



A JOINT MEETING OF

**5TH US-KOREA WORKSHOP ON
NANOSTRUCTURED MATERIALS &
NANOMANUFACTURING
&
3RD US-KOREA WORKSHOP ON
NANO ELECTRONICS**

***Including Annual Review of
Grants under Air Force Nanoscience Initiative for
Korea &
The Center for Nanostructured Materials
Technology***

***8-9 August 2006; 8:10 AM – 5:30 PM
UCLA Sunset Village
Univ. of California, Los Angeles (UCLA)***

SPONSORED BY:

***US Air Force Office of Scientific Research
Center for Nanostructured Materials Technology
(21st Century Frontier R&D Program of Korea)***



**Ministry of Science and Technology
21st Century Frontier R&D Program**



**Center for Nanostructured
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6. AUTHOR(S)

H. Thomas Hahn

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)University of California, Los Angeles
48-121 Engineering IV
420 Westwood Plaza
Los Angeles, CA 90095**8. PERFORMING ORGANIZATION
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A Joint Meeting of the 3rd US-Korea Workshop on Nanoelectronics and the 5th US-Korea Workshop Nanostructured Materials and Nanomanufacturing was held at the University of California, Los Angeles on 8-9 August 2006. The Meeting started with 6 overview presentations on research programs in the subject areas supported by the AFOSR and the Center for Nanostructured Materials Technology, Korea, respectively. The Nanoelectronics Workshop included 10 U.S. papers and 14 Korean papers while the Nanostructured Materials Workshop included 15 U.S. papers and 9 Korean papers. CDs containing copies of presentations are available from AFOSR.

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The **1st US-Korea Workshop on Nanostructured Materials and Nanomanufacturing** was organized as a part of the *US-Korea Symposium on Nanotechnology*, which was held at the Korean Federation of Science and Technology Societies (KOFST) and Hanyang University in Seoul, Korea, on 9-11 July 2002. The Symposium was co-chaired by Dean Sung-Goon Kang at Hanyang University and Dr. Byung-Lip Lee at the US Air Force Office of Scientific Research (AFOSR). The Workshop Panel Co-Chairs were Dr. Jo-Won Lee, in charge of the National Program on Tera-Level Nanodevices in Korea, and Prof. H. Thomas Hahn at the University of California at Los Angeles (UCLA).

As a result of overwhelmingly positive feedback from the Symposium, it was decided to continue at least the Workshop part of panel discussion as an annual event in two countries alternately. Within this context, the **2nd US-Korea Workshop on Nanostructured Materials and Nano-manufacturing** was held at Caltech in Pasadena, California, on 9 August 2003, with a theme of "Carbon Based Nanomaterials." The Workshop was co-chaired by Dr. Byung-Lip Lee at AFOSR and Dr. Jo-Won Lee at the National Program on Tera-Level Nanodevices in Korea.

In 2004, the **3rd US-Korea Workshop on Nanostructured Materials and Nanomanufacturing** was held at Hanyang University in Seoul, Korea on 10-11 May, with a theme of "Tubular/Filamentary Nanomaterials and Their Composites." The Workshop was co-chaired by Dr. Sang-Hee Suh, in charge of the Center for Nanostructured Materials Technology (CNMT) in Korea, and Prof. H. Thomas Hahn at UCLA. Concurrently with the above Workshop, the **1st US-Korea Workshop on Nanoelectronics** was co-organized by Dr. Jo-Won Lee at the National Program on Tera-Level Nanodevices in Korea and LtCol Todd Steiner at AFOSR to cover a broader range of topics.

Following the 2004 US-Korea Workshops, 17 exploratory research grants were awarded to a number of universities in Korea under the *Air Force Nanoscience Initiative for Korea* directed by Dr. Jack Agee at AFOSR. Among them, 4 research grants were initiated with 100% matching support from the CNMT, directed by Dr. Sang-Hee Suh and funded by the *21st Century Frontier R&D Program* of Korean Ministry of Science and Technology. Throughout these activities since 2002, Dr. Tae-Woo Park, Prof. Brett Pokines and Dr. Misoon Mah at the US Asian Office of Aerospace R&D were instrumental in organizing the Workshop sessions and handling research grant applications.

The 2005 Workshops were arranged to hold "kick-off" or "review" session for each of afore-mentioned research grants and, at the same time, to explore the chances to forge scientific collaboration between the PI's in Korea and the guest speakers from the United States. Co-sponsored by CNMT and AFOSR, a joint session of the **2nd US-Korea Workshop on Nanoelectronics** and the **4th US-Korea Workshop on Nanostructured Materials and Nano-manufacturing** was held on 25-26 April 2005 at the Korea Institute of Science & Technology in Seoul, Korea. The Workshop was co-chaired by Dr. Sang-Hee Suh at CNMT and Prof. Wonbong Choi at Florida International University as Co-

Chairs.

The follow-up review for 2006 will be conducted as a joint meeting of the **3rd** *US-Korea Workshop on Nanoelectronics* and the **5th** *US-Korea Workshop on Nanostructured Materials and Nano-manufacturing* on 8-9 August 2006 at the UCLA Sunset Village. Co-chaired by Prof. H. Thomas Hahn at UCLA and Dr. Sang-Hee Suh at CNMT, this meeting will handle a review of on-going 15 research grants initiated under the *Air Force Nanoscience Initiative for Korea*. In addition, 8 speakers from Korea and 20 speakers from the US will be presenting the results of their research activities relevant to the themes of the current Workshops.

Workshop Co-Chairs

Prof. H. Thomas Hahn (*Univ. of California, Los Angeles*)

Dr. Sang-Hee Suh (*Center for Nanostructured Materials Technology*)

Organizing Committee

Dr. Byung-Lip Lee (*Air Force Office of Scientific Research*), **Co-Chair**

Dr. Donald Silversmith (*Air Force Office of Scientific Research*), **Co-Chair**

Dr. Hugh Delong (*Air Force Office of Scientific Research*)

Dr. Misoon Mah (*Asian Office of Aerospace R&D*)

Prof. Brett Pokines (*Asian Office of Aerospace R&D*)

Prof. Wonbong Choi (*Florida Int'l Univ*)

Dr. Cheol Park (*National Institute of Aerospace*)

Prof. Duck-Joo Yang (*Univ. of Texas, Dallas*)

Prof. Haiwon Lee (*Hanyang Univ.*)

Dr. Jun-Kyung Kim (*Korea Institute of Science & Technology*)

Prof. Kun-Hong Lee (*Pohang Univ. of Science & Technology*)

Prof. Young-Hee Lee (*Sungkyunkwan Univ.*)

AGENDA

8 August 2006 (Tuesday)

REGISTRATION (08:10 – 08:25) (South Bay Room)

OPENING SESSION (08:25 – 10:05) (South Bay Room)

*Prof. H. Thomas Hahn (Univ. of California, Los Angeles), **Presiding***

Dean Vijay Dhir (Henry Samueli School of Engineering & Applied Science, Univ. of California, Los Angeles)

Dr. Sang-Hee Suh (Center for Nanostructured Materials Technology)

Dr. Byung-Lip Lee (Air Force Office of Scientific Research, Aerospace & Materials Science Directorate)

Dr. Donald Silversmith (Air Force Office of Scientific Research, Physics & Electronics Directorate)

Dr. Lawrence Goldberg (National Science Foundation)

Mr. Jim Fillerup (Air Force Office of Scientific Research, International Office)

10:05 Coffee Break

NANOMATERIALS – SESSION I: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

*Dr. Hugh Delong (Air Force Office of Scientific Research), **Moderator***

10:20 Dr. Byung-Lip Lee (Air Force Office of Scientific Research)
Opening Remark

10:30 Prof. Chih-Ming Ho (Univ. of California, Los Angeles)
"Complex Bio System in the Eye of Engineers" – Host Lecture

11:10 Dr. Young-Wook Jun / Prof. Jinwoo Cheon (Yonsei Univ.)
"Smart Nanocrystals Tailored for Their Utilizations in Cancers and Viruses"

11:35 Prof. Pradeep Guduru (Brown Univ.)
"Biologically Inspired Wavy Surface Adhesion"

NANOELECTRONICS – SESSION I: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

Dr. Gail Brown (Air Force Research Lab), **Moderator**

10:20 Dr. Donald Silversmith (Air Force Office of Scientific Research)
Opening Remark

10:30 Prof. Kang L. Wang (Univ. of California, Los Angeles)
"Nanoarchitectonics and Nanoelectronics" – Host Lecture

11:10 Dr. Young S. Park / Prof. Tae-Won Kang (Dongguk Univ.)
"Indium Gallium Nitride/Gallium Nitride (InGaN/GaN) Nanorod Superlattice"

11:35 Prof. Seung-Joo Park (Gwangju Inst. of Sci. & Technology)
"Growth of ZnO nanostructures for ZnO LED"

12:00 Lunch

NANOMATERIALS – SESSION II: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

Prof. Haiwon Lee (Hanyang Univ.), **Moderator**

13:30 Prof. Bongsoo Kim (Korea Adv. Inst. of Sci. & Technology)
"Synthesis of Single Crystalline Te Nanotubes with Triangular Cross-section"

13:55 Prof. Jiyoung Kim (Univ. of Texas, Dallas)
"Metal Oxide Nanotubes Fabricated by Atomic Layer Deposition (ALD)"

14:20 Prof. Kun-Hong Lee (Pohang Univ. of Sci. & Technology)
"Microwave Synthesis of Nanomaterials"

14:45 Prof. Sanggi Lee (Korea Inst. of Sci. & Technology; Ewha Woman's Univ.)
"Investigation of Anion Effects in Ionic Liquid-Nano Hybrid Materials"

NANOELECTRONICS – SESSION II: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

Prof. Jong-Chun Woo (Seoul Nat'l Univ.), **Moderator**

13:30 Prof. Gyu-Chul Yi (Pohang Univ. of Sci. & Technology)
"Fabrication and Photoluminescent Characterizations of ZnO/Zn1-xMgxO Nanorod Quantum Structures"

13:55 Prof. Euijoon Yoon (Seoul Nat'l Univ.)
"Growth of Ultra Thin In-rich InGaN/GaN Quantum Wells (QWs) by Metalorganic Chemical Vapor Deposition (MOCVD)"

14:20 Prof. Marek Osinski (Univ. of New Mexico)

"Highly Unidirectional Ring Diode Lasers with Quantum Dot Active Region"

- 14:45 Prof. Jimmy Xu (Brown Univ.)
"Extending the Reach of the Mighty Silicon Technology to the Optical Space – Emissive Structural Deformation and Lasing Induced by Nano-scale Patterning"

15:10 Coffee Break

NANOMATERIALS – SESSION III: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

Prof. Steven Donaldson (Air Force Research Lab; Univ. of Dayton), **Moderator**

- 15:25 Dr. Tia BensonTolle (Air Force Research Lab, AFRL/MLBC)
"Nanomaterials Research at AFRL/MLBC"
- 15:50 Prof. Duck-Joo Yang (Univ. of Texas, Dallas)
"Nano Materials Synthesis, Functionalization and Potential Applications"
- 16:15 Dr. Christopher Bunker (Air Force Research Lab, AFRL/PRTG)
"Synthesis of Core-Shell Nanoparticles, Nanofibers, and Nanocomposites for Application to Fuels"
- 16:40 Prof. Jaehwan Kim (Inha Univ.)
"Feasibility of Biodegradable MEMS Based on Cellulose Paper"

17:05 Wrap-up

NANOELECTRONICS – SESSION III: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

To be Nominated, **Moderator**

- 15:25 Prof. William Jo (Ewha Woman's Univ.)
"Synthesis and Physical Properties of Phase-Change Nanoparticles for Memory and Data Storage Applications"
- 15:50 Dr. Matthew Kane / Prof. Ian Ferguson (Georgia Tech)
"Metalorganic Chemical Vapor Deposition (MOCVD) growth of multifunctional nanostructures for spintronic applications"
- 16:15 Prof. Jaejin Lee (Ajou Univ.)
"Group IV Based Ferromagnetic Nanomultilayers for Spintronics Applications"
- 16:40 Prof. Kilwon Cho (Pohang Univ. of Sci. & Technology)
"Surface Induced Self Assembly of Conjugated Organic Molecules for"

High Performance Organic Thin Film Transistors"

17:05 **Wrap-up**

17:15 ADJOURN

9 August 2006 (Wednesday)

NANOMATERIALS – SESSION IV: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

Dr. Shih-Chi Liu (National Science Foundation), Moderator

08:10 **Housekeeping**

08:20 Prof. Haiwon Lee (Hanyang Univ.)
"Manipulation and Alignment of Functionalized Carbon Nanotubes"

08:45 Prof. Fu-Kuo Chang (Stanford Univ.)
"Nano-Reinforced Interface of Piezoelectric Sensors for Structural Health Monitoring"

09:10 Prof. Steven Donaldson (Air Force Research Lab, AFRL/MLBC; Univ. of Dayton) *"Multifunctional Hybrid Nanocomposites"*

09:35 Dr. Sabyasachi Ganguli (Air Force Research Lab, AFRL/MLBC)
"Aligned Nanotubes for Improved Through Thickness Thermal Conductivity in Adhesive Joints"

NANOELECTRONICS – SESSION IV: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

Dr. Misoon Mah (Asian Office of Aerospace R&D), Moderator

08:10 **Housekeeping**

08:20 Prof. Hyun-Jung Shin (Kookmin Univ.)
"Fabrication and Characterization of Electric Field Induced Resistive Sensor at the end of Scanning Probe Tip"

08:45 Prof. Wonbong Choi (Florida Int'l Univ.)
"Controlled Growth of Carbon Nanotube Y-Junction for Multifunctional Application"

09:10 Prof. Jong-Chun Woo (Seoul Nat'l Univ.)
"Molecular Beam Epitaxy on Aligned Carbon Nanotube Arrays for Nanoelectronic Applications"

09:35 Dr. Gail Brown (Air Force Research Lab, AFRL/MLPS)

"Quantum Semiconductor Materials Research for Future Electronics"

10:00 Coffee Break

NANOMATERIALS – SESSION V: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

*Dr. Sang-Hee Suh (Center for Nanostructured Materials Technology),
Moderator*

- 10:20 Prof. Suk-Joong Kang (Korea Adv. Inst. of Sci. & Technology)
"Nanostructure Control of Interface and Microstructural Design in Ceramics"
- 10:45 Dr. Jun-Kyung Kim (Korea Inst. of Sci. & Technology)
"Novel Manufacturing Technology of Clay-Nanocomposites for Structural Application"
- 11:10 Prof. Soon-Hyung Hong (Korea Adv. Inst. of Sci. & Technology)
"Fabrication Processes and Properties of Carbon Nanotube Nanocomposites"
- 11:35 Prof. Nicholas Kotov (Univ. of Michigan)
"Molecular Design of Multilayer Composites from Carbon Nanotubes"

NANOELECTRONICS – SESSION V: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

Prof. Jimmy Xu (Brown Univ.), Moderator

- 10:20 Dr. Sang-Jung Ahn (Korea Res. Inst. of Standards & Sci.)
"Development of Biologically Active Carbon Nanotube Probes for Scanning Force Microscope"
- 10:45 Prof. Hee-Cheul Choi (Pohang Univ. of Sci. & Technology)
"Modification of Single Walled Carbon Nanotube Field Effect Transistor (SWNT-FET) Devices Toward Ultra-High Sensitive Biomolecule Recognition"
- 11:10 Prof. Otto Zhou (Univ. of North Carolina)
"Development of CNT Based Emission X-Ray Source and Tomographic Imaging System"
- 11:35 Dr. Jin Koog Shin (Korea Electronics Technology Inst.)
"Introduction of Probe-based Data Storage of KOREA"

12:00 Lunch

NANOMATERIALS – SESSION VI: (Sunset Village (SV) Delta Terrace B-3

House Lounge)

*Dr. Tia BensonTolle (Air Force Research Lab, AFRL/MLBC), **Moderator***

- 13:30 Prof. Y. Sungtaek Ju (Univ. of California, Los Angeles)
"Thermal Energy Transport in Nanostructures and Nanocomposites"
- 13:55 Prof. Tsu-Wei Chou (Univ. of Delaware)
"Processing/Structure/Multifunctional Property Relationships in Carbon Nanotube Composites"
- 14:20 Dr. Cheol Park (Nat'l Inst. of Aerospace)
"Electroactive Carbon Nanotube Nanocomposites for Multifunctional and Structural Aerospace Applications"
- 14:45 Prof. Minoru Taya (Univ. of Washington)
"Design of Membrane Actuators Based on Ferromagnetic Shape Memory Alloy Composite"

NANOELECTRONICS – SESSION VI: (Sunset Village (SV) Delta Terrace B-4 House Lounge)

*Prof. Wonbong Choi (Florida Int'l Univ.), **Moderator***

- 13:30 Prof. Alex Cartwright (Univ. of Buffalo)
"Hybrid Nanostructured Materials for Solar Cells"
- 13:55 Prof. Young-Hee Lee (Sungkyunkwan Univ.)
"Energy Storage in Carbon Nanotubes"
- 14:20 Prof. Kwang-Sup Lee (Hannam Univ.)
"Nanoscale Ordering of Functional Materials by Guided Self-Assembly for Photovoltaic Application: Synthesis and Characterization"
- 14:45 Dr. Daniel Choi (NASA Jet Propulsion Lab)
"Nanowires: Innovation and Manufacturing Opportunities"

15:10 Coffee Break

NANOMATERIALS – SESSION VII: (Sunset Village (SV) Delta Terrace B-3 House Lounge)

*Prof. H. Thomas Hahn (Univ. of California, Los Angeles), **Moderator***

- 15:25 Open Panel Discussion
- 16:40 **Concluding Remarks**

NANOELECTRONICS – SESSION VII: (Sunset Village (SV) Delta Terrace B-

4 House Lounge)

*Dr. Lawrence Goldberg (National Science Foundation), **Moderator***

15:25 *Open Panel Discussion*

16:40 **Concluding Remarks**

17:00 ADJOURN

FORMAT: 15 minutes presentation by each ***Invited Speaker*** followed by 10 minutes discussion led by each **Session Moderator**.