naoya Uchiyama, Kenjiro Fukuda, Tomoyuki Yokota, Yte Zschieschang, Daniel Fischer, Hagen Klauk, Tatsuya Yamamoto, Kazuo Takimiya, Masaaki Ikeda, Hirokazu Kuwabara, Tsuyosi Sekitani, Yueh-Lin Loo and Takao Someya, "Organic Transistors with high thermal stability for medical applications," *Nature Communications* Vol. 3, Article No; 723 (2012), doi: 10.1038/ncomms1721, Published online 06 March 2012.

- ◆ *NTT develops a current-injection laser with ultralow power consumption - Towards ultralow power consumption microprocessors*

Nippon Telegraph and Telephone Corporation (NTT) announced on 13 February 2012 that they have developed a current-injection photonic-crystal laser with ultralow power consumption, which can be applicable to both off-chip and on-chip optical data transmission for microprocessors. Details of the research are published in the scientific Journal *Optics Express** on the same day.

Explosive diffusion of broadband services such as FTTH and smartphones are expected to lead to network traffic 200 times increase and the total power consumed by ICT-related equipment 5 times during the coming 20 years. NTT laboratories have focused on finding a radical solution to reduce the power consumption of microprocessors (MPU), since MPUs consume most of the power in ICT-related equipment.

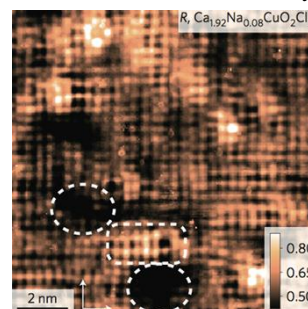
NTT Laboratories have developed a lambda (wavelength)-scale embedded active region photonic-crystal (LEAP) laser, in which a wavelength-scale InGaAsP-based active region is embedded in an InP based photonic-crystal (PhC) waveguide. This LEAP laser achieved the world's first continuous-wave operation of a current-injection-photonic crystal laser at room temperature (25-30°C). An ultralow effective operating current of 10 μ A was realized and the output power of 1.8 μ W was obtained at the current level of 2.0 mA. NTT claims that this result was obtained by a unique structural feature of the present LEAP laser, where the current injection is performed by lateral pin junctions into the active region.

NTT seems to consider that the operating characteristics of the fabricated LEAP laser is an answer to the request of future optical interconnects in CMOS MPUs presented in International Technology Roadmap 2007 ITRS ([Source](#)).

* Shinji Matsuo, Koji Takeda, Tomonori Sato, Masaya Notomi, Akihiko Shinya, Kengo Nozaki, Hideaki Hasebe, and Takaaki Kakitsuka, "Room-temperature continuous-wave operation of lateral current injection wavelength-scale embedded active-region photonic-crystal laser," *Optics Express* Vol. 20, No. 4, pp. 3773-3780 (2012), Published 13 February 2012.

- ◆ *High-temperature superconductivity starts with nanoscale electronic oases*

Cornell University (Ithaca, NY, USA) announced on 30th May 2012 that an international research team, led by Professor J.C. S  amus Davis of Cornell University and Professor Hidenori Takagi of the University of Tokyo (Hongo, Tokyo, Japan) has succeeded in observing expansion of high-temperature superconductivity to start from isolated nanoscale patches. Details were published online in *Nature Physics* on 20th May 2012 (Ref). Lead author of the paper, T. Kohsaka and Prof. Takagi are affiliated with RIKEN, and a press release in Japanese was also presented by RIKEN.



The international team used extremely precise scanning tunneling microscopes (STMs) to scan a surface in steps smaller than an atom to measure what electron energy levels are occupied or unoccupied. The team examined a series of samples of sodium-doped calcium cuprate $\text{Ca}_{2-x}\text{Na}_x\text{CuO}_2$, prepared with gradually increasing sodium content. At the lowest concentration of sodium doping, isolated nanoscale patches indicates a sign of superconductivity. As more "dopant" atoms are added, small, scattered superconducting areas grow

to touch with each other and eventually fill the entire space. Visual understanding of the evolution of high-temperature superconductivity has come to the reality by STM observation.

(Ref) Y. Kohsaka, T. Hanaguri, M. Azuma, M. Takano, J. C. Davis and H. Takagi, "Visualization of the emergence of the pseudogap state and the evolution to Superconductivity in a lightly hole-doped Mott insulator," *Nature Physics* (2012) doi: 10.1038/nphys2321, published online 20 May, 2012.

◆ *Structurally flexible "silicene" integrated with Si wafers*

The Japan Advanced Institute of Science and Technology (JAIST) announced on May 30, 2012, that a team of researchers at JAIST, has succeeded in preparing silicene on Si wafers via a ceramic zirconium diboride (ZrB₂) buffer layer, and has found that a direct band gap can be induced in silicene by structural control. The report of this research has been published in Physical Review Letters.

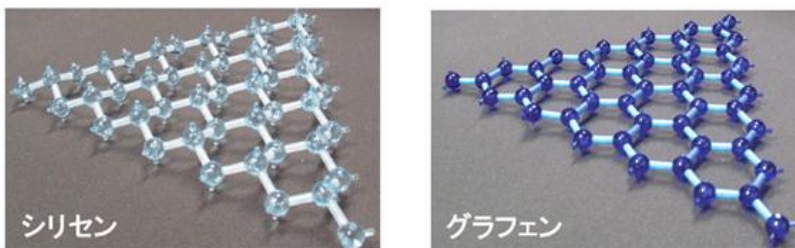


Figure 1: Stick-and-ball models of silicene and graphene.

Theoretical studies on silicene have suggested not only astonishing electronic and transport properties similar to graphene, but also presence of band width. However, experimental evidence for its existence has been scarce so far.

The JAIST team found that epitaxial silicene is grown spontaneously on the surface of ZrB₂ thin film formed on Si (111) wafer by thermal decomposition of zirconium borohydride under ultra-high vacuum. The structural and electronic properties of silicene have been characterized by scanning tunneling microscopy (STM) and photoelectron spectroscopy. Further, in order to achieve better understanding of experimental results, first-principles calculations of the crystal and electronic structures of epitaxial silicene were carried out.

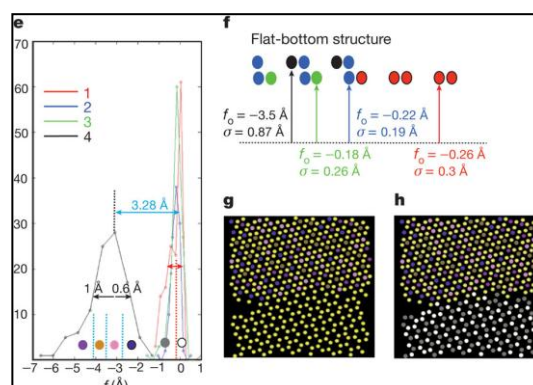
The experimental data provide clear proof for the presence of two-dimensional silicene. In this method, silicene is formed uniformly and spontaneously with Si atoms supplied from the Si wafer underneath the ZrB₂ film at high temperature, obtaining good reproducibility. In addition, particular buckling, displacement of neighboring Si atoms out of the plane, is demonstrated to lead to a direct band gap. The buckling is determined by the choice of the substrate with selected lattice parameters, and the electronic properties can be made tunable. This structurally flexible silicene with a tunable direct band gap will open a way to logic circuit and optoelectronic applications.

* Antoine Fleurence, Rainer Friedlein, Taisuke Ozaki, Hiroyuki Kawai, Ying Wang, and Yukiko Yamada-Takamura, "Experimental evidence for epitaxial silicene on diboride thin films", *Physical Review Letters*, Vol. 108, No. 24, p. 245501 (2012) [5 pages] DOI:10.1103/PhysRevLett.108.245501 published 11 June 2012

Taiwan (Source: NPNT)

◆ *Big-Bang Tomography: A new route to atomic resolution Tomography*

Until now it has not been possible to image at atomic resolution by classical electron tomographic methods, except when the target is a perfectly crystalline nano-object imaged along a few zone axes. The main reasons are that mechanical tilting in an electron microscope with sub-ångström precision over a very large angular range is difficult, that many real-life objects such as dielectric layers in microelectronic devices impose



geometrical constraints and that many radiation-sensitive objects such as proteins limit the total electron dose. Hence, there is a need for a new tomographic scheme that is able to deduce three-dimensional information from only

Hubble plots and histogram of the focal distance
e, Histogram of f for four different types of atom. ; **f**, The flat-bottom model. f_o , average focal distance; σ , standard deviation. **g**, Subtypes of atoms of type 4. **h**, Subtypes of atoms of type 1.

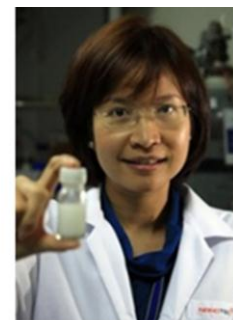
one or a few projections. Here we present an electron tomographic method that can be used to determine, from only one viewing direction and with sub-ångström precision, both the position of individual atoms in the plane of observation and their vertical position. The concept is based on the fact that an experimentally reconstructed exit wave consists of the superposition of the spherical waves that have been scattered by the individual atoms of the object. Furthermore, the phase of a Fourier component of a spherical wave increases with the distance of propagation with a known 'phase speed'. If we assume that an atom is a point-like object, the relationship between the phase and the phase speed of each Fourier component is linear, and the distance between the atom and the plane of observation can therefore be determined by linear fitting. This picture has similarities with Big Bang cosmology, in which the Universe expands from a point-like origin such that the distance of any galaxy from the origin is linearly proportional to the speed at which it moves away from the origin (Hubble expansion). The proof of concept of the method has been demonstrated experimentally for graphene with a two-layer structure and it will work optimally for similar layered materials, such as boron nitride and molybdenum disulphide. (Dirk Van Dyck & Fu-Rong Chen, NATURE, 486:243-246 JUN 13, 2012. Diagram provided by Prof. Fu-Rong Chen)

Thailand (Source: NANOTEC)

◆ Using chitosan core-shell nanoparticle for breast cancer

A group of researcher from NANOTEC and King Mongkut's University of Technology Thonburi (KMUTT) has successfully developed target drug delivery system using folate-conjugated pluronic F127/chitosan core-shell nanoparticles to deliver doxorubicin (DOX) to target cancer cells focusing on breast cancer.

As in many developing countries, cancer in Thailand is becoming a significant health problem. Cervix and breast cancer is the leading cause of death in Thai women. The only commercial DOX – encapsulated liposome



Dr. Nuttaporn
with sample chitosan-based nanoparticles

available has a short half-life in microcirculation and is unstable in the blood stream. Hence there is a need to find a more controlled and stable DOX carrier system.

“DOX is one of the most commonly used chemotherapeutic agents for cancer treatment including breast cancer. However, DOX is also considered a poor soluble drug that is toxic to healthy tissues. By using core-shell nanoparticles from folate-conjugated pluronic F127/chitosan we were able to develop a delivery vector that has greater targeting ability, chemical stability and lower cytotoxicity”, said Dr. Nuttaporn Pimpha, NANOTEC researcher at Hybrid Nanostructure and Nanocomposite.

The researchers reported their work in a paper published by the Journal of Nanomaterials.

NEW PUBLICATIONS

India

1. Nanospheres for Gas sensor Applications”, MATERIALS SCIENCE FORUM, 710, 768-773, 2012.
2. A. T. Mallajosyula, S. Iyer, S. Kumar, B. Mazhari, “Capacitance-voltage characteristics of P3HT: PCBM bulk hetero junction solar cells with ohmic contacts and the impact of single walled carbon nanotubes on them”, ORGANIC ELECTRONICS, 13(7): 1158-1165 JUL 2012.
3. S. K. Tripathi, R. Goyal, M. P. Kashyap et al, “Depolymerized chitosans functionalized with bPEI as carriers of nucleic acids and tuftsin-tethered conjugate for macrophage targeting”, BIOMATERIALS, 33(16): 4204-4219 JUN 2012.
4. A. Indra, G. K. Lahiri et al, “carbon monoxide assisted self-assembled platinum nanoparticles for catalytic asymmetric hydrogenation”, CHEMISTRY-A EUROPEAN JOURNAL, 18(22): 6742-6745 MAY 29 2012.
5. S. Acharya, M. Dutta, S. Sarkar et al, “Synthesis of micrometer length Indium Sulfide nanosheets and study of their dopant induced photoresponse properties”, CHEMISTRY OF MATERIALS, 24(10): 1779-1785 MAY 22 2012.
6. A. Jana, K. S. P. Devi, T. K. Maiti et al, “Perylene-3-ylmethanol: Fluorescent organic nanoparticles as a single-component photoresponsive nanocarrier with real-time monitoring of anticancer drug release”, JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, 134(18): 7656-7659 MAY 9 2012.
7. S. Mahesh, A. Gopal, R. Thirumalai et al, “Light- induced Ostwald ripening of organic nanodots to rods “ JOURNAL OF THE AMERICAN CHEMICAL SOCIETY” 134 (17): 7227-7230 MAY 2 2012.
8. M. S. Deshpande, S. Mazumdar, “ “Sequence specific association of tryptic peptides with multiwalled carbon nanotubes: Effect of localization of hydrophobic residues” BIOMACROMOLECULES, 13(5): 1410-1419 MAY 2012.
9. S. N. Kale, A. D. Jadhav, S. Verma et al, “Characterization of biocompatible NiCo2O4 nanoparticles for applications in hyperthermia and drug delivery” NANOMEDICINE- NANOTECHNOLOGY BIOLOGY AND MEDICINE, 8(4): 452-459 MAY 2012.
10. A. Sasidharan, L. S. Panchakarla, A. R. Sadanandan et al, “Hemocompatibility and macrophage response of pristine and functionalized graphene” SMALL, 8(8): 1251-1263 APR 23 2012.
11. S. Srivastava, R. Awasthi, D. Tripathi et al, “Magnetic- nanoparticle-doped carbogenic nanocomposite: An effective magnetic resonance/ fluorescence multimodal imaging probe”, SMALL, 8(7): 1099-1109 APR 10 2012.
12. R. G. Chaudhuri, S. Paria, “Core/ Shell nanoparticles: Classes, properties, synthesis mechanisms, characterization, and applications”, CHEMICAL REVIEWS, 112(4): 2373-2433 APR 2012.
13. F. Dilnawaz, A. Singh, S. Mewar et al, “The transport of non-surfactant based paclitaxel loaded magnetic nanoparticles across the blood brain barrier in a rat model”, BIOMATERIALS REVIEWS, 33(10): 2936-2951 APR 2012.

Japan

1. Y. Kohsaka, T. Hanaguri, M. Azuma, M. Takano, J. C. Davis and H. Takagi, "Visualization of the emergence of the pseudogap state and the evolution to Superconductivity in a lightly hole-doped Mott insulator," *Nature Physics* (2012) doi: 10.1038/nphys2321. Published online 20 May, 2012.
2. Antoine Fleurence, Rainer Friedlein, Taisuke Ozaki, Hiroyuki Kawai, Ying Wang, and Yukiko Yamada-Takamura, "Experimental evidence for epitaxial silicene on diboride thin films", *Physical Review Letters*, Vol. 108, No. 24, p. 245501 (2012) [5 pages] DOI:10.1103/PhysRevLett.108.245501 published 11 June 2012
3. Shinji Matsuo, Koji Takeda, Tomonori Sato, Masaya Notomi, Akihiko Shinya, Kengo Nozaki, Hideaki Hasebe, and Takaaki Kakitsuka, "Room-temperature continuous-wave operation of lateral current injection wavelength-scale embedded active-region photonic-crystal laser," *Optics Express* Vol. 20, No. 4, pp. 3773-3780 (2012), Published 13 February 2012.
4. Kazunori Kuribara, He Wang, Naoya Uchiyama, Kenjiro Fukuda, Tomoyuki Yokota, Yte Zschieschang, Daniel Fischer, Hagen Klauk, Tatsuya Yamamoto, Kazuo Takimiya, Masaaki Ikeda, Hirokazu Kuwabara, Tsuyosi Sekitani, Yueh-Lin Loo and Takao Someya, "Organic Transistors with high thermal stability for medical applications," *Nature Communications* Vol. 3, Article No; 723 (2012), doi: 10.1038/ncomms1721, Published online 06 March 2012.

Singapore

1. Jarrett J. Dumond and Hong Yee Low; "Recent developments and design challenges in continuous roller microand nanoimprinting"; *J. Vac. Sci. Technol. B*, Vol. 30, No. 1, Jan/Feb 2012; DOI: 10.1116/1.3661355
2. Wei Qin, Dan Ding, Jianzhao Liu, Wang Zhang Yuan, Yong Hu, Bin Liu and Ben Zhong Tang; "Biocompatible Nanoparticles with Aggregation- Induced Emission Characteristics as Far-Red/Near-Infrared Fluorescent Bioprobes for In Vitro and In Vivo Imaging Applications"; *Adv. Funct. Mater.* 2012, 22, 771–779

Taiwan

1. Li Liu, Qing Ye, Yi-Jen Wu, Wen-Yuan Hsieh, Chih-Lung Chen, Hsin-Hsin Shen, Shian-Jy Wang, Haosen Zhang, T. Kevin Hitchens, Chien Ho. Tracking T-cells in vivo with a new nano-sized MRI contrast agent. *Nanomedicine-Nanotechnology Biology and Medicine*, March 2012. **SCI IF: 4.882**
2. Yu-Fan Chang, Chun-Yu Chen, Fang-Tsai Luo, Yu-Chiang Chao, Hsin-Fei Meng, Hsiao-Wen Zan, Hao-Wu Lin, Sheng-Fu Horng, Teng-Chih Chao, Han-Cheng Yeh, Mei-Rurng Tseng. Vacuum-free Lamination of Low Work Function Cathode for Efficient Solution-processed Organic Light-emitting Diodes. *Organic Electronics*. **Volume 13, Issue 3**, Pages 388–393, March 2012. **SCI IF: 3.998**
3. Wen-Chuan Lee, Chih-Hsien Chang, Chih-Min Huang, Yu-Tse Wu, Liang-Cheng Chen, Chung-Li Ho, Tsui-Jung Chang, Te-Wei Lee, Tung-Hu Tsai. Correlations between radioactivity and chemotherapeutics of ¹¹¹In-VNB-Liposome in pharmacokinetics and biodistribution in rats. *International Journal of Nanomedicine*, Volume 2012:7 pages 683-692, February 2012. **SCI IF: 4.976**

ASIA NANO FORUM SOCIETY NEWSLETTER

ISSUE No.17 July 2012

EVENTS

Date	Avenue	Events
Aug. 16-18, 2012	Seoul, Korea	Nano Korea 2012 - The 10th International Nanotech Symposium & Nano-Convergence Expo Website: www.nanokorea.or.kr
Sep. 3-7, 2012	Queensland, Australia	International Organic Excitonic Solar Cells Conference Website: http://www.uq.edu.au/iceanconference/index.html
Sep. 13-15, 2012	Suzhou, China	CHInano 2012 Conference&Expo Website: http://chinanoconf.com/
Oct.2, 2012	Hsinchu, Taiwan	2012 CNSI/NPNT Joint Workshop on Nano Technology Event Contact: Ms. Sharon Huang (sharonhuang96@nctu.edu.tw)
Oct. 3-5, 2012	Taipei, Taiwan	2012 Taiwan Nano Week Website: http://nano.tca.org.tw/
Oct. 4-8, 2012	Tehran, Iran	Iran Nano 2012 Website: www.anm2012.com
Oct. 17-19, 2012	Chennai, India	4th International Conference on Advanced Nanomaterials (ANM 2012) Website: www.anm2012.com
Oct. 18-19	Pune, India	The International Conference on Nanotechnology : NANOCON 2012 Website: http://www.nanocon2012.com/
Oct. 22-25, 2012	Brisbane, Australia	ICEAN-2012:International Conference on Emerging Advanced Nanomaterials Website: http://www.uq.edu.au/iceanconference/index.html
Oct.30-Nov.2, 2012	Kobe, Japan	2012 International Microprocesses and Nanotechnology Conference Website: http://imnc.jp/
Oct.30-Nov.2, 2012	Ha Long City, Vietnam	6th International Workshop on Advanced Materials Science and Nanotechnology (IWAMSN2012) Website: http://iwamsn2012.ac.vn/
Nov. 4-7, 2012	Bangkok, Thailand	The 6th IEEE International Conference on Nano/Molecular Medicine and Engineering (IEEE-NanoMed 2012) Website: http://www.ieee-nanomed.org/2012/
Feb. 11-15, 2013	Auckland, New Zealand	The 6th International Conference on Advanced Materials and Nanotechnology (AMN6) http://www.amn-6.com/
Jun.30-Jul.5, 2013	Singapore	International Conference on Materials for Advanced Technologies (ICMAT 2013) For more information: eileenso@mrs.org.sg
Aug.13-16, 2013	Nanjing, China	The 4th International Conference of Bionic Engineering(ICBE 2013) website: http://www.icbe2013.cn