

Outline of the Aisa Nanotech Camp 2008

Feb 4-21, 2008, Japan

The basic concept of Asia Nanotech Camp 2008 (ANC2008) is to provide our younger generation of nanotechnologists (especially PhD students and postdoctoral researchers from the Asia Nanotech Forum (ANF) network economies) with an opportunity to learn the frontier of this field and more importantly, to build personal relationships across the Asian nations. The period is so chosen to match the nano tech 2008 in Tokyo which is the world's largest nanotech event and where nanotechnology leaders meet.

ANC2008 was initiated under the ANF Human Resources Development Working Group led by Dr. Hiroshi Yokoyama. We hope this program will become a continuous effort in ANF network economies in fostering a young generation of nanotechnology leaders.

The program involved variety of activities including attending lectures by experts, giving seminars, participating nanotech 2008, visiting nanotech companies, and industry centers and others in Tsukuba, Tokyo and Nagoya. The participants were also requested to introduce their research activities in the seminars, work on group assignments and present the results at the symposium.

This event, under the collaboration with ANF, was co-organized and co-sponsored by National Institute of Advanced Industrial Science and Technology (AIST), National Institute for Materials Science (NIMS), Tokyo Institute of Technology (Tokyo Tech) under the global COE program.

The following is a brief report on the activities of ANC2008 from 5th to 20th, Feb. 2008. We invited 30 young researchers from Asia, and 5 students from Tokyo Tech (One of the foreign participants withdrew during the camp because of illness). The names and their areas are found in the attached symposium program. For the transportation, for example, to visit companies' labs, we used a bus chartered for the camp.

5th Opening, attending lectures, and seeing AIST

After the opening talks by Dr. Yokoyama, Director of Nanotechnology Research Institute (NRI), AIST, Prof. Hideo Takezoe, Tokyo Tech, and Masahiro Takemura, Director at International Affairs Office, Planning Div., NIMS, beginning at 9 am, we

had first seminar by 9 participants to introduce their researches.

In the afternoon, Prof. Masakazu Aono, Center Director of NIMS, gave a lecture entitled 'General topics of Nanotechnology', introducing technology to polymerize C₆₀ films reversibly, multi-probe STM, high resolution processing by tungsten oxide, and other variety of topics. In addition, he introduced International Center for Materials Nanoarchitectronics (MANA), new international research center in NIMS.

Then we made a lab tour in 4 groups: CNT for 8 participants, nano material for 14 participants, MEMS & aerosol deposition for 6 participants, and processing method for 7 participants.

We held the second seminar to introduce 10 participants' research.

6th Lectures at AIST, and visiting Hitachi Mechanica Lab at Katsuta

Dr. Kazutomo Suematsu, Team Leader of Research Center for Advanced Carbon Materials, AIST, gave a lecture entitled 'High-resolution TEM' at Information Conference room at 9 am.

The state-of-the-art technology enabled the observation of composite atoms of CNT and detection of defects and chirality. And C₆₀ and organic molecules are encompassed inside CNT and the inner structure of molecules and their change can be seen. Active questions from participants were raised.

Next, Dr. Nobuichi Kamei, Director of science and safety policy headquarter at Mitsui sogo Research Centre, gave a lecture entitled 'Nanotechnology Industrialization in Japan'. He introduced Japanese cultural background and argument of true nanotechnology.

In the afternoon we went to Hitachi Mechanical Engineering Institute in Katsuta. After listening to the overall introduction at meeting room, we attended the lectures on simulation of heat design and then observed researches on MEMS, biosensor, and robotics.

7th Visit to NEC Research Institute at Tsukuba and SII Nanotechnology in Tokyo

We went to NEC Research Institute in Tsukuba and observed materials and device technology at Nanoelectronics Research Institute in the morning.

They introduced various fields ranging from bio plastics already applied in practical use to quantum computer in the basic research stage. Organic radical battery is displayed as a trial of new principle. Not only the technology per se is intriguing and many

questions were asked, but also in terms of management of research and development in the realization of technology we could learn a lot.

We went to SII Nanotechnology in Shintomi-cho, Tokyo. Demonstration of probe microscope and explanations of other measuring equipments were made in each group divided from beginners to specialists. Moreover, we could obtain information on the latest technological trend of probe microscope. For example, we learned an interesting development on the noise reduction of light lever laser detecting of cantilever.

8th Observation of NIMS, attending lectures, and seminar

We visited by two official buses to three campuses, Sengen, Namiki, and Sakura in NIMS 9 am. In Sengen campus, we saw fine particle processing of Nanotechnology Innovation Centre and collaborative equipment of nano bio, which were newly built in October, 2007. In Namiki campus, project for invitation of young scientists overseas at International Centre was explained. In Sakura campus, we observed the world's largest NMR (930MHZ) and electron microscope.

In the afternoon, we asked Dr. Seiichiro Kawamura, Room Leader of Technology and Strategy, Selete, to talk about an overview of Nanoelectronics at Information Conference room, AIST.

Nanoelectronics, which is the largest market of industrialization of nanotechnology, being followed the road map, is invested a quite sum of money. Many participants showed their high interests, popping up questions such as strain silicon and the feasibility of molecular devices.

Dr. Jinhua YE, Centre Director of Photocatalyst Material Centre at NIMS gave a lecture entitled 'Nano photon catalysis: green ultimate technology for sustainable society'. As for the law of photocatalyst, electrical charged separation caused by light incitation. Trials were shown to enhance the effectiveness of hydrolysis through development of many different materials. In answering the questions as to the difference from solar cells, she insisted the superiority of system with hydrogen fuel in that electrode structure is not necessary for manufacturing hydrogen by photocatalysis. In the third seminar, the last one, the remaining 15 participants made presentations of their activities.

11th Holiday, Moved to Tokyo

We moved to a hotel in Kawasaki from Tsukuba.

12th Observation of Tokyo Tech Institute

We went to Tokyo Tech. There they made a lab tour in three groups.

13th Lectures by Tokyo Tech Professors, Poster session

We went to Tokyo Tech, and attended the lectures by professors at Tokyo Tech in the morning. In the afternoon, participants, including 17 Tokyo Tech students joining in G-COE, made a poster session.

14th Observation of International Exhibition of Nanotechnology, 2008

Participants visited Nanotech 2008, the International Exhibition of Nanotechnology, and were overwhelmed by the great number of exhibitions. They seem to have high interest in development and realization of practical use in products such as cosmetics using nano particles.

15th Workshop by NIMS at Tokyo Bigsight

We went to Tokyo Big Sight. NIMS held workshop adjacent to the Nanotech Exhibition Hall to introduce nanotechnology research development.

16th Visit to ULVAC, move to Nagoya on weekend

We checked out the hotel in Kawasaki and moved to Nagoya. On the way to Nagoya, we visited ULVAC head factory in Chigasaki. We made a guided tour after listening to the explanation of outline of the factory.

Gigantic equipments that transmit 3m-by-3m mother glass for manufacturing line of flat panel display and that manufacture films sputtered various materials were impressive.

18th AIST Chubu Centre

We visited AIST Chubu center to learn environmental friendly material technology.

We had two lectures in the morning after opening greeting and video explanation.

Dr. Kazumi Kato, Group Leader of Talor Liquid Integrated Research Group, Advanced Manufacturing Process Research Division, gave a lecture on the method of manufacturing ceramics from solution. Participants asked merits and demerits of liquid phase. As a merit, she elaborated the array of stoichiometry unlike vapour deposition

and as a demerit, it is hard to control crystallization.

Dr. Masanobu Awano, Group Leader of Functional Module Research Group, gave a lecture on ceramic reactor.

There were three lectures and lab tours in three groups

Yutaka Tai, Researcher of Mesoporous Ceramics Research Group, Sustainable Material Research Division, gave a lecture on Au catalysis. Au nanoparticles below 5 nm foster the catalytic activity. He referred to arofen and imogolite as catalyst supports.

Dr. Kazuki Yoshimura, Group Leader of Responsive Function Thin-layer Research Group, gave a lecture on light control glasses. He uses Mg, Ni, and Ti as light control materials, instead of unstable rare earth element.

Dr. Taizo Ono, Group Leader of Nano sign Measurement Technology Research Group, Measurement Fronteer Research Division, gave a lecture on risk evaluation of nano material and the crystal structure control using organic compound molecules combined hydrogenised part with fluorinated part.

19th JFCC, Toyota Commemorative Museum of Industry and Technology

We went to Japan Fine Ceramics Centre (JFCC) in the morning.

Watching Video explaining facility, we had 2 lectures, and saw facility. The first lecture was about high proficiency microscope by Dr. Han and the second one was evaluation of superconductivity tape by Dr. Fumiharu Kato. Dr. Kato introduced the visual trial regarding not only the structure, but also the function by the low-temperature probe laser microscope.

We observed microscope laboratory, exhibition hall at the entrance, and newly constructed nanotech Centre. Although new microscopes have not been equipped yet, we learned the explanation of blocking structures against oscillation and magnetic noise that will be supposed to be caused with equipment of high-performance microscope. JFCC accepts pos docs from China, Korea, and Thailand, so participants changed notes with them.

We moved to Toyota Commemorative Museum of Industry and Technology in the afternoon. Dr. Osamu Watanabe at Toyota Central Research Centre introduced nanotechnology-related research activity there. His specialty is the method of adsorption of molecules onto the azopolymer substrate, called Photo-induced plastization, and he is developing various applications such as bio sensor, photonic crystal etc.

We understand that Toyota Commemorative Museum of Industry and Technology is the starting place of Toyota Automobiles and has been increasing the number of visitors since Aichi EXPO.

After the research introduction and explanation of facility, we observed the museum. Fulfilled displays concerning making things rudiment and enactment of forging, particularly looming machinery and automobiles were popular.

20th Symposium

We moved to Noyori Academic memorial hall at Nagoya University. Dr. Shuji Abe, Deputy Director of NRI, gave a lecture entitled 'Nanotechnology in the society' after the opening. Talking about the difficulty of putting the discussion of Nano risks together, he demonstrated that nanotech should not be discussed as just one in a lump, which might enervate the nanotech industrialization as a whole. We are required to put a priority on ethical issues such as bio-related, realistic and most urgent technology to tackle with.

Next, 5 groups made presentations of the group assignments. The assignments were intended to make them consider the ways, the methods how to contribute to the global and social problems like resources and safety. In some countries, water crisis and Tsunami, for example, are serious issues, and viewpoints and arguments were totally different from those in Japan. Thus, we believe that this is one of the staple products of this Asia Nanotech Camp.

Group 1 analyzed energy problems and resorted to new technological solutions such as solar, wind, H₂ fuel, biodiesel, and nuclear, expecting the feasibility of contribution to nano technology.

Group 2 tackled with natural disasters. In order to prevent natural disasters and recover from it, and to save human lives, prevention of global warming, prevention of pathogen, preservation of water and food, and wearable smart shields were raised.

Group 3 dealt with natural disasters such as fire, tsunami, hurricane, heat waves, and earthquakes and suggested on the three levels, that is, individual countermeasures against vulnerability, social resilient infrastructure, and emergency responses. For example, robust communication equipment, individual solar electrolyte generator, medical equipment, high-intensity, self-retrieval building materials, structural fault detector, emergency-responsive rescue team with advanced-functional and light-weight equipment.

Group 4 chose water crisis and raised the technological assignment such as filter for drinking water, disposal water treatment, hydrophilic thin-film coagulation nanocomposite membrane, cloud seeding of rain, and water quality detection monitor.

Group 5 dealt with energy problems as saving energy by electricity generation by solar cells and light-weighted automobiles and considered the improvement of properties by composite materials using nanowires and CNT according to the updated report.

In the afternoon, Dr. Sumio IJIMA, Centre Director of Advanced Carbon Materials, AIST, gave a special lecture entitled 'Carbon nano tube'. He introduced his research background such as initial as best to the young researchers, emphasizing on his serendipity that he discovered CNT, bolstered by ample knowledge and technology, and not by mere incidental discovery.

Group 6 selected the food shortages problem and made an outstanding presentation.

Countermeasures were divided into two terms; 1. the technology of food preservation by packing and anticorrosion treatment for short- or medium-term, and 2. solar-cell-driven green house for long-term. Ultimately, Genetically Modified Organism (GMO) plants will be the trump card to solve starvation.

Group 7 dealt with water crisis, considering technologies available for water treatment, reuse, and preservation. They suggested water quality test using magnetic particles, filtering by radially arrayed CNT pipe nanoporous materials and cleansing thin membrane activated by sun light.

Group 8 also dealt with water crisis, raising equipments such as statistic nano cleansing, thin membrane desalination, and disposal liquid using zeolite. Specifically they suggested technologies magnetic particles and reversible electrical absorption were to be used in order to remove arsenal.

Group 9 dealt with energy problem and suggested collaboration of combination of members' CNT, MEMS and analytical technique for the development of new fuel cells.

Finally, Prof. Weon Bae Ko, Sahmyook University, Korea, gave a special lecture entitled 'Chemical compound technology using ultrasound'. In chemical reaction of decorating C₆₀ with lateral chain, the generation of side products was curbed under the irradiation of ultrasound.

Before closing, we announced 5 Asia Nanotech Camp Award laureates; 2 Japanese; Miss Serizawa and Mr. Oda, and 3 foreigners; Mr. Duriska, Mr. Liao, and Mr. Chen. For three people overseas were endowed with maximum 6-month stay at Tokyo Tech.

Attached is the program of the symposium.

Asia Nanotech Camp 2008 Symposium Program

9:30 Opening

9:40 Lecture: **Nanotechnology in society**

Dr. Shuji Abe (AIST)

10:10 Break

Presentation 1: Group Challenge

10:25--10:40 Group 1: Eun-Ha KIM (Korea), Yoshio SHIMBO (Japan),
Martin DURISKA (Australia)

10:40--10:55 Group 2: Annop KLAMCHUEN (Thailand), Yi ZHANG (China),
Vu Duc CHINH (Vietnam)

10:55--11:10 Group 3: An PING (China), Jade MACKAY (New Zealand),
Hirokazu ODA (Japan), Sung Ho HWANG (Korea)

11:10--11:25 Group 4: Khai Leok CHAN (Singapore), Doungporn YIAMSAWAS (Thailand),
Minoos NAEBE (Australia), Xiaojun XIAN (China)

11:25--11:40 Group 5: Arief UDHIARTO (Indonesia), David MACKENZIE (New Zealand),
Ai SERIZAWA (Japan), Lingyun WANG (China)

11:40 Lunch Break

13:20 Special talk: **Carbon Nanotubes**

Prof. Sumio Iijima (AIST, Meijo Univ., Nagoya Univ.)

14:20 Break

Presentation 2: Group Challenge

14:30--14:45 Group 6: Gamolwan TUMCHARERN (Thailand), Pham Duc THANG (Vietnam),
Yang Chung LIAO (Taiwan), Liyu LIU (Hong Kong)

14:45--15:00 Group 7: Anindya DAS (India), Ghim Wei HO (Singapore),
Yu LINGMIN (China), Kazuyuki ISHIKAWA (Japan)

15:00--15:15 Group 8: Christophe BUMBY (New Zealand), Horng-Shyang CHEN (Taiwan),
Nurul Hidayah MOHD YUNOS (Malaysia), Nam-Ho YOU (Japan)

15:15--15:30 Group 9: Dewi Eniya Listiani (Indonesia), Bei ZHANG (Hong Kong),
Jae-Hong KWON (Korea), Ngyun Van CHUC (Vietnam)

15:30 Coffee Break

15:45 Special talk: **Sonochemical synthesis of various metal nanoparticles and fullerene derivatives**

Prof. Weon Bae Ko (Sahmyook University, Korea)

16:50 ANC award Commendation ceremony for excellent activities

Prof. Junji Watanabe (Tokyo Tech)

17:15--17:30 Closing Dr. Hiroshi Yokoyama (AIST)