

Rensselaer Physics Department

Activities

APR 2004 – JUN 2004
(Rensselaer Students are underlined)

HONORS AND AWARDS

T.-M. LU

- Co-organizer and session chair: Materials Research Society Symposium on “Materials, Technology, and Reliability for Advanced Interconnects and Low-K Dielectrics”, Materials Research Society Spring Meeting, San Francisco, CA, April 12-15, 2004.
- Panelist at the Fudan-Novellus International Workshop on Cu-Interconnect, Shanghai, China, May 24-26, 2004.

C. WETZEL

- Chairperson Session N: Nitride HEMTs: RF Dispersion and Passivation, 46th Electronic Materials Conference, Notre Dame University, Notre Dame, IN, June 23, 2004.
- Chairperson Session II: Characterization of Nitride Semiconductors, 46th Electronic Materials Conference, Notre Dame University, Notre Dame, IN, June 25, 2004.
- Chairperson Session II: InN, GaN, AlN and related materials, their heterostructures, and devices: Heteroepitaxy II, Spring Meeting of the European Materials Research Society, Strasbourg, France, May 25, 2004.
- Re-elected Committee Member of The Electronic Materials Conference.
- Nominated Member of Subcommittee CLEO 3: Semiconductor Lasers and LEDs. Conference on Laser Electro-Optics (CLEO) 2005.
- Nominated Member of Subcommittee CLEO 15: LEDs and Displays. CLEO Conference on Laser Electro-Optics (CLEO) 2005.
- Symposium Organizer, “InN, GaN, AlN and Related Materials, their Heterostructures, and Devices”, Spring Meeting of the European Materials Research Society, Strasbourg, France 2004.

X.-C. ZHANG

- US Patent #6734974, “Terahertz Imaging with Dynamic Aperture”, Z. Jiang, Q. Chen, X.G. Xu, and X.-C. Zhang, awarded on May 11, 2004.

- Conference co-chair, 2nd International Symposium on Ultrafast Phenomena and Terahertz Waves, Shanghai, China, May 11-13, 2004.

INVITED TALKS

J.-Q. LU

- “Planarization Issues in Wafer-Level 3D Integration”, 2004 MRS Spring Meeting, San Francisco, CA, April 12-16, 2004.
- “Wafer-Level 3D Hyper-Integration Processing Technology”, 3D Technology, Modeling and Process Symposium, San Francisco Airport, CA, April 13, 2004.
- “Wafer-Level 3D Integration: Status and Directions”, Interconnect Focus Center Workshops, University at Albany, NY, June 25, 2004.

T.-M. LU

- “Dielectric and Metal Barriers for Cu Interconnect”, Fudan-Novellus International Workshop on Cu-Interconnect, Shanghai, China, May 25, 2004.

H. NEWBERG

- “Opportunities for Women in Science”, Forum speaker, First Unitarian Universalist Society of Albany, April 18, 2004.
- “Galactic Tidal Streams, the Formation of the Milky Way, and the Connection with WIMP Dark Matter Detection”, Origins of Life Seminar, Rensselaer Polytechnic Institute, April 26, 2004.
- “Galactic Structure from Wide Field Surveys”, Wide-Field Imaging conference, Berkeley, CA, May 18, 2004.

G.-C. WANG

- “Terascale Electronics and Terahertz Science at Rensselaer”, Siena College, SPS chapter induction speaker, April 28, 2004.

C. WETZEL

- “Development of Green Light Emitting Diodes in Polarization Controlled GaInN/GaN”, Georgia Institute of Technology, School of Electrical and Computer Engineering, Atlanta, GA, April 22, 2004.

I. WILKE

- “Femtosecond Relativistic Electron Beam Bunch Length Measurements”, Cornell University, Physics Department, Accelerator Seminar, Ithaca, NY, May 7, 2004.

X.-C. ZHANG

- “THz Wave Technology and Applications”, Short Course SC547, International Society of Optical Engineering (SPIE) Defense and Security Symposium 2004, Orlando, FL, April 13, 2004.
- “Recent Progress on THz Science, Technology, and Applications”, 2nd International Symposium on Ultrafast Phenomena and Terahertz Waves, Shanghai, China, May 11-13, 2004.
- “Why THz Waves?” X.-C. Zhang, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai, China, May 13, 2004.
- “THz Technology”, X.-C. Zhang, Short Course SC164, Conference of Lasers and Electro-Optics, 2004, San Francisco, CA, May 17, 2004.
- “Pulsed THz Wave Technology”, X.-C. Zhang, the National Academies of Science Committee on Assessment of Security Technologies for Transportation, J. Erik Jonsson Center of National Academy of Sciences, Woods Hole, MA, June 10, 2004.
- “Terahertz Science and Technology”, X.-C. Zhang, Faculty of Engineering and Physical Science, University of Manchester, Manchester, UK, June 29, 2004.
- “Recent Development of Terahertz Wave Time-Domain Technology”, X.-C. Zhang, plenary talk, Conference on Precision Electromagnetic Measurement, London, UK, June 30, 2004.

MEETING ATTENDANCE

J.-Q. LU

- 2004 MRS Spring Meeting, San Francisco, CA, April 12-16, 2004.
- 3D Technology, Modeling and Process Symposium, “3D Architectures for Semiconductor Integration and Packaging”, San Francisco Airport, CA, April 13-15, 2004.
- Rensselaer Colloquium on Teaching and Learning, Rensselaer, May 10-11, 2004.
- Interconnect Focus Center Workshops, University at Albany, NY, June 25, 2004.

H. NEWBERG

- Wide-Field Imaging Conference, Berkeley, CA, May 16-18, 2004.

G.-C. WANG

- Physics in public interest, Conference for physics department chairs, Washington DC., June 4-6, 2004.

C. WETZEL

- Program Committee Meeting, International Workshop on Nitride Semiconductors, Pittsburgh, PA, April 24, 2004.
- Spring Meeting of the European Materials Research Society, Strasbourg, France, May 24-26, 2004.
- Lehigh Microscopy School, Lehigh University, Bethlehem, PA, June 10, 2004.
- 46th Electronic Materials Conference, Notre Dame University, Notre Dame, IN, June 22-25, 2004.

I. WILKE

- Conference of Laser and Electro-Optics/International Conference of Quantum Electronics (CLEO / IQEC), San Francisco, CA, May 16-21, 2004.

X.-C. ZHANG

- Visited Teraview Limited, Cambridge, UK, July 1, 2004.
- Visited National Physical Laboratory, Middlesex, UK, July 2, 2004.

OTHER PROFESSIONAL TRAVEL

I. WILKE

- Cornell University, Department of Electrical Engineering, W.J. Schaff and H. Lu, meeting and discussions on THz-emission from Indium Nitride, May 6, 2004.
- Lawrence Berkeley National Laboratory, Berkeley, CA, Meeting and discussions with W. Walukiewicz on Indium Nitride thin film electronic properties, May 12, 2004.

PRESENTATIONS (presenter in bold)

J.-Q. LU

- “Wafer-Level 3D Hyper-Integration Processing Technology”, **J.-Q. Lu**, T.S. Cale, and R.J. Gutmann, 3D Technology, Modeling and Process Symposium, San Francisco Airport, CA, April 13, 2004.
- “Planarization Issues in Wafer-Level 3D Integration”, **J.-Q. Lu**, T.S. Cale, and R.J. Gutmann, 2004 MRS Spring Meeting, Symposium K: Advances in Chemical Mechanical Polishing, San Francisco, CA, April 12-16, 2004.
- “Wafer-Level 3D Integration: Status and Directions”, **R.J. Gutmann** and **J.-Q. Lu**, Interconnect Focus Center Workshops, University at Albany, NY, June 25, 2004.
- 4 posters in “Interconnect Focus Center Workshops”, University at Albany, NY, June 24-25, 2004.

H. NEWBERG

- “Comets”, H. Newberg, Executive Chamber at the NYS Capitol in Albany, NY, Bring Your Sons and Daughters to Work Day, April 22, 2004.

C. WETZEL

- “Improving the Wavelength-Power Performance in Green GaInN/GaN Light Emitting Diodes”, **C. Wetzel**, T. Detchprohm, P. Li, and J.S. Nelson, 46th Electronic Materials Conference, Notre Dame University, Notre Dame, IN, June 23, 2004.

I. WILKE

- “Ultrafast Electron Beam Pulse Measurements Using Laser Gated Semiconductor Reflectivity”, P. Bolton, **R. Carr**, A. Fisher, R. Ascazubi, and I. Wilke, 2004 Workshop on Ultrafast X-Ray Science, San Diego, CA, April 28-May 1, 2004.
- “Pulsed Terahertz Emission from Indium Nitride Thin Films”, R. Ascazubi, **Ingrid Wilke**, K. Denniston, W. J. Schaff, and H. Lu, International Quantum Electronics Conference (IQEC), May 17, 2004.
- “A Femtosecond Laser-Activated Silicon Reflection Switch for Electron-Beam Bunch Length Measurements”, **R. Ascazubi**, I. Wilke, H. Zhong, S. Wang, X.-C. Zhang, A. Fisher, P. Bolton, R. Carr, and H. Schlarb, Conference of Laser and Electro-Optics (CLEO), May 18, 2004.

X.-C. ZHANG

- “Spectroscopic Characterization of Explosives”, Y. Chen, H. Liu, Y. Deng, D.B. Veksler, M.S. Shur, X.-C. Zhang, D. Schauki, M.J. Fitch, and R. Osiander, 5411-02, International Society of Optical Engineering (SPIE) Defense and Security Symposium 2004, Orlando, FL, April 12, 2004.
- “Imaging of Landmines with Pulsed THz Waves”, H. Zhang, J. Xu, J. Partridge, and X.-C. Zhang, 5411-06, International Society of Optical Engineering (SPIE) Defense and Security Symposium 2004, Orlando, FL, April 12, 2004.
- “THz Spectroscopy for Trace Explosive Detection”, D. Schauki, Y. Chen, R. Osiander, and X.-C. Zhang, 5411-10, International Society of Optical Engineering (SPIE) Defense and Security Symposium 2004, Orlando, FL, April 12, 2004.
- “THz Spectroscopy of Selected Gasoline Samples”, F.M. Al-Douseri, Y. Chen, and X.-C. Zhang, Conference of Lasers and Electro-Optics, 2004, San Francisco, CA, May 16, 2004.

PAPERS PUBLISHED

G. CIOLEK

- “Formation and Collapse of Nonaxisymmetric Protostellar Cores in Planar Magnetic Molecular Clouds”, S. Basu (U. of Western Ontario) and G.E. Ciolek, *The Astrophysical Journal*, Vol. 607, pp. L39-L42, May 20, 2004.

J.-Q. LU

- “Back-End Compatibility of Bonding and Thinning Processes for a Wafer-Level 3D Interconnect Technology Platform”, S. Pozder, J.-Q. Lu, Y. Kwon, S. Zollner, J. Yu, J.J. McMahon, T.S. Cale, K. Yu, and R.J. Gutmann, 2004 IEEE International Interconnect Technology Conference (IITC04), San Francisco Airport, CA, June 7-9, 2004.
- “Wafer-Level 3D Manufacturing Issues for Streaming Video Processors”, A.Y. Zeng, J.-Q. Lu, R.J. Gutmann, and K. Rose, *The 15th Annual IEEE/SEMI Advanced Semiconductor Manufacturing Conference (ASMC 2004)*, pp. 247-251, IEEE, 2004, Boston, MA, May 4-6, 2004.
- “Wafer-Level 3D Hyper-Integration Processing Technology”, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, Invited at 3D Technology, Modeling and Process Symposium, San Francisco Airport, CA, April 13, 2004.
- “Planarization Issues in Wafer-Level 3D Integration”, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, (invited) 2004 MRS Spring Meeting, Symposium K: Advances in Chemical Mechanical Polishing, San Francisco, CA, April 12-16, 2004.
- “Evaluation of Thin Dielectric-Glue Wafer-Bonding for Three-Dimensional Integrated Circuit-Applications”, Y. Kwon, J. Yu, J.J. McMahon, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, 2004 MRS Spring Meeting, Symposium F: Materials, Technology, and Reliability for Advanced Interconnects and Low-k Dielectrics, San Francisco, CA, April 12-16, 2004.
- “Fundamental Limits for 3D Wafer-to-Wafer Alignment Accuracy”, M. Wimplinger, J.-Q. Lu, J. Yu, Y. Kwon, T. Matthias, T.S. Cale, and R.J. Gutmann, 2004 MRS Spring Meeting, Symposium F: Materials, Technology, and Reliability for Advanced Interconnects and Low-k Dielectrics, San Francisco, CA, April 12-16, 2004.
- “Optical Interconnect Components for Wafer Level Heterogeneous Hyper-Integration”, P.D. Persans, M. Ojha, R. Gutmann, J.-Q. Lu, A. Filin, and J. Plawsky, 2004 MRS Spring Meeting, Symposium F: Materials, Technology, and Reliability for Advanced Interconnects and Low-k Dielectrics, San Francisco, CA, April 12-16, 2004.
- “Thermal Cycling Effects on Bond Strength and Residual Stress in Benzocyclobutene (BCB)-Bonded Wafers”, Y. Kwon, J. Seok, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, *Journal of The Electrochemical Society*, 2004. Submitted.
- “Wafer-Level Three-Dimensional Monolithic Integration for Intelligent Wireless Terminals”, R.J. Gutmann, A.Y. Zeng, S. Devarajan, J.-Q. Lu, and K. Rose, *Journal of Semiconductor Technology and Science*, 2004. Submitted.

T.-M. LU

- “Bias-Temperature Stability of Ultrathin Parylene-Capped Dielectrics: Influence of Surface Oxygen on Copper Ion Diffusion”, J.J. Senkevich, P.-I. Wang, C.J. Wiegand, and T.-M. Lu, *Appl. Phys. Lett.* 84, 2617, 2004.
- “Separation of Copper Ion-Induced and Intrinsic Polymer Instabilities in Polyarylether Using Triangular Voltage Sweep”, A. Mallikarjunan, S.P. Murarka, and T.-M. Lu, *J. Appl. Phys.* 95, 1216, 2004.
- “Correlation Between Bond Cleavage in Parylene N and the Degradation of its Dielectric Properties”, J.J. Senkevich, A. Mallikarjunan, C.J. Wiegand, T.-M. Lu, H.N. Bani-Salameh, and R.L. Lichti, *Electrochemical and Solid-State Letters* 7, 4, G56-58, 2004.
- “Enhanced Photoluminescence of PPV Thin Film Coated on the Nano-Structured Substrate by Glancing Angle Deposition”, T. Karabacak, C. Wiegand, J.J. Senkevich, T.-M. Lu, D. Jia, and F. Fernandez, *Electrochemical and Solid-State Letters*. Submitted.
- “Selective Deposition of Ultra-Thin Parylene-N Film on Dielectrics Versus Copper Surfaces”, J.J. Senkevich, C.J. Wiegand, G.-R. Yang, and T.-M. Lu, *Chem. Vapor. Dep.* Submitted.

T.-M. LU and G.-C. WANG

- “Growth of Uniformly Aligned Nanorod Arrays by Oblique Angle Deposition with Two-Phase Substrate Rotation”, D.-X. Ye, T. Karabacak, B.K. Lim, G.-C. Wang, and T.-M. Lu, *Nanotechnology* 15, accepted, 2004.
- “Enhanced Cold Emission from <100> Oriented β -W Nanoemitters”, J.P. Singh, F. Tang, T. Karabacak, T.-M. Lu, and G.-C. Wang, *J. Vac. Sci. Technol.* B23(3), 1048, 2004.
- “Metal Coated Si Springs: Nanoelectromechanical Actuators”, J.P. Singh, D.-L. Liu, D.-X. Ye, R.C. Picu, T.-M. Lu, and G.-C. Wang, *Appl. Phys. Lett.* 84(18), 3657, 2004.
- “Molecular Caulking”, C. Jezewski, C.J. Wiegand, D. Ye, A. Mallikarjunan, D.L. Liu, C. Jin, W.A. Lanford, G.-C. Wang, J.J. Senkevich, and T.-M. Lu, *Journal of the Electrochemical Society*, 151, n 7, F157-61, 2004.

C. WETZEL

- “Optimization for Green and Deep Green GaInN/GaN Light Emitting Diodes”, C. Wetzel, P. Li, T. Detchprohm, and J.S. Nelson, *Phys. Stat. Sol. (c)*. Submitted.

I. WILKE

- “Terahertz Emission from InN”, R. Ascazubi, I. Wilke, K. Denniston, H. Lu, and W. Schaff, *Applied Physics Letters* 84, 4810, 2004.

X.-C. ZHANG

- “Educational and Training Program of THz Science and Technology at Rensselaer”, G.-C. Wang, T.-M. Lu, M. Shur, S. Kalyanaraman, and X.-C. Zhang, in Education and Training in Optics and Photonics on CD-ROM (Optical Society of America, Washington, DC, EMG2, 2004).
- “Study of Differently Doped Zn_{0.95}Cd_{0.05}Te < 110 > Single Crystals as THz Emitters”, X.M. Wang, X.L. Xu, Y.P. Yang, Y.L. Shi, F.L. Li, L. Wang, X.-C. Zhang, H.S. Kang, and T.K. Kim, Acta Physica Sinica, 53 (4): 1003-1007, April, 2004.

PROPOSALS (SUBMITTED or GRANTED)

J.-Q. LU

- BAA 03-25 - 3D ELECTRONICS: “Wafer to Wafer Alignment and Planarization Constraints for Wafer-Level 3D ICs” (subcontract to IBM), J.-Q. Lu and R.J. Gutmann, \$530,000 for 4 years, funded.
- SRC Customization Research, “Evaluation of Wafer Bonding Impact on Strain in Active Silicon in Monolithic Wafer-Level 3D IC Stacks”, J.-Q. Lu and R.J. Gutmann, \$35,000 for one year. Granted.
- Infotonics, “3D Wafer Level Packaging of Microsystems for Harsh Environments”, J.-Q. Lu - one of 13 Investigators, \$120,000 seed fund for one year, funded.
- NASA, “Self-Reconfigurable Analog/Mixed-Signal Electronics for Extreme Environments”, J.-Q. Lu, \$25,000 seed fund in collaboration with JPL and ISMT. Submitted.

T.-M. LU and G.-C. WANG

- “GOALI: Novel High Performance Polymer with Strong Metal Adhesion”, T.-M. Lu, S. Murarka, G.-C. Wang, and R. Ghoshal (Polyset Inc.), NSF, \$334K, 3 years, May, 2004. Submitted.
- “Novel High Performance Polymer with Strong Metal Adhesion for Packaging Applications”, G.-C. Wang, S. Murarka, and T.-M. Lu, Collaborators: C. Chiu, Texas Instruments, and R. Ghoshal, Polyset Inc., SRC, \$300K, 3 years, June 28, 2004.

H. NEWBERG

- “Astro Graduate Student Fellowship”, NASA/NY Space Grant, \$10,000, February, 2004-January, 2005.
- “Undergraduate Fellowships”, NASA/NY Space Grant, \$7200, May, 2005-August, 2005.

G.-C. WANG

- Student centered active learning in studio physics, P. Casabella, G. Bedrosian, S. Dwyer, and G.-C. Wang, submitted to Provost Office, March 31, 2004, \$6K, May, 2004. Granted.
- Faculty Mobile Computing Grant Application, submitted to College of Undergraduate Education, \$2.2K, June 18, 2004. Submitted.

C. WETZEL

- “High-Power GaInN and AlGaInP Emitters with High Conversion Efficiency”, Collaboration with E.F. Schubert, \$2.7 M over 3 years, Department of Energy, April 15, 2004. Submitted.

I. WILKE

- IGERT: Environmental Nanogeochemistry & Engineering, pre-proposal, April 29, 2004, National Science Foundation, PI: J. Kilduff, co-PI: I. Wilke, K. Fortun, C. Breneman, and T. Abrajano.
- “Femtosecond Laser assisted Micro-Injection”, June 1, 2004, \$390,000, National Institute of Health, PI, co-PI: R. Palazzo.

SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES

I. WILKE

- The publication “Terahertz Emission” by InN by R. Ascazubi, I. Wilke et al. published June 7, 2004 in Applied Physics Letters was featured in Nature News and Views in Brief Section under the title A new source of terahertz radiation? in Nature vol. 429 on June 3, 2004. The same publication was also selected for the Virtual Journal of Ultrafast Science, vol. 3, June, 2004.

VISITORS TO RENSSELAER

H. NEWBERG

- Tim Beers (Michigan State University), Physics Colloquium speaker and collaborator, April 13-15, 2004.

IMPORTANT ACTIVITIES OF STUDENTS

S. SCATTAREGGIA

- Stephanie has been very active in planning and organizing Outreach Activities with educators at schools, libraries, and museums. Stephanie has “reached

out” to over 670 people so far this summer. (NEWBERG)

C. SHNEIDER

- “Terahertz Emission from GaSb”, Rensselaer Summer Undergraduate Research Program, \$3000 fellowship, granted. (WILKE)

OTHER

H. NEWBERG

- Interviewed by CBC/Radio-Canada on “Dark-Matter Highway”, April 1, 2004.
- Interviewed by Glen Busby (NPR, WAMC) for the national program, “To the Best of Our Knowledge”, April 26, 2004.

I. WILKE

- External reviewer of PhD thesis “Ultrafast Carrier Dynamics by a Novel Pump and Probe THz-Technique” by H. Wald, University of Jena, Department of Physics, Jena (Germany).