

Nanotechnology Update in Vietnam – From a visit in Vietnam in Nov. 2009

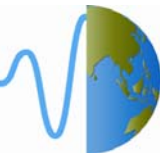
Executive Summary:

I wrote about Nanotechnology in Vietnam back in Feb. 2004 at my column Asia Pacific Nanotech Weekly (www.nanoworld.jp/apnw) when Vietnam just started the initiative in nanoscience and launched infrastructure building and basic science programs. Today, with a population of about 86 million and very young population (one third of the population is between 10-24 years old) and a vibrant economy, Vietnam has advanced fast in building R&D capabilities and growing high-tech industries with the help of both domestic and foreign investments. With limited government and private funding for developing nanotechnology compared with the developed world, Vietnam has progressed quite impressively in building its world class facilities and high quality research. In this article we share with you my experience of my recent visit in Vietnam and participation in one domestic nanotech conference Solid State Physics and Materials Science Annual conference (SPMS2009) held in Da Nang city during Sept 9-10 and an international conference International Workshop of Nanotechnology Application (IWNA2009) held in Vung Tau city during Sept 12-14. The main findings are

- a) Vietnam has built world class nanotechnology R&D facilities at selected center of excellence at major universities and national research laboratories as well as industry parks
- b) Vietnam has a clear focus on nanotech application for clean-tech, in particular, applications in efficient lighting such as LED, solar cell, water treatment and others
- c) R&D focus is in nanomaterials including Oxide Materials (ZnO, TiO₂, Fe₂O₃ for lighting, solar applications, photocatalytic, cancer treatment applications); Composite Materials using CNT, Al₂O₃ and others; Metal Nanoparticles (Cu/Ag for agriculture application as pesticides); and Quantum Dot (CdSe).
- d) Vietnam also started to pursue Nanotech For Oil and Gas application
- e) MEMS R&D capability building – Ho Chih Minh University Nanotechnology Laboratory

I continued our world nano tour in Vietnam in November 2009 month when I participated in two nanotech conferences as an invited speaker.

The first one was the Solid State Physics and Materials Science 2009 (SPM2009) held in Da Nang during Nov. 9-10th, an annual domestic conference where physicists and materials scientists gather. Da Nang is the 3rd largest city in Vietnam and it is attractive to foreign tourists for its beautiful beaches and the old capital Hue nearby. This is a city of Scooters, unlike most big cities in China where cars are dominating the road and causing severe pollution and traffic jam. Normal people's life is simple and yet they look happy and self-contained.



The conference was mostly in Vietnamese and there was neither English program nor website. I was one of a few foreign speakers who gave our presentations in English in the morning to about 200 participants. We observed this conference and found a number of research areas the Vietnamese scientists are pursuing and some of the research activities are quite competitive and has interesting commercial applications. These areas including Carbon Nanotube composite materials, III-V semiconductor materials for LED application, Nanowires or CNT hybrid with semiconductor metal oxides materials application for high sensitivity gas sensors and FET, metallic nanoparticles application in agriculture as pesticides and anti-microbial, TiO₂ for water treatment, biodiesel/biofuel, Magnetic nano- particle for biomedical application including imaging, separation of molecules, and treatment (DDS, hyperthermia) and many other interesting areas. The most impressive talk was given by Prof. Phan Hong Khoi who is the Project Manager of the Vietnam Energy Efficient Public Lighting Project funded by United Nation and Vietnamese Academy of Science and Technology. Prof. Khoi presented overview on Vietnam status in commercializing LED technologies. “We are getting support from the World Bank, Asia Development Bank to fund manufacturing of energy efficient lighting products. Our project provides for capacity building, training, technology, standardization and policy implementation”, Prof. Khoi revealed during our interview.

A clear focus on the application R&D is in the area of energy, environment, sensors and smart materials. All overseas speakers have already or in the process of established nanotech R&D collaborations with Vietnamese universities and industries. Dr. Cattien Nguyen, who is a senior research scientist working at NASA Ames Research Center based in Silicon Valley, has established quite a few collaborative projects especially in the areas of CNT and LED with scientists and industries in Vietnam. “Vietnam, and in particular Ho Chi Minh City and Hanoi are like Shanghai a few years ago, full of excitement and opportunities. The young scientists here are highly motivated and with international exposures, they can easily become international competitive”, Dr Cattien Nguyen shared with us during our interview. Similar to other Asian countries, the overseas trained Vietnamese scientists, who are now working in private companies or are professors at universities in Vietnam , have been the key driver for advancing Vietnam nanotechnology and accelerate its commercialization with the help of corporate and private investors.

The other conference was the International Workshop on Nanotechnology Application (IWNA2009), Nov. 12-14 held in Vung Tau city. A full conference program can be found at its website www.hcmlnt.edu.vn.

Vung Tau is one of Vietnamese beach resort cities, about 2 hrs (130km) by a slow local bus from Ho Chi Minh City. It is also the crude oil extraction center of Vietnam.

The conference was a bi-annual international nanotech event started 2007 after the Laboratory of Nanotechnology in Vietnam National University – Ho Chi Minh City lab was established in 2006 which is one of the Vietnam nanotech infrastructure building initiatives launched in 2004. The conference chair is Prof. Dang Mau Chien who is the director of laboratory which is the main sponsor of this conference. Prof. Chien and his colleagues' collaborative relationship with Europe has brought speakers from France (especially Minatec), Netherland (Univeristy of Twente), Spain, Japan, Korea, Taiwan and Singapore. The opening plenary talks in the morning of the first day were all about MEMS given by Herve Fanet - Commissariat à l'Energie Atomique (CEA) - LETI - MINATEC, France; Cees J.M. van Rijn - Wageningen University / AQUAMARIJN Micro Filtration B.V, The Netherlands, and Susumu Sugiyama - Ritsumeikan University, Japan. The Laboratory of Nanotechnology has a strong collaboration with Minatec and it has the most comprehensive facilities for MEMS devices fabrication and characterization in Vietnam. The rest of the conference covered cutting edge R&D and application in nanotechnology including fundamental research, nanofabrication and synthesis, nanomaterials and nanostructures, MEMS and Nano Devices, and nanotechnology application. There was also a poster session. A special Forum on Business Opportunities in Micro and Nanotechnology Industry was held on the last day where industries and research scientists presented the latest nanotech application and industry activities in Vietnam, France and Japan.

There are about 200 participants in the conference and 35% are foreigners. The organizers offered fantastic hospitalities to speakers and participants from overseas offering free and delicious lunches and dinners plus local guided tour in Vung Tau city.

During this conference, I discovered the advancement and enthusiasm of Vietnamese industry moving into nanotechnology. The Forum on Business Opportunities of Micro-Nanotechnology Industry in Vietnam held on the last day of the conference attracted over 50 participants which was the most popular session together with 2 other technical parallel sessions. Prof. Nguyen Phuong Tung from the Institute of Applied Materials Science introduce the potential of nanotechnology application for oil and gas exploration and production and some of the ongoing the research activities in her research group in collaboration with Vietnam oil and gas industry in Vung Tau city. Green Power Technology CEO Albert Chan Tu presented its company unique high performance low cost technology for manufacturing thin film solar cell and equipment Its technology is based on amorphous silicon and APP-CVD method (atmosphere pressure thus low-cost, no vacuum required)



I was particularly impressed by the SHTP Labs, a carbon nanotubes producer located in the Saigon Hi Tech Park Research Laboratories which demonstrated their low cost solid phase production method for producing short CNT and its capability of application in making composite materials in collaboration with Good Year and Hitachi Hi-tech. This company is able to produce 1kg per hour CNT with 100nm long.

I was most impressed by the strong industry and academia collaboration in application research and development in Vietnam especially in the area of Carbon Nanotubes (CNT. Dr Phan Ngoc Minh and Prof. Phan Hong Khoi's team at the Institute of Materials Science (IMS) of Vietnam Academy of Science and Technology (VAST) have been working on CNT) since 2003 when Dr Minh returned from Japan from synthesis to application development in composite materials, thermal dissipation media (thermal management for High-brightness LED), electro-magnetic wave absorption, electron field emitter and scanning probes. This group works closely with Green Power Nano Joint Stock Company (led by Albert Chan Tu), Dr Cattien Nguyen from NASA and other local manufacturers.

One of the most impressive talks in this conference was solution based low cost production of ZnO nanorod and its potential in replacing GaN in LED and ITO for conducting electrode application presented by two invited speakers from Singapore Prof. SUN Xiao Wei (NTU) and Prof. CHUA Soo Jin (NUS and IMRE).

As a result of this conference and our site visit, we discovered that major nanotech facilities have been established near Ho Chi Minh funded by the Ho Chi Minh City government (HCMC). They include

- 11.5M USD Saigon high-tech park a) Nano Lab, b) Microelectronics Lab, and c) Precision Mechanics Lab.
- 6M USD Nanotechnology Laboratory at Ho Chih Ming University, a complete microfabrication and characterization facility

Vietnam is moving towards establishing clean-tech industries especially in Solar and Lighting areas. Another presented at the business forum was Red Sun Energy which is a maker of module panels from 25Wp to 175Wp (mono and poly-crystalline) with 15% solar efficiency, and other energy saving products including Solar water heater, Solar LED lighting, LED illuminated write board and etc.

I enjoyed enormously my Vietnam experience in Nov. 2009 and will go to Hanoi Nov.2010 for the big Hanoi 1000 Years Anniversary celebration together with a major nanotechnology conference. Vietnam will host the Asia Nano Forum 7th Summit during this period as well. Until then, Happy Holidays!



Fig1. The crowd at the domestic annual Solid State Physics and Materials Conference (SPM2009) held during Nov. 9-10th, 2009 in DaNang City. Dr Phan Ngoc Minh is the Chairman of the conference (far left on the front row).



Fig. 2. Lerwen with the Vietnamese nanotech elites at the SPM2009 from right to left: Prof. Phan Ngoc Minh, Prof. Nguyen Phuong Tung, Prof. Tran Kim Anh, Lerwen Liu, Prof. Phan Hong Khoi, and Prof. Le Quoc Minh.



Fig.3. Lerwen visited the Laboratory of Nanotechnology at Vietnam National University- Ho Chi Minh City. From left to right: Prof. Dang Mau Chien (director), Lerwen Liu, Prof. Phan Ngoc Minh (IMS, VAST) and Prof. Takahito Ono (Tohoku Univ. Japan)