

# *Rensselaer Physics Department Activities*

**October 2006 – December 2006**

(Rensselaer Students are underlined)

## **HONORS AND AWARDS**

**G.-C. WANG**

- AAAS, elected as a fellow, Nov. 9, 2006.

**X.-C ZHANG**

- US patent 7,119,339, "Transmission Mode Terahertz Computed Tomography," issued on October 10, 2006.
- US patent 7,129,491, "Diffraction Mode Terahertz Tomography" issued on Oct. 31, 2006.
- France patent FR1281061 "Electro Optics Terahertz Transceiver".
- United Kingdom patent GB 1281061 "Electro Optics Terahertz Transceiver".
- Germany patent GM 60118352.5 "Electro Optics Terahertz Transceiver".
- Italy patent IT 1281061 "Terahertz Transceivers and Methods for Emission and Detection of Terahertz Pulses using such Transceivers".
- EP patent EP 1281061 "Terahertz Transceivers and Methods for Emission and Detection of Terahertz Pulses using such Transceivers".

## **INVITED TALKS**

**G. CIOLEK**

- "Formation and Collapse of Nonaxisymmetric Protostellar Cores in Magnetic Interstellar Clouds", Department of Astronomy & Astrophysics, University of Chicago, Nov. 21 2006

**G.-C. WANG**

- Research and education at Rensselaer Physics, Hsinchu City, Taiwan, Dec. 13, 2006.

## M. YAMAGUCHI

- THz spectroscopy and its applications, undergraduate Chemistry/Physics Seminar, SUNY Brockport (Oct. 2006, Brockport, NY).

## X.-C ZHANG

- “Recent development of THz wave generation, detection and application,” AVS 53rd International Symposium & Exhibition, San Francisco, Nov. 15, 2006.
- “THz Technology: from Nanometer to Kilometer” 1st Asia Pacific THz Workshop, Hsin-Chu, Taiwan, Dec. 14, 2006.

## MEETING ATTENDANCE

### S.-K. EAH

- MRS Fall Meeting, Boston, Nov. 27 – Dec 1, 2006.

### G.-C. WANG

- Attended “Wiley Faculty Network Workshop”, Nov. 4, 2006, Rensselaer.

### M. YAMAGUCHI

- Research & Industrial Collaboration Conference, (Oct. 4. 2006, Boston, MA)

## OTHER PROFESSIONAL TRAVEL

### G.-C. WANG

- Visited National Experimental High School in Hsinchu city, Taiwan on Dec. 14, 2006 for undergraduate recruiting.
- Visited European High School in Yang Ming Shan, Taipei, Taiwan on Dec. 15, 2006 for undergraduate recruiting.

## PRESENTATIONS (presenter in bold)

### S.-K. EAH

- “Self-assembled 2-Dimensional Gold Nanoparticles with Nearly Perfect Superlattice Domains of Hexagonal Close-Packing Order and Size Larger than 10  $\mu\text{m}$ ” **Sang-Kee Eah**, MRS Fall Meeting, Boston, Nov. 27 – Dec 1, 2006.

### G.-C. WANG

- **G.-C. Wang** served as a panelist for “The Women at the Rensselaer Mentor Program”, topic “Balancing a Successful Career and Personal

Life”, Nov. 17, 2006. Attendees included 125 undergraduates and graduates and 15 professional women from Tech Valley.

- **G.-C. Wang** gave a presentation “Highlight of research and education at Rensselaer Physics” for University of Massachusetts at Amherst Campus visit, Nov. 13, 2006, Rensselaer.
- Postdoc Fu Tang presented a talk “Reflection high-energy electron diffraction (RHEED) pole figures for surface texture analysis”, **F. Tang\***, G.-C. Wang, and T.-M. Lu, at MRS Symposium U, Advances in /In Situ/ Characterization of Film Growth and Interface Processes, Boston, MA, Dec. 2006.

## M. YAMAGUCHI

- **Masashi Yamaguchi**, THz wave technology for suicide bomber detection, DHS BomDetec Program November Review (Nov., 2006, Billerica, MA).
- **Xi-Cheng Zhang** and Masashi Yamaguchi, THz wave standoff distance detection of explosives (>100 m) using the air as an emitter & sensor, ONR Program Review (Oct. 2006, Monterey, CA).
- **Masashi Yamaguchi**, THz Wave Generation through third order nonlinear optical process, Motorola campus visit, (Nov.2006, RPI)

## PAPERS PUBLISHED

### G. CIOLEK

- “Formation and Collapse of Nonaxisymmetric Protostellar Cores in Planar Magnetic Interstellar Clouds: Formulation of the Problem and Linear Analysis”, Glenn E. Ciolek & Shantanu Basu, *The Astrophysical Journal*, v. 652, pp. 442-457

### F. E. SCHUBERT

- Schubert E. F., Kim J. K., Luo H., and Xi J.-Q. “Solid-state lighting – A benevolent technology” *Reports on Progress in Physics* 69, 3069 (November 2006)

### G.-C. WANG

- “Field angle and thickness dependence of coercivity in electrodeposited CoNi/Cu multilayer nanowires”, X.-T. Tang, G.-C. Wang, and M. Shima, *IEEE Transactions on Magnetics* 42, 2975 (2006).
- “Magnetic layer thickness dependence of magnetization reversal in electrodeposited CoNi/Cu multilayer nanowires”, X.-T. Tang, G.-C. Wang, and M. Shima, *J. Magn. Mater.* 309, 188 (2006).
- “Surface pole figures by reflection high-energy electron diffraction”, F. Tang, G.-C. Wang, and T.-M. Lu, *Appl. Phys. Lett.* 89, 241903 (2006).

## **X.-C. ZHANG**

- N. Karpowicz, D. Dawes, M. Perry, X.-C. Zhang, "Fire damage on carbon fiber materials characterization by THz waves," International Journal of High Speed Electronics and Systems, Vol. XX, No. X (2006) 1–3
- Hai-bo Liu, Yunqing Chen, X.-C. Zhang, "Characterization of anhydrous and hydrated pharmaceutical Materials with THz time-domain spectroscopy," Journal of Pharmaceutical Science, 95, NO. XX, (2006).
- Hai-Bo Liu, George Plopper, Sarah Earley, Yunqing Chen, Bradley Ferguson, and X.-C. Zhang, "Sensing minute changes in biological cell monolayers with THz differential time-domain spectroscopy," Biosensors and Bioelectronics, Volume 22, Issue 6, 15 January 2007, Pages 1075-1080
- Brian Schulkin and X.-C. Zhang, "Time-domain spectrometers expand toward new horizons," Laser Focus World, Nov. issue, 89, (2006).
- Albert Redo and X.-C. Zhang, "Terahertz Photonics," Microwave Photonics, Chapter 10, edited by Chi Lee, CRC Press, Taylor & Francis Group, page 363-416, 2006.

## **PROPOSALS (SUBMITTED or GRANTED)**

### **S.-K. EAH**

- "Self-assembly of nanoparticles into very large two-dimensional superlattices" submitted Nov. 3, 2006, \$200,555, National Science Foundation
- "Making and Playing a Nano-Piano", submitted Nov. 17, 2006, \$40,000, Rensselaer Polytechnic Institute, Research Seed Grant

### **G. CIOLEK**

- "Effect of Magnetic Fields on Interstellar Dust and Star Formation", submitted Nov. 15 2006, \$365,868, National Science Foundation

### **G.-C. WANG**

- Investigation of hydrogenation/de-hydrogenation in Pd-coated ultrathin Mg nanoblades: A complementary experimental study and first principle simulations, Wang, Lu and Nayak, NSF, \$492 K, Submitted Nov. 3, 2006.
- Spin-Dependent Thermoelectric Transport in Magnetic Multilayer Nanowires, Shima, Nayak, Borca, and Wang, \$625 K, NSF, Submitted Nov. 3, 2006.
- NER: Active Nanorod Arrays for the Generation of Intense Terahertz Wave, Yamaguchi, Nayak, and Wang, NSF, 2007-2008, \$130 K, Submitted Nov. 15, 2006.

## M. YAMAGUCHI

- “Nanoscale Acoustics and Non-Contact Thermal Conduction Measurements in Nanotube/Nanorod Arrays”, Interconnect Focus Center-NY state, PI- Masashi Yamaguchi, Oct. 2006-Sept. 2007, \$80,000, funded.
- “NIRT: Wafer Scale Active Nanoemitter for Energy Applications”, NSF-NIRT-CBET, PI- Shawn-Yu Lin, co-PIs Yong Xu, Partha S. Dutta, Toh-Ming Lu and Masashi Yamaguchi, Nov.2006, \$1,600,000 for 3 years, submitted.
- “NER: Active Nanorod Arrays for the Generation of Intense Terahertz wave”, PI- Masashi Yamaguchi, co-PIs Saroj Nayak, and Gwo-Ching Wang, NSF-NER-CBET, submitted on Nov. 2006, \$130,000 for 1 year, submitted.

## X.-C. ZHANG

- Lockheed Martin, “CW THz Imager,” \$25,000. 2006. Granted.
- Private cash donation, “THz research and education,” \$15,000. 2006. Received.
- Navy, “Handheld THz Explosive Detector”, \$2M. 2007-2009, revised budget.
- Army Night Vision, “Real Time, Explosive Specific, Chemical Sensing at Standoff Distance,” \$250,000. 18 months. Proposal is accepted, now is working on the Statement of Work.
- Idaho National Lab., “Stand-off detection of explosive materials using THz spectroscopy and imaging,” \$34,000, 10 months. Granted.
- Idaho National Lab., “Stand-off detection of explosive materials using THz spectroscopy and imaging,” \$200,000, two years (2008-2009). Submitted.
- Office of Naval Research, “THz wave technology for standoff detection of explosives and other military and security applications,” \$180,000. Submitted.

## **SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES**

## **VISITORS TO RENSSELAER**

### X.-C. ZHANG

- 11/26/06 to 12/7/06, Jung-Il Kim, Terahertz Wave Technology Research Group, Korea Electrotechnology Research Institute
- 11/28-11/29, Glenn J. Bastiaans, Intelligent Optical Systems
- 11/29/06, Byron Carnahan, Mine Safety Appliances Co. Instrument Division, MSA, PA, USA. Philipp Bachmann, Aritron, MSA, Switzerland.
- 11/30 – 11/31, Bob Greigor, ATF, Physics Technology, The Boeing Company, Seattle, WA

- 11/30/06, Matthew Price-Gallagher, and Clark Fletcher, HydroElectron Ventures Inc. Westmount, QC H3Z 2A7, Canada
- 12/4/06 to 12/6/06, Dr. Vance Deason, Idaho National Lab
- Dr. Warren Ussery, Lockheed Martin
- 12/5/06, Dr. Michael Burke, Lawrence Livermore National Lab
- Dr. Frank Hepburn, NASA Marshall Flight Center
- 12/7/06, Dr. Ming Li, Applied Materials

## **NON-PROFESSIONAL ACTIVITIES**

### **IMPORTANT ACTIVITIES OF STUDENTS**

#### **F. E. SCHUBERT**

- Physics Ph. D. student Yangang Andrew Xi was awarded MRS Silver Award of the Materials Research Society for his presentation: Y. A. Xi, K. X. Chen, F. Mont, J. K. Kim, C. Wetzel, E. F. Schubert, W. Liu, X. Li, J. A. Smart “Extremely high quality AlN grown on (0001) sapphire by using metal-organic vapor-phase epitaxy” Materials Research Society (MRS) Fall Meeting, Boston MA, November 27 – December 1 (2006) Boston MA (December 2006)

#### **G.-C. WANG**

- Churamani Gaire passed candidacy exam on Nov. 17, 2006. His proposed study is “A study of monotonic, fatigue and creep deformation behavior of a-Si nanostructures by atomic force microscopy”
- Graduate student presented a poster “Current perpendicular to plane giant magnetoresistance in electrodeposited CoNi/Cu multilayer nanowires”, X.-T. Tang\*, G.-C. Wang, and M. Shima, at the MRS Symposium, at Boston, Dec. 2006.

### **OTHER**

#### **G.-C. WANG**

##### Patent Disclosure

- RHEED Surface Pole Figure, Fu Tang, G.-C. Wang, and T.-M. Lu, on 11/09/2006, Invention Disclosure No. 1096.
- Nanocatalyst Pd-coated Ultrathin Mg Nanoblades for Hydrogen Storage, Fu Tang, Tom Parker, G.-C. Wang, and T.-M. Lu, 11/09/2006, Invention Disclosure No. 1098.