

Rensselaer Physics Department

Activities

OCT 2005 – DEC 2005

(Rensselaer Students are underlined)

HONORS AND AWARDS

T.-M. LU

- The first recipient of the SRC Faculty Leadership Award, Portland, Oregon, Oct 24, 2005.

C. WETZEL

- Session Chair FF7/EE5: Joint Session: Nitride Materials for Devices, Symposium GaN, AlN, InN and Related Materials and Progress in Semiconductor Materials V—Novel Materials and Electronic and Optoelectronic Applications, Materials Research Society Meeting, Boston, MA Nov 29, 2005

- Rensselaer Polytechnic Institute, Troy NY, The 2005 Trustee Celebration of Faculty Achievement, December 1, 2005.

X.-C. ZHANG

- US 6,977,379 issued on 12/20/2005. “T-ray microscope”. Inventors: Tao Yuan, Jingzhou Xu, and X.-C. Zhang

INVITED TALKS

S.-K. EAH

- “A Distant Mirror Modifies the Light Scattering Cross Section of a Single Gold Nanoparticle”, Quantum Krispy Kreme Seminar for Quantum Science & Technologies group at Hearne Institute for Theoretical Physics in Louisiana State University (Baton Rouge, Louisiana), Nov 14, 2005

T. KARABACAK

- “Stress Reduction and Improved Adhesion in Sputter Deposited Thin Films Using Nanostructured Compliant Layers”, T. Karabacak*, MST 2nd International Symposium on Adhesion Aspects of Thin Films, Savannah, GA, November 2005.

T. -M. LU

- “Scaling, universality, and morphology evolution of films”, Physics Colloquium (celebration of the Materials Research Society Medal Award), Nov. 9, 2005.

A. REDO

- “THz applications in solid state physics, Barcelona, 09/29/05

- “Sensing and imaging with CW terahertz”, RPI, 10/12/05

G.-C. WANG

- Testing mechanical response of nanovolumes of material, C. Gaire, D.-X. Ye, R.C. Picu, T.-M. Lu, G.-C. Wang, SPIE 2005, Optics East, Conference 6002, Oct. 23, 2005, Boston, MA.

C. WETZEL

- “Status of Semiconductor White Lighting”, American Vacuum Society 52nd Annual International Symposium Boston, MA, October 30 - November 4, 2005.

X.-C. ZHANG

- “THz photonics and its application,” IEEE Microwave Photonics, Seoul, Korea, Oct. 12, 2005.
- “Current status and perspective of THz technology,” Korea Electrotechnical Research Institute, Changwon, Korea, Oct. 12, 2005.
- “THz wave sensing and imaging for industrial applications” TeraTech, Osaka, Japan, Nov. 18, 2005.
- “THz Gap” Closing Remark, TeraTech, Osaka, Japan, Nov. 18, 2005.

MEETING ATTENDANCE

S.-K. EAH

- 2005 Materials Research Society (MRS) fall meeting, Boston, MA, Nov 28 – Dec 2, 2005

A. REDO

- 4th world congress on industrial process tomography, Aizu, Japan, September 5th to 8th 2005

C. WETZEL

- Abschlussfeier E16, Technische Universitaet Muenchen, Muenchen, Germany, Oct 20 -23, 2005.
- Symposium GaN, AlN, InN and Related Materials, Materials Research Society Meeting, Boston, MA Nov 27- Dec 2, 2005.
- 35th Annual Meeting of the Society for Neuroscience, Washington Convention Center, Washington, DC, Nov 11-13, 2005.
- Status of Semiconductor White Lighting, American Vacuum Society 52nd Annual International Symposium Boston, MA, October 30 - November 4, 2005.

M. YAMAGUCHI

- "CMSE: Frontiers in material science symposium", Cambridge, MA, Oct. 12, 2005.

OTHER PROFESSIONAL TRAVEL

S.-K. EAH

- brainstorming for my project of "Thermal microscopy of single mitochondria with a single gold nanoparticle sensor", Wadsworth Center in New York, Department of Health (Albany, NY) Oct 12, 2005. Dr. Carmen Mannella, Prof. Robert E. Palazzo, & Prof. Ingrid Wilke

M. YAMAGUCHI

- CenSSIS, Northeastern University, Boston, MA on Nov. 28 2005 regarding HSARPA joint project.

PRESENTATIONS (presenter in bold)

T. KARABACAK

- "Low temperature melting of tungsten and ruthenium nanorod arrays (poster)", **T. Karabacak**, P.-I. Wang, D.-X. Ye, G.-C. Wang, and T.-M. Lu, MRS Conference, Boston, December 2005.
- "Low temperature melting of tungsten and ruthenium nanorod arrays", **T. Karabacak**, D.-X. Ye, P.-I. Wang, G.-C. Wang, and T.-M. Lu, AVS Conference, Boston, November 2005.
- "Dynamic scaling during shadowing growth of Ru nanorods", **T. Karabacak**, F. Tang, L. Li, M. Pelliccione, G.-C. Wang, and T.-M. Lu, AVS Conference, Boston, November 2005.
- "Scaling behavior of Ru texture evolution under shadowing growth", **F. Tang**, T. Karabacak, P. Morrow, C. Gaire, G.-C. Wang, and T.-M. Lu, AVS Conference, Boston, November 2005.

F. SCHUBERT

- Thomas Gessmann, Yangang Xi, Hong Luo, Jong Kyu Kim, J.-Q. Xi, Kaixuan Chen, Jay M. Shah and E. Fred Schubert "Polarization-enhanced ohmic contacts to GaInN-based blue light-emitting diodes" *AVS 52nd International Symposium & Exhibition*, Oct. 30 – Nov. 4, Boston MA (October 2005)
 - Hong Luo, Jong Kyu Kim, Yangang Xi, E. Fred Schubert, Jaehee Cho, Cheolsoo Sone, and Yongjo Park "Trapped whispering-gallery optical modes in white light-emitting diodes lamps with remote phosphor" *AVS 52nd International Symposium & Exhibition*, Oct. 30 – Nov. 4, Boston MA (October 2005)
 - Yangang Xi, Xiaolu Li, Jong Kyu Kim, Frank W. Mont, Thomas Gessmann, Hong Luo, Alyssa Pasquale, and E. Fred Schubert "Quantitative assessment of diffusivity and specularly of textured surfaces for light extraction in light-emitting

diodes”, *AVS 52nd International Symposium & Exhibition*, Oct. 30 – Nov. 1, Boston MA (October 2005)

- Hong Luo, Jong Kyu Kim, Yangang Xi, E. F. Schubert, Jaehee Cho, Cheolsoo Sone, and Yongjo Park “Analysis of high-power packages for white-light-emitting diode lamps with remote phosphor” *MRS Fall Meeting*, Nov. 28 – Dec. 2, Boston MA (November 2005)

- Jong Kyu Kim, J.-Q. Xi, Hong Luo, Jay M. Shah, Thomas Gessmann, Jaehee Cho, Cheolsoo Sone, Yongjo Park, and E. Fred Schubert “Enhancement of light extraction in GaInN light-emitting diodes by omni-directional reflectors with ITO nanorod low-index layer” *2005 Materials Research Society (MRS) Fall Meeting* Nov. 28 – Dec. 2, Boston MA (November 2005)

- Jay M. Shah, Jong Kyu Kim, Hong Luo, Yangang Xi, Thomas Gessmann, and E. Fred Schubert “Reduction of base access resistance in AlGaIn/GaN heterojunction bipolar transistors using GaInN base cap layer and selective epitaxial growth” *2005 Materials Research Society (MRS) Fall Meeting* Nov. 28 – Dec. 2, Boston MA (November 2005)

- J.-Q. Xi, Jong Kyu Kim, Dexian Ye, Jasbir S. Juneja, T.-M. Lu, Shawn-Yu Lin and E. F. Schubert “Optical thin films with very low refractive index and their application in photonics” *2005 Materials Research Society (MRS) Fall Meeting* Nov. 28 – Dec. 2, Boston MA (November 2005)

- Hong Luo, Jong Kyu Kim, Yangang Xi, Jaehee Cho, Cheolsoo Sone, Yongjo Park, and E. Fred Schubert, “High power packages for phosphor-based white-light-emitting diode lamps” *International Semiconductor Device Research Symposium*, Dec. 7 – Dec. 9, Bethesda MD (December 2005)

- **(Best Poster Award)** J.-Q. Xi, Jong Kyu Kim, Dexian Ye, Jasbir S. Juneja, T.-M. Lu, Shawn-Yu Lin, and E. Fred Schubert, “Optical Thin Films with Very Low Refractive Index and Their Application in Photonic Devices”, *ISDRS*, Dec. 7 – Dec. 9, Bethesda, MD (December 2005)

- **(Key Note Address)** E. F. Schubert and Jong Kyu Kim “Innovations in Light-Emitting Devices” Thirteenth International Workshop on The Physics of Semiconductor Devices, New Delhi, India, December 13 – 17 (2005)

G.-C. WANG

- Testing mechanical response of nanovolumes of material, C. Gaire, D.-X. Ye, R.C. Picu, T.-M. Lu, G.-C. Wang, *SPIE 2005, Optics East, Conference 6002*, Oct. 23, 2005, Boston, MA.

C. WETZEL

- "Analysis of Quantum Efficiency of GaInN/GaN Light Emitting Diodes in the Range of 390 - 580 nm"; W. Zhao, Y. Li, Y. Xia, M. Zhu, T. Detchprohm, E.F. Schubert, and **C. Wetzel**; Symposium GaN, AlN, InN, and Related Materials, Fall Meeting of the Materials Research Society Boston, Nov 28 – Dec 2, 2005.
- "Charge Profiling of the p-AlGaIn Electron Blocking Layer in AlGaInN Light Emitting Diode Structures"; Y. Xia, Y. Li, W. Zhao, M. Zhu, T. Detchprohm, E.F. Schubert, and **C. Wetzel**; Symposium GaN, AlN, InN, and Related

Materials, Fall Meeting of the Materials Research Society Boston, Nov 28
– Dec 2, 2005.

M. YAMAGUCHI

• M. Yamaguchi and X.-C. Zhang, “THz wave chemical sensor”, DARPA-MACS proposers’ day conference, Arlington, VA, Nov.4 2005.

PAPERS PUBLISHED

T. KARABACAK

- “Dynamic evolution of mounds during thin film growth”, M. Pelliccione, T. Karabacak, and T.-M. Lu, Phys. Rev. Lett., submitted.
- “Low temperature melting of copper nanorod arrays”, T. Karabacak, J. S. DeLuca, D. Ye, P.-I. Wang, G.-C. Wang, and T.-M. Lu, J. Appl. Physics, submitted.
- “Phase transformation of single crystal β -tungsten nanorods at elevated temperatures”, T. Karabacak, P.-I. Wang, G.-C. Wang, and T.-M. Lu, Thin Solid Films, 493, 293 (2005).
- “Texture evolution during shadowing growth of isolated Ru columns”, F. Tang, T. Karabacak, P. Morrow, C. Gaire, G.-C. Wang, and T.-M. Lu, Phys. Rev. B, 72, 165402 (2005).

T.-M. LU

- “Direct Copper Electroless Deposition on a Tungsten Barrier Layer for Ultralarge Scale Integration”, Young-soon Kim, Dae-lok Bae, Hoichang Yang, Hyung-shik Shin, G.-C. Wang, J. J. Senkevich, and T.-M. Lu, J. Electrochem. Soc., 152 (2), C89-C95 (2005).
- “Phase transformation of single crystal β -tungsten nanorods at elevated temperatures”, Thin Solid Films, Volume 493, Issues 1-2, 22 December 2005, Pages 293-296 Tansel Karabacak, Pei-I Wang, Gwo-Ching Wang and Toh-Ming Lu
- “Pressure dependent Parylene pore sealant penetration in porous low K dielectrics”, Jasbir. S. Juneja, Gregory A. Ten Eyck, T.-M. Lu, J. Vac. Sci. Technol. B 23, 2232 (2005).
- “Mechanical testing of isolated amorphous Si slanted nanorods”, C. Gaire, D.-X. Ye, F. Tang, R. C. Picu, G.-C. Wang, and T.-M. Lu, J. Nanosci. Nanotech. 5, 1893 (2005).
- “Texture evolution during shadowing growth of isolated Ru columns”, F. Tang, T. Karabacak, P. Morrow, C. Gaire, G.-C. Wang, and T.-M. Lu, Phys. Rev. B, 72, 165402 (2005).
- “Physical properties of nanostructures grown by oblique angle deposition”, J.P. Singh, T. Karabacak, D.-X. Ye, D.-L. Liu, C. Picu, T.-M. Lu, and G.-C. Wang, J. Vac. Sci. Technol. B, 23, 2114 (2005).

- “Enhanced step coverage by oblique angle physical vapor deposition”, T. Karabacak and T.-M. Lu, *J. Appl. Phys.*, 97, 124504 (2005).
- “Stress reduction in sputter deposited films using nanostructured compliant layers by high working-gas pressures”, T. Karabacak, J.J. Senkevich, G.-C. Wang, and T.-M. Lu, *J. Vac. Sci. Technol. A*, 23, 986 (2005).
- “Copper Drift in High Dielectric Constant Tantalum Oxide Thin Films”, P. Jain, Jasbir. S. Juneja, A. Mallikarjunan, T.-M. Lu, submitted to *Applied Physics Letters*.
- “Dynamic evolution of mounds during thin film growth”, M. Pelliccione, T. Karabacak, and T.-M. Lu, *Phys. Rev. Lett.*, submitted.
- “Low temperature melting of copper nanorod arrays”, T. Karabacak, J. S. DeLuca, D. Ye, P.-I. Wang, G.-C. Wang, and T.-M. Lu, *J. Appl. Physics*, submitted.
- “Texture of Ru columns grown by oblique angle sputter deposition”, P. Morrow, F. Tang, T. Karabacak, D.-X. Ye, P.-I. Wang, G.-C. Wang, and T.-M. Lu, *J. Appl. Physics*, submitted.
- “Dielectric barriers, pore sealing, and metallization”, J. S. Juneja, P.-I. Wang, T. Karabacak, and T.-M. Lu, *Thin Solid Films*, submitted.
- “Investigation of the electrical properties of novel polycarbosilane-based polymer as low-k dielectric”, Pei-I Wang, Zhizhong Wu, T.M. Lu, and L. V. Interrante, *Journal of the Electrochemical Society*, in press.
- “Stability of Cu on epoxy silosane polymer under bias temperature stress”, Pei-I Wang, Jasbir S. Juneja, Shyam Murarka, Toh-Ming Lu, and Ram Ghoshal, *J. Electrochem. Soc.*, submitted.
- “Texture of Ru columns grown by oblique angle sputter deposition”, Paul Morrow, Fu Tang, Tansel Karabacak, Dexian Ye, Pei-I Wang, Gwo-Ching Wang, and Toh-Ming Lu, *J. Vac. Sci. Technol.*, submitted
- “Dielectric barriers, pore sealing, and metallization”, Jasbir S. Juneja, Pei-I Wang, Tansel Karabacak, and T.-M. Lu, *Thin Solid Films*, in press.
- “Interfacial interaction of in-situ Cu growth on Tetrasulfide self-assembled monolayer on plasma treated Parylene surface”, S. Pimanpang, Pei-I Wang, Jasbir S. Juneja, G.-C. Wang, and T.-M. Lu, *J. Vac. Sci. Technol.*, submitted.
- “Self-assembled monolayer growth on chemically modified polymer surfaces”, *Applied Surface Science*, S. Pimanpang, Pei-I Wang, G.-C. Wang, and T.-M. Lu, in press.
- “Bias-temperature Stability of Ti-Si-N-O films”, Yong Chiang EE, Jasbir S. Juneja, Pei-I Wang, Toh-Ming Lu, H. Bakhru, Lap Chan, S. B. Law, Clare Yong, Zhong Chen, S. Xu, *J. Electrochem. Soc.*, submitted.
- “Low temperature melting of copper nanorod arrays”, Tansel Karabacak, James S. DeLuca, Dexian Ye, Pei-I Wang, Gwo-Ching Wang, and Toh-Ming Lu, *J. Appl. Phys.*, submitted.
- “Effect of hydrophilic group on water droplet contact angles on surfaces of acid modified SiLK and parylene polymers”, S. Pimanpang, Pei-I Wang, G.-C. Wang, and T.-M. Lu, *Colloids and Surfaces A*, submitted.

- “Metallic material engineering for achieving a photonic band-edge near the visible wavelengths”, S. Y. Lin, D.-X. Ye, T.-M. Lu, and J. Bur, *J. Appl. Phys.*, submitted.
- “Damping properties of epoxy films with nanoscale fillers”, J. Suhr, N. Koratkar, D.-X. Ye, and T.-M. Lu, *Intelligent Materials Systems and Structures*, submitted (2005).
- “Atomic Layer Deposition of Pd on an Oxidized Metal Substrate”, Gregory A. Ten Eyck, Samuk Pimanpang, Hassaram Bakhru, Toh-Ming Lu, and Gwo-Ching Wang, submitted to *Chem. Vapor Deposition*.
- “Electroless copper on refractory and noble metal substrates with an ultra-thin plasma-assisted atomic layer deposited palladium layer”, Young-Soon Kim, Hyung-II Kim, Joong-Hee Cho, Hyung-Kee Seo, M. A. Dar, Hyung-Shik Shin, Gregory A. Ten Eyck, Toh-Ming Lu, and Jay J. Senkevich, *Electrochimica Acta*, 2005.
- “Surface Characterization of Copper Electroless Deposition on Atomic Layer Deposited Palladium on Iridium and Tungsten”, Young-Soon Kim, Gregory A. Ten Eyck, De-Li Liu, Samuk Pimanpang, Joong-Hee Cho, Hyung-Shik Shin, Jay J. Senkevich, Toh-Ming Lu, *Surface Coatings and Technology*, (2005).

H. NEWBERG

- “Galactic structure from wide-field surveys (Review Article)”, Heidi Jo Newberg, *New Astronomy Reviews*, 49, pp. 447-452, 2005
- “Spectroscopic Observations and Analysis of the Unusual Type Ia SN 1999ac,” *Supernova Cosmology Project: Garvanini, G. et al., The Astronomical Journal*, 130, pp. 2278-2292, 2005

F. SCHUBERT

- Xi Y., Gessmann Th., Xi J.-Q., Kim J. K., Shah J. M., Schubert E. F., Fischer A. J., Crawford M. H., Bogart K. H. A., Allerman A. A. “Junction temperature in ultraviolet light-emitting diodes” *Special Issue on Ultraviolet Semiconductor Sources, Jpn. J. Appl. Phys.* **44**, 7260 (October 2005)
- **(Invited)** Schubert E. F., Kim J. K., Xi J.-Q., and Luo H. “Innovations in Light-emitting devices” in *The Physics of Semiconductor Devices* edited by V. Kumar, S. K. Agarwal, and S. N. Singh (Allied Publishers PVT. Limited, New Delhi, India, 2005)

G.-C. WANG

- Phase transformation of single crystal α -tungsten nanorods at elevated temperatures, Tansel Karabacak, Pei-I Wang, Gwo-Ching Wang, and Toh-Ming Lu, *Thin Solid Film* 493, 293 – 296 (2005).

PROPOSALS (SUBMITTED or GRANTED)

S.K. EAH

- Self-assembly of nanoparticles into very large two-dimensional superlattices, Nov 4, 2005 (submitted), \$199,902 (two years), National Science Foundation

T. KARABACAK

- “Nano and micro technology for heat transfer enhancement in micro systems”, November 2005, 50K, RPI seed, submitted.

T.-M. LU

- “NIRT: Study of electro- and magneto-mechanical nano-assemblies”, Physics faculty, Toh-Ming Lu, Gwo-Ching Wang, MANE faculty, Nikhil Koratkar, Theodorian Borca-Tasciuc, and Materials Science and Engineering faculty Mutsuhiro Shima, \$1.15M, NSF NIRT, granted.

- Texture Evolution in Nanorods and Nanosprings Fabrication: Synergistic Investigations of In situ Diffraction and Atomistic Simulations, G.-C. Wang, T.M. Lu, and H. Huang, \$414K, submitted to the NSF, Sept. 2005.

- GAANN: Photonic and electronic materials and devices for energy applications, S.Y. Lin, T.-M. Lu, P. Dutta, G.-C. Wang, M. Yamaguchi, E. Bhat, M. Jensen, and Theodorian Borca-Tasciuc, DOEducation, \$752K, 3 years from August 06 to July 09, submitted on Nov. 14, 2005.

- “Modification of Light Emission from 3D Metallic Photonic-Crystal Structures”, S. Lin, T.-M. Lu, NSF, \$490K, pending.

- “Photonic and Electronic Materials and Devices for Efficient Energy Conversion”, S. Lin, T.-M. Lu, and P. Dutta, DOE, \$750K, pending.

- NIRT: “Integrated Nanostructural, Radiological and Biomedical research Towards a New X-ray Radiotherapy Device”, J. Xu, T.-M. Lu, P. Ajayan, and Y. Danon, NSF, \$1.6M, pending.

- NER: “Water Electrolysis Using Nanostructured electrodes-An Efficient Approach to Hydrogen Production”, N. Koratkar, T.-M. Lu, and G. Eisman, NSF, \$130K, pending.

- NER: “Nanoscale Acoustic and Thermal Conductivity in Nanotube/Nanowire Arrays”, M. Yamaguchi, T.-M. Lu, and P. Ajayan, NSF, \$130K, pending.

- NIRT: “Wafer-Scale Active Nano-Emitters for energy Applications”, S. Lin, T.-M. Lu, P. Dutta, M. Yamaguchi, NSF, \$1.54M, pending.

H. NEWBERG

- “Revealing the Structure of the Galactic Halo through Statistical Analysis – Middle School Teacher Training,” 5/2006-4/2009, \$317,676, NSF, submitted 11/2005

- “The Dynamic Grid for Astroinformatics: Data-Driven Discovery of the Milky Way Origin and Evolution from the Sloan Digital Sky Survey,” 5/2006-4/2009, \$757,700, NSF, submitted 12/2005

G.-C. WANG

- Texture evolution in nanorods and nanosprings fabrication: Synergistic investigations of in situ diffraction and atomistic simulations, G.-C. Wang, T.-M. Lu, and H. Huang, \$414 K, submitted to the NSF, Sept. 2005.

- GAANN: Photonic and electronic materials and devices for energy applications, S.Y. Lin, T.-M. Lu, P. Dutta, G.-C. Wang, M. Yamaguchi, E. Bhat, M. Jensen, and Theodorian Borca-Tasciuc, DOEducation, \$752 K, 3 years from August 2006 to July 2009, submitted on Nov. 14, 2005.

- Biomimetic nanostructured surfaces for exceptional adhesion, R.C. Picu, Associate Professor, Dept. of Mechanical, Aerospace and Nuclear Engineering, G.-C. Wang and T.-M. Lu, Professors, Dept. of Physics, Applied Physics and Astronomy, RPI 2005 seed grant proposal, \$40 K, submitted to vice president for research, Nov. 2005.

C. WETZEL

- High Performance Green LEDs by Homoepitaxial MOVPE, E.F. Schubert, 3/2006 – 2/2009, Department of Energy, \$ 1,795,520.

- High Luminous Flux & High Efficiency Green Emitters for Solid State Lighting, Drew Hanser, 3/2006 – 9/2006, Department of Energy, \$ 100,000.

M. YAMAGUCHI

- “THz wave standoff distance detection of explosives(>100m) using the air as an emitter & sensor”, X.-C. Zhang, and Masashi Yamaguchi, Office of Naval Research submitted.

- “Boson Peaks, Nanoscale Inhomogeneities and Intermediate Range Order in Glasses”, John Schroeder, Masashi Yamaguchi, and Cornelius Moyanihan, NSF-DMR, submitted.

- “NIRT Wafer-scale active nanoemitter for energy applications”, Shawn-Yu Lin, Partha S Dutta, Toh-Ming Lu, and Masashi Yamaguchi, NSF-NIRT, submitted.

- “NER: Nanoscale Acoustics and Thermal Transport in Nanorod/Nanotube Arrays”, Masashi Yamaguchi, Pulickel M Ajayan, and Toh-Ming Lu, NSF-NER, submitted.

X.-C. ZHANG

- Monsanto. \$50k. with Ingrid Wilke.

- Australia international travel grant. C. Zhang, D. Abbott, X.-C. Zhang

Approved Project Title: Terahertz optoelectronics based on spintronics materials
2006 : \$12,000, 2007 : \$10,000. Awarded.

- DuPont. Gift, \$20,000. X.-C. Zhang. Awarded.
- Intelligent Optical System, \$250,000. Two years. Awarded.
- NATO Business Meeting, \$2500. AFOSR. Submitted.
- NATO Advanced Research Workshop. \$7500. AFOSR. Submitted.
- CenSSIS. PI. Zhang, co-PI., Yamaguchi, \$550,000. Two years. Awarded.
- SC&A-PNT. Zhang, \$2,200,000. Three years. Awarded.
- Army Benet Lab, \$200,000. Two years. Submitted.
- ARO-DRI, \$300k. Three years. Submitted.
- Army Night Vision and Sensors Lab. \$1M. Three years. Submitted.

SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES

S.-K. EAH

- Joined RPI's NSF center for directed assembly of nanostructures (not sure whether I joined before or after Oct. 1, 2005)

VISITORS TO RENSSELAER

S.-K. EAH

- Associate Professor Michael Barnes, Department of Chemistry, University of Massachusetts Amherst (Amherst, MA), Oct 24, 2005. Gave a talk of "Polymer Nano-antennae: Oriented Nanostructures from Single Molecules of Semiconducting Polymers" at condensed matter and optics seminar

C. WETZEL

- Mukesh Chatter, Axio Wave Network, RPI Alumn 1982 & Paul Severino, Nov 11, 2005.

X.-C. ZHANG

- Matt Hunwardsen and Scott Campbell, Materials Technology Division, Rockwell Scientific Company LLC, work with the Center for THz Research on THz imaging project.
 - 10/20/05 Emily Shu, Intel Corp. Visit.
 - 10/20/05 Hongze He, (Bureau Chief), Dehao Zou, (Chief Correspondent) The People's Daily, UN Bureau. Visit our THz activities.
 - 10/18/05 Myron Wecker (deputy director-administration) and Alan Doctor (deputy director-business development). NY CAT on THz program.
 - 10/25/05 Hiro Miura (worldwide sales manager), Keiji Katagiri (President and CEO), Dr. Toshiaki Asahi (Head) Nikko Materials, ACROTEC Semiconductor Materials. Discussion on ZnTe wafer quality.
 - 11/3/05 Rich Skibo, Steve Ostrow PNT and SA&C. THz program
 - 11/8/05 Japanese JFE R&D Corp, Junichi Yotsuji. THz program
 - 11/8/05 Gerber Scientific International, THz program.

- 11/8/05 Four scientists from Army Benet Lab.
- 11/28 Naval Research Lab Dr. Dong Ho Wu. THz technology training at RPI for one week
- 11/28/05 ETH, Zurich, Prof. Peter Gunter, Seminar and visit
- 12/8/05 Intelligent Optical Systems, Glenn Bastiaans, Kick Off meeting at Rensselaer
- 12/13/05 Lawrence Livermore National Lab, Michael Burke, Robert (Bob) Deri, Collaborated research on THz program

IMPORTANT ACTIVITIES OF STUDENTS

H. NEWBERG

- Jamie Kern submitted thesis for MS in physics, titled: "The Angular Distribution of Globular Clusters in M87 and The Search for Type Ia Supernova Progenitor Companions: the Remnant of SN 1006"

T.-M LU

- Best Poster Award at the 56th Annual Meeting of International Society of Electrochemistry, Busan, Korea, September 26, 2005: "A study on the ruthenium seed layer growth by electrochemical deposition", Hyung-Il Kim, Hyung-Shik Shin, Joong-Hee Cho, M. A. Dar, Hyung-Kee Seo, Young-Soon Kim, Jay J. Senkevich, and T.-M. Lu.
- Best Poster Award at the International Semiconductor Device Research Symposium (ISDRS) held in Washington DC, December 7, 2005: "Optical Thin Films with Very Low Refractive Index and Their Application in Photonic Devices", J.-Q. Xi, Jong Kyu Kim, Dexian Ye, Jasbir S. Juneja, T.-M. Lu, Shawn-Yu Lin, and E. Fred Schubert.

G.-C. WANG

Speaker is underlined.

- Low temperature melting of Tungsten and Ruthenium nanorod arrays, Tansel Karabacak, Dexian Ye, Pei-I Wang, Gwo-Ching Wang, and Toh-Ming Lu, AVS 52th International Symp. and Exhibition, Boston, MA, Nanometer scale science and technology, Oct. 31, 2005.
 - Dynamical scaling during shadowing growth of Ru nanorods, L. Li, F. Tang, T. Karabacak, G.-C. Wang, and T.-M. Lu, AVS 52th International Symp. and Exhibition, Boston, MA, XPS and SPM new developments and applications, Nov. 2, 2005.
 - Texture evolution during shadowing growth of Ru nanorods, F. Tang, T. Karabacak, P. Morrow, C. Gaire, G.-C. Wang, and T.-M. Lu, AVS 52th International Symp. and Exhibition, Boston,, Nov. 2005.
 - Shadowing growth of uniform 3D nanostructures on templated substrates by a novel oblique angle deposition technique, Dexian Ye, R. C. Picu, G.-C. Wang and T.-M. Lu
- Poster presenter has a *.

- Low temperature melting of metallic nanorod arrays, Tansel Karabacak*, Dexian Ye, Pei-I Wang, Gwo-Ching Wang, and Toh-Ming Lu, MRS fall 2005.
- “Electrodeposited CoNi/Cu multilayered nanowires”, X.T. Tang*, G.-C. Wang, and M. Shima, TMS, Rensselaer, Nov. 15, 2005.
- “Mechanical testing of isolated nanorods using atomic force microscope”, Churamani Gaire*, Gwo-Ching Wang, and Catalin Picu, TMS, Rensselaer, Nov. 15, 2005.
- “Self-limiting chemisorptions of $\text{Cu}(\text{hfac})_2$ on N_2 plasma treated parylene surface”, S. PimanpangP, Pei-I Wang, Dexian Ye, Jasbir S. Juneja, G.-C. Wang, and T.-M. Lu, TMS, Rensselaer, Nov. 15, 2005.

OTHER

H. NEWBERG

- Appeared in December issue of Discover Magazine on Milky Way discoveries. Also, Dec 12, 2005 WAMC _To the Best of our Knowledge_ show on the dark matter highway.