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2013 SATU Summer Intensive Program
Speaker CV and Lecture Abstract

CURRICULUM VITAE

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1. Personal Information

Birth: Tainan City, Taiwan, 1965.

2. Educations:

1997.1	Mechanical Engineering, UCLA, Ph.D.
1992.2	Mechanical Engineering, Columbia University, M.S.
1987.6	Agricultural Machinery Engineering, National Taiwan University, B.S.

3. Professional Experiences:

2012.8~	Center for Micro/Nano Science and Technology, NCKU, Director General
2012.8~	Department of Engineering Science, NCKU, Distinguished Professor
2011.8~2012.7	Technology Transfer & Business Incubation Center, NCKU, Director
2008.6~2008.9	Department of Biological Engineering, Massachusetts Institute of Technology, Visiting Professor
2007.8~2012.7	Department of Engineering Science, NCKU, Professor
2004.8~2007.7	Department of Engineering Science, NCKU, Associate Professor

4. Fields of Specialty:

- Plasmonic Biosensing & Molecular Imaging
- Adaptive Optics in Biomedical Nonlinear Optical Microscopy

5. Major awards and honors

- "Teaching Excellence Award" from National Cheng Kung University in 2011.
- "Wu Ta You Memorial Award" from National Science Council of Taiwan for research excellence in 2005.

6. List of Recent Selected Publications (* corresponding author)

- V. A. Hovhannisyan, P,-S, Hu, H.-Y. Tan, **S.-J. Chen***, and C.-Y. Dong*, "Spatial orientation mapping of fibers using polarization-sensitive second harmonic generation microscopy," *Journal of Biophotonics* **5** (2012) 768.
- Y.-C. Li, L.-C. Cheng, C.-Y. Chang, C.-H. Lien, P. J. Campagnola, and **S.-J. Chen***, "Fast multiphoton microfabrication of freeform polymer microstructures by spatiotemporal focusing and patterned generation," *Optics Express* **20** (2012) 19030.
- C.-Y. Lin, C.-H. Lien, K.-C. Cho, C.-Y. Chang, N.-S. Chang, P. J. Campagnola, C. Y. Dong, and **S.-J. Chen***, "Investigation of two-photon excited fluorescence increment via crosslinked bovine serum albumin," *Optics Express* **20** (2012) 13669.
- L.-C. Cheng, C.-Y. Chang, C.-Y. Lin, K.-C. Cho, W.-C. Yen, N.-S. Chang, C. Xu**,** C. Y. Dong, and **S.-J. Chen***, "Spatiotemporal focusing-based widefield multiphoton microscopy for fast optical sectioning," *Optics Express* **20** (2012) 8934.
- W.-S. Kuo, Y.-T. Chang, K.-C. Cho, K.-C. Chiu, C.-H. Lien, C.-S. Yeh, and **S.-J. Chen***, "Gold nanomaterials conjugated with indocyanine green for dual-modality photodynamic and photothermal therapy," *Biomaterials* **33** (2012) 3270.
- K.-C. Cho, C.-H. Lien, C.-Y. Lin, C.-Y. Chang, L. L. H. Huang, P. J. Campagnola, C. Y. Dong, and **S.-J. Chen***, "Enhanced two-photon excited fluorescence in three-dimensionally crosslinked bovine serum albumin

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microstructures," *Optics Express* **19** (2011) 11732.

- C.-H. Lien, W.-S. Kuo, K.-C. Cho, Y.-D. Su, L. L. H. Huang, P. J. Campagnola, C. Y. Dong, and **S.-J. Chen***, "Fabrication of gold nanorods-doped, bovine serum albumin microstructures via multiphoton excited photochemistry," *Optics Express* **19** (2011) 6260.
- K.-C. Chiu, C.-Y. Lin, C. Y. Dong, and **S.-J. Chen***, "Optimizing silver film for surface plasmon-coupled emission induced two-photon excited fluorescence imaging," *Optics Express* **19** (2011) 5386.
- W.-S. Kuo, C.-H. Lien, K.-C. Cho, C.-Y. Chang, C.-Y. Lin, L. L. H. Huang, P. J. Campagnola, C. Y. Dong, and **S.-J. Chen***, "Multiphoton fabrication of freeform polymer microstructures with gold nanorods," *Optics Express* **18** (2010) 27550.
- Y.-D. Su, K.-C. Chiu, R.-Y. He, N.-S. Chang, H.-L. Wu, and **S.-J. Chen***, "Study of cell-biosubstrate contacts via surface plasmon polariton phase microscopy," *Optics Express* **18** (2010) 20125.

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(NDL, National Nano Device Laboratories)
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BIOGRAPHY

Fu-Liang Yang received the B.S. degree in materials science and engineering from the National Tsing Hua University, Taiwan, R.O.C., in 1989, and the Ph.D. degree in materials science and engineering from the University of Cambridge, U.K., in 1994.

From 1994 to 2000, Fu-Liang Yang was with Vanguard International Semiconductor Corporation (VIS), where he worked on DRAM process and device development. He joined TSMC in 2000 as a Device Technical Section Manager. From 2002 to 2006, he managed an exploratory department with research focuses on novel transistor architecture and process technologies for sub-32nm node logic (FinFET and SOI) and nonvolatile memory. He was elected as an TSMC Academician, TSMC Academy, in 2004. From January 2007 to July 2008, he has conducted a phase-change memory program for NAND/NOR Flash replacement in TSMC. He has authored more than 30 IEDM and VLSI Symposium papers, and several invited talks at international conferences. He also authored or co-authored more than 240 patents (including 135 USA patents) in advanced CMOS devices and dynamic/static/nonvolatile memory technologies. One of his distinguished achievements is holding CMOS scaling record for gate length down to 5nm. This work published in 2004 (first author, in VLSI Symposium) has been cited 228 times. He was a technical subcommittee Member of IEDM 2010-2011, a Program Committee Member of SSDM 2010-2013, and also an international reviewer of Singapore National Advance Memory Program, SERC 2009 and 2011.

On August 1, 2008, he was inaugurated as Director General of National Nano Device Labortories (NDL) with research focuses on the emerging nanotechnologies, such as sub-20nm CMOS technology, new generation photovoltaic, and MEMS and Bio-Chips. Recent achievements include forming the smallest 16nm and 10nm functional SRAM cell by the innovative Nano-Injection Lithography (maskless and photoresist free) and multiple Fin height, which have been published as IEDM-2009 late news paper and Symp. VLSI Technology 2013, respectively. In 2010 (IEDM), Dr. YANG led another research team achieving functional R-RAM cell array with half pitch down to record 9nm. For Fu-Liang's another identity of Research Fellow in NDL, he is now a PI for two national research programs: (1) Sub-10nm Resistive Memory Chip Development, and (2) 3D Hybrid Si Quantum-Dot Memory/Logic Device Chip,

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both of which reflects his long-term interest and commitment to explore nano CMOS and to extend the VLSI technology advance beyond conventional CMOS scaling.

Outlook for 10nm CMOS: Business Market and Technology Options

Abstract

This talk will first compare the PC versus mobile device IC market, then I will review the device roadmaps and teardown of 28/32nm (present production technology) and 20/22nm (the most advanced production technology by Intel only) technologies from: 1) TSMC, 2) IBM Alliance (IBM, ST, Global Foundries & Samsung) and 3) Intel with planar and FinFET devices. Then I will show the various options for 14nm and 10nm FinFET devices. Special attention will be paid on 10nm patterning technology, which is widely agreed that the lithography technique could be a showstopper, especially from economic viewpoint. EUV (Extreme UltraViolet) is the expected solution, but its mask set price (extrapolated from 45nm to 32nm node) of up to 3 million USD will be punitive to test chips and pilot productions in the 14nm era. E-Beam Lithography, a maskless process, is therefore highly attractive as the lithography technique, at least at the initial circuit verification stage. However, our recent experimental data shows that E-Beam Lithography suffers from line width roughness and proximity effect for 15nm patterning, arising from electron-beam backscattering. Here a newly developed technology, Nano-Injection Lithography (NInL), will first be presented. The NInL technique is not only maskless for minimizing entry cost but also photoresist free to greatly enhance pattern resolution, down to 2nm 3-sigma line width roughness, and without significant proximity effect. The first 10nm 6T-SRAM cell of $0.018\mu m^2$ patterned by this technology with FinFET device structure will be presented.

At 10nm generation, new channel material to replace Si with much higher carrier mobility has long been anticipated. Ge is especially attractive because it is among very few candidates with higher mobility over silicon at both electron (2.4 times higher) and hole (4.4 times higher). Here Ge CMOS with special thermal process of microwave anneal ($<390^0C$) to meet low thermal budget at 10nm generation will be presented. The microwave process significantly outperforms conventional RTA process in 3 aspects: (1) diffusion-less junction, (2) increased Cox and lower gate leakage, and (3) ultrathin 7.5nm nickel mono-germanide with lower sheet resistivity and contact resistivity. Disruptive Innovation with molecular semiconductor materials of single layer MoS_2 and WSe_2 for N-MOS and P-MOS will also be reviewed as they are the emerging candidates to approach the ultimate monolithic 3D stacking device structure, after Si/Ge era.

Furthermore, TMO-RRAM (Transition-Metal-Oxide based Resistive Random Access Memory) is attractive and much investigated for emerging non-volatile memory recently, mainly due to its process simplicity and scalability. A CMOS compatible TMO system, WO_x by 450^oC thermal oxidation, and special patterning technology of NInL (Nano Injection Lithography) technique are used to study

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sub-10nm scaling issues. Our experimental date for the smallest RRAM at 9nm half pitch will be reviewed. Its programming current is only 1 μA and well below the expected current drive capability of the transistors. Such improvement in programming current is highly encouraging for future high-density RRAM production beyond the scaling end of NAND Flash.

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1. Personal Information

Birth: Tainan City, Taiwan, 1968.

2. Educations:

2006.9	Mechanical Engineering, NCKU, Taiwan, Ph.D.
1996.6	Mechanical Engineering, NTUST, Taiwan, M.S.

3. Professional Experiences:

2011.6~	Center for Micro/Nano Science and Technology, NCKU, Assistant Research Fellow
2011/2~	Mechanical Engineering, NCKU, Assistant Professor (part time)
2009.2~2011.5	Center for Micro/Nano Science and Technology, NCKU, Assistant Research Professor
2006.9~2009.1	Center for Micro/Nano Science and Technology, NCKU, Postdoctoral Research Fellow
1996.8~1999.4	Mechanical Engineering Research Laboratories, ITRI, Engineer

4. Fields of Specialty:

- Nanomachenical inspection
- Fabrication and characterization of micro-nano materials

5. List of Recent Selected Publications (* corresponding author)

- C. F. Han, B. H. Wu, C.J. Chung, S. F. Chuang, W. L. Li, J. F. Lin, "Stress–strain analysis for evaluating the effect of the orientation of dentin tubules on their mechanical properties and deformation behavior," Journal of the Mechanical Behavior of Biomedical Materials, vol. 12, pp. 1–8, 2012.
- C. K. Chung, B. H. Wu, C. W. Lai and T. Y. Chen, "Nano silicon top-layer for composite-induced multiphasic enhancement of thermal stability of hardness of diamond-like carbon nanofilm at 900 °C", Surface & Coatings Technology 206, pp. 4580-4584, 2012.
- Tse Chang Li, Bo Hsiung Wu, Jen Fin Lin, "Effects of prestrain applied to a polyethylene terephthalate substrate before the coating of Al-doped ZnO film on film quality, electrical properties, and pop-in behavior during nanoindentation", IEEE/ASME Journal of Microelectromechanical Systems, vol. 21, pp.1059 – 1070, 2012.
- C. Y. Chen, C. J. Chung, B. H. Wu, W. L. Li, C. W. Chien, P. H. Wu, C. W. Cheng, "Microstructure and lubricating property of ultra-fast laser pulse textured silicon carbide seals", Applied Physics A, 107, pp. 345-350, 2012.
- Tse Chang Li, Bo Hsiung Wu, Jen Fin Lin," Effects of Pre-strain Applied at a Polyethylene Terephthalate Substrate Before the Coating of TiO(2) Film on the Coating Film Quality and Optical Performance", Thin Solid Films, vol.519, pp7875-7882, 2011.
- C. C. Peng, C. K. Chung, B. H. Wu, M. H. Weng, C. C. Huang, J. F. Lin, "Effects of annealing conditions and thickness ratio of Si/Al films on the Hall carrier mobility, Al carrier concentration, and nanovoids formed in the metal-induced Si crystallization of Si/Al/Si/SiO2/glass specimens", Surface & Coatings Technology 205, pp.4672–4682, 2011.

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- C. K. Chung and B. H. Wu, "Effect of substrate temperature on the in-situ formation of crystalline SiC nanostructured film using ultra-high-vacuum ion beam sputtering", Journal of Nanoscience and Nanotechnology, Vol.10, pp. 4679-4683, 2010.
- B. H. Wu and J. -J. Junz Wang, "A Neuro- Fuzzy Approach to Generating Mold/Die Polishing Sequences", Journal of Materials Processing Technology 209, pp. 3241-3250, 2009.
- B. H. Wu*, C. K. Chung, T. R. Shih and U. S. Mohanty, "Effect of Residual Stress on Nanoindented Property of Si/C/Si Multilayers", Journal of Micro/Nanolithography, MEMS, and MOEMS, Vol. 8(3), 033030, 2009.

Mechanical Properties of Nano Indenter

Abstract

Nano-materials have excellent electronic, photoelectric, mechanical and biomedical properties. In the recent years, a lot of resources have been offered into this area for carrying out frontier nano-related researches and developing the nano-products. The functions and durations of nano-products are crucially affected by mechanical properties of nano-materials, e.g. strength, hardness, stiffness and tribology. Therefore, the presentation will utilize the facilities in CMNST to construct the measuring techniques of nano-structure mechanical properties, and to observe deformation and fracture behaviors of nano-structures. Nano Indenter systems are designed by materials scientists who understand the behavior of materials at this scale. Nano Indenter systems have been engineered to provide optimal capability in accurately characterizing the mechanical properties of thin films, bulk materials and components. The presentation results will lead to more understand the elastic, plastic and fracture behaviors of nano structures, which would be helpful for the dimensional design and durational prediction of nano-devices.

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Hsisheng Teng (鄧熙聖)

Distinguished Professor & University Chair
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I. EDUCATION

Institution	Degree	Field	Period
Brown Univ. (USA)	Ph.D.	Engn.	1987 - 1992
Brown Univ. (USA)	M.S.	Engn.	1987 - 1991
National Cheng Kung Univ. (TW)	B.S.	Chem. Engn.	1980 - 1984

II. CURRENT RESEARCH INTERESTS

1. Advanced Materials for Photocatalytic Watersplitting
2. Nanostructured Carbons for Supercapacitors
3. Dye-Sensitized Solar Cells: Nanostructured Photoelectrodes

III. AWARDS / HONORS

1. University Chair, National Cheng Kung University (2012)
2. Outstanding Engineering Professor Award, Chinese Institute of Engineers (2012)
3. Coordinator of the Chemical Engineering Program, National Science Council (2012-present)
4. Editor in Chief, *J. Taiwan. Inst. Chem. Engr.*, Jul. 2012–present. (2011 ISI Impact Factor = 2.110)
5. Research Excellence Award, National Science Council (2003, 2011)
6. Thomson Reuters Taiwan Research Front Award, Thomson Reuters (2011)

III. SELECTED PEER REVIEWED PUBLICATIONS

1. Yeh, T.F.; Cihlář, J.; Chang, C.Y.; Cheng, C.; Teng, H.* "Roles of Graphene Oxide in Photocatalytic Water Splitting", *Materials Today* 2013, in press.
2. Huang, C.W.; Wu, C.A.; Hou, S.S.; Kuo, P.L.; Hsieh, C.T.; Teng, H. "Gel Electrolyte Derived from Poly(ethylene glycol) Blending Poly(acrylonitrile) is Applicable to Roll-to-Roll Assembly of Electric Double Layer Capacitors", *Advanced Functional Materials* 2012, Vol. 22, 4677.
3. Huang, C.W.; Hsieh, C.T.; Kuo, P.L.; Teng, H., "Electric Double Layer Capacitors Based on a Composite Electrode of Activated Mesophase Pitch and Carbon Nanotubes", *Journal of Materials Chemistry* 2012, Vol. 22, 7314-7322.
4. Li, T.L.; Lee, Y.L.; Teng, H. "High-Performance Quantum Dot-Sensitized Solar Cells Based on Sensitization with $CuInS_2$ Quantum Dots/CdS Heterostructure", *Energy and Environmental Science* 2012, Vol. 5, 5315-5324.
5. Yeh, T.F.; Chan, F.F.; Hsieh, C.T.; Teng, H. "Graphite Oxide with Different Oxygenated Levels for Hydrogen and Oxygen Production from Water under Illumination", *Journal of Physical Chemistry C* 2011, Vol. 115, 22587–22597.
6. Yeh, T.F.; Syu, J.M.; Cheng, C.; Chang, T.H.; Teng, H. "Graphite Oxide as a Photocatalyst for Hydrogen Production from Water" *Advanced Functional Materials* 2010, Vol. 20, 2255–2262.

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Graphene Oxide as Media for Electrical-Energy Storage and Photon-Energy Conversion

Abstract

Graphene oxide (GO) sheets have highly tunable electronic properties because of their unique 2D carbon grid skeleton, which allows extensive modification with surface functionalities. We report the excellent capacitive performance of photocatalytically reduced GO based on a facile light irradiation process. This reduction removes the oxygen functionalities of the basal plane for electron conduction and double layer formation, whereas the oxygen functionalities remaining in the periphery of the GO sheets provide highly reversible pseudocapacitance. We introduce strategies to tune the electronic structure of GO and presents the roles of GO, with various materials or alone, as a mediator for photocatalytic water splitting. Photo-driven water splitting uses semiconducting materials that have electronic structures suitable for electron and hole injections for H_2 and O_2 evolutions from water decomposition. GO is an ideal material to mediate photogenerated charges for water decomposition because of its versatility in electronic structures and flexibility in 2D profiles to hybridize with other semiconducting materials.

Acknowledgements:

This research is supported by the National Science Council of Taiwan (101-2221-E-006-243-MY3, 101-2221-E-006-225-MY3, 102-3113-P-006-012, and 102-3113-E-006-002) and the "Aim for the Top-Tier University and Elite Research Center Development Plan" of National Cheng Kung University.

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1. Personal Information
Birth: Aschersleben, Germany.
2. Educations:
2011.11 PhD thesis, Electrical Engineering,Massachusetts Institute of Technology, USA
2009.03 M.S. Electrical Engineering,Massachusetts Institute of Technology, USA
2006.08 Diploma Technical Physics,Technical University Ilmenau, Germany
2003.08 Vordiploma Technical Physics,Technical University Ilmenau, Germany
3. Professional Experiences:
2012.03 Postdoctoral fellow at National Taiwan University, Taipei, Taiwan.
2006-2011 MIT Research assistantship "Nanomaterials and -electronics"
2009.09 Internship at National Taiwan University, Taipei, Taiwan. Setup and application of a low pressure graphene CVD system"
2009.07 Internship at Universidade Federal de Minas Gerais. Belo Horizonte, Brazil "Tunable excitation resonant Raman spectroscopy of SWNTs"
2008.01 Internship at Tokyo University, Tokyo, Japan .Supported by Hayashi Fellowship "Ultralow pressure CVD of SWNTs".
2005.07 Internship at MIT, Cambridge, USA. "Synthesis and properties of carbon nanotubes"
2004-2006 Research Assistant at TU Ilmenau, Germany. "Surface Science".
4. Fields of Specialty:
-Synthesis of carbon nanostructures
-Optical spectroscopy of carbon nanotubes and graphene
-Electronic properties of nanomaterials
5. Major awards and honors
-Poster Award NT08: Ninth international conference on the science and application of nanotubes
-Honorable mention ACS Nanotation Video Contest
6. List of Recent Selected Publications (* corresponding author)
-**M. Hofmann**, A.L.Hsu, Y.P. Hsieh, M.S. Dresselhaus, and J. Kong, "Direct CVD synthesis of patterned graphene via catalyst passivation," Nature Nanotechnology,submitted, (Impact Factor 30.3)
- **M. Hofmann**, Y.C. Shin, Y.P. Hsieh, M.S. Dresselhaus, and J. Kong, "A facile tool for the characterization of CVD two-dimensional materials," Nano Research, submitted, (Impact Factor 5.1)
-**M. Hofmann**, Y.P. Hsieh, C.T. Liang, and Y.F. Chen, "Size effects on Phonon localization and Raman enhancement in silicon nanotips," Journal of Raman Spectroscopy, submitted (Impact Factor 3.1)
- **M. Hofmann**, D. Nezich, A. Reina, and J. Kong, "In-Situ Sample Rotation as a Tool to Understand Chemical Vapor Deposition Growth of Long Aligned Carbon Nanotubes," Nano Letters, vol. 8, no. 12, 2008, pp. 4122-4127. (Impact Factor 12.2)

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- K.K. Kim, A.L. Hsu, X.T. Jia, S.M. Kim, Y.S. Shi, **M. Hofmann**, D. Nezich, J.F. Rodriguez-Nieva, M. Dresselhaus, T. Palacios, and J. Kong, "Synthesis of Monolayer Hexagonal Boron Nitride on Cu Foil Using Chemical Vapor Deposition," Nano Letters, vol. 12, no.1, 2012, pp. 161-166, NANOSCIENCE NANOTECHNOLOGY (Impact Factor 12.2) Journal rank 1/32 Citations 0
- S.B. Liu, T.H. Zeng, **M. Hofmann**, E. Burcombe, J. Wei, R.R. Jiang, J. Kong, and Y.Chen, "Antibacterial Activity of Graphite, Graphite Oxide, Graphene Oxide, and Reduced Graphene Oxide: Membrane and Oxidative Stress," ACS nano, vol. 5., no. 9, 2011, NANOSCIENCE NANOTECHNOLOGY 2010

From Nanoscience to Nanoengineering—Putting Graphene to Work

Abstract

The field of nanoscience, despite the short time since its inception, has revolutionized our understanding of the effect of size on fundamental properties of matter. Being able to precisely control the dimensions of nano-objects opens up the new and exciting possibilities of nanoengineering.

This talk will focus on graphene as a prototype for a new class of materials with atomic precision dimension control. Our recent advances in novel sensors and electronic devices that are based on this unprecedented ability to engineer a material will be highlighted.

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1. Personal Information

Birth: Taiwan, 1974.

2. Educations:

2003.6 Electrical Engineering and Computer Science, MIT, Ph.D.
2000.6 Electrical Engineering and Computer Science, MIT, M.S.
1996.6 Physics, National Taiwan University, B.S.

3. Professional Experiences:

2012.7~ Bluestone Global Tech Ltd., VP of Technology & Co-founder
2012.1~ Taiwan Bluestone Technology Ltd., CEO & Co-founder
2003.8~2011.12 Watson Research Center, IBM, Research Staff Member

4. Fields of Specialty:

- Carbon electronics, including graphene and carbon nanotubes
- Nano-scale device fabrication

5. Major awards and honors

- "Lee Hsun Young Scientist Award" from Institute of Metal Research, China Academy of Sciences in 2012.
- "IBM Outstanding Technical Accomplishment" from IBM in 2011.
- "EDS George Smith Award" from IEEE in 2010
- "Pat Goldberg Memorial Best Paper Award" from IBM in 2009
- "Gold Medal Award" from MRS in 2002

6. List of Recent Selected Publications

- Y. Q. Wu, V. Perebeinos, **Y.-M. Lin**, T. Low, F. Xia, Ph. Avouris*, "Quantum behavior of graphene transistors near the scaling limit," *Nano Letters* 12 (2012) 1417.
- Y. Q. Wu, D. B. Farmer, W. Zhu, S.-J. Han, C. D. Dimitrakopoulos, A. A. Bol, P. Avouris, **Y.-M. Lin**, "Three-terminal graphene negative differential devices," *ACS Nano* 6 (2012) 2610.
- Y. Q. Wu, K. Jenkins, A. Valdes-Garcia, D. Farmer, Y. Zhu, A. A. Bol, C. D. Dimitrakopoulos, W. Zhu, F. Xia, **Y.-M. Lin**, "State-of-the-art graphene high frequency electronics," *Nano Letters* 12 (2012) 3062.
- **Y.-M. Lin**, D. B. Farmer, K. A. Jenkins, Y. Wu, J. L. Tedesco, R. L. Myers-Ward, C. R. Eddy, Jr., D. K. Gaskill, C. Dimitrakopoulos, and Ph. Avouris, "Enhanced Performance in Epitaxial Graphene with Optimized Channel Morphology," *IEEE Electron Device Letter* 32 (2011) 1343.
- **Y.-M. Lin**, A. Valdes-Garcia, S.-J. Han, D. B. Farmer, I. Meric, Y. Sun, Y.-Q. Wu, C. Dimitrakopoulos, A. Grill, P. Avouris, and K. A. Jenkins, "Wafer-scale Graphene Integrated Circuit," *Science* 332 (2011) 1294.
- Y. Wu, **Y.-M. Lin**, A. A. Bol, K. A. Jenkins, F. Xia, D. B. Farmer, Y. Zhu, and P. Avouris, "High-frequency, scaled graphene transistors on diamond-like carbon," *Nature* 472 (2011) 74.
- F. Xia, V. Perebeinos, **Y.-M. Lin**, Y. Wu, and Ph. Avouris, "The origins and limits of metal–graphene junction resistance," *Nature Nanotechnology* 6 (2011) 179.

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- D. Farmer, **Y.-M. Lin**, and Ph. Avouris, "Graphene Field-Effect Transistors with Self-Aligned Gates," *Appl. Phys. Lett.* 97 (2010) 013103.
- **Y.-M. Lin**, C. Dimitrakopoulos, K. A. Jenkins, D. B. Farmer, H.-Y. Chiu, A. Grill, Ph. Avouris, "100 GHz Graphene Transistor from Wafer-Scale Epitaxial Graphene," *Science* 327 (2010) 662.
- K. Majumdar, K. V. R. M. Murali, N. Bhat, and **Y.-M. Lin**, "Intrinsic limits of subthreshold slope in biased bilayer graphene," *Appl. Phys. Lett.* 96 (2010) 123504.
- Z. Chen, J. Appenzeller, **Y.-M. Lin**, J. Sippel-Oakley, A. G. Rinzler, J. Tang, S. J. Wind, P. M. Solomon, Ph. Avouris, "An Integrated Logic Circuit Assembled on a Single Carbon Nanotube," Science 311 (2006) 1735.
- Z. Chen, **Y.-M. Lin**, M. J. Rooks, and Ph. Avouris, "Graphene nano-ribbon electronics," PhysicaE 40 (2007) 228.
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Graphene: Production and Applications in Electronics

Abstract

Graphene is a single sheet of carbon atoms and has attracted enormous attention for future electronic applications. As a truly two-dimensional conductor, graphene is light-weight, strong, transparent and, at the same time, possesses unprecedented carrier mobility, higher than that of any other semiconductors at the same thickness. These attributes have made graphene one of the most promising candidates for high-frequency electronics and transparent flexible conductors.

Here I first present recent progress on high-frequency graphene device and circuits for RF applications. By scaling the graphene devices down to 40-nm gate length, a cut-off frequency as high as 450 GHz is achieved. In addition, wafer-scale graphene integrated circuits where all circuit elements are monolithically fabricated on a single SiC substrate is demonstrated, which operates as a broadband mixer at 10 GHz. In addition, we show that a novel negative differential resistance (NDR) behavior can be also obtained in three-terminal graphene devices.

I will also present the mass production of CVD graphene and transfer of such large-area graphene on various flexible substrates. High-performance touch panels and other flexible electronic applications are demonstrated.

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2013 SATU Summer Intensive Program
Speaker CV and Lecture Abstract

CURRICULUM VITAE

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1. Personal Information

Birth: Penghu county, Taiwan, 1960.

2. Educations:

1994.6	Science and Engineering of Materials, ASU, Ph.D.
1984.6	Institute of Materials Science and Engineering, National Sun-Yat-Sen University, M.S.
1982.6	Mechanical Department, National Chiao-Tung University, B.S.

3. Professional Experiences:

2013-Present	Associated Researcher, Center for Micro/Nano Science and Technology, NCKU
2011-2013	Vice Director, MA-tech Co.
2005-2011	Technical Consultant, E.B.Tech Co., Ltd.
2003-2005	FA2 Department manager, UMC 12A
2002-2003	FA section manager, UMC 12A
2001-2002	FA Senior engineer, UMC
1999-2001	Manager of Microstructural Analysis Lab., MRL, ITRI
1995-1999	Researcher, Microstructural Analysis Lab., MRL, ITRI
1994-1995	Postdoctoral, Center for Solid State Science, Arizona State University
1986-1989	Associate researcher, Fine Ceramic Lab., MRL, ITRI

4. Fields of Specialty:

- Materials analysis
- High resolution TEM/STEM.

5. Major awards and honors

- FA Expert of UMC (2002)
- Committee of Taiwan Microscopy Society, 1999 July ~ 2005, 2011 ~ present
- Microscopy Society of America (MSA) Presidential Scholar for 1994)

6. List of Recent Selected Publications

- 鮑忠興·劉思謙，「近代穿透氏電子顯微鏡實務」，滄海書局出版，台中，2008 年 4 月初版；2012 年 11 月二版。.
- Alagesan Sugramanian, Jong-Shing Bow, Hong-Wen Wang, "The effect of Li+ intercalation on different size TiO2 nanoparticles and the performance of dye-sensitized solar cells," Thin Solid Films, Vol.520, 7011-7017(2012).
- Chang-Ning Huang, Jong-Shing Bow, Yuyuan Zheng, Shuei-Yuan Chen, New Jin Ho, Pouyan Shen, "Nonstoichiometric Titanium Oxides vis Pulsed Lazer Ablation in Water," Nanoscal Res. Lett., Vol.5, 972-985 (2010).

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- J. S. Bow and Speed Yu, "Depth Measurement of Dislocations in Si Substrate by Stereo TEM," Proc. ISTFA, 233-234 (2005).
- Jong-Shing Bow, Sz-Chian Liou, and San-Yuan Chen, "Structural characterization of room-temperature synthesized nano-size b-tricacium phosphate," Biomaterials **25**, 3155-3161 (2004)
- Sz-Chian Liou, San-Yuan Chen, Hsin-Yi Lee, and Jong-Shing Bow, "Structural characterization of nano-size calcium apatite powders," Biomaterials **25**, 189-196 (2004)
- Bang Chiang Lan, Jung-Jui Hsu, San-Yuan Chen, and Jong-Shing Bow, " Forming gas annealing on physical characteristics and electrical properties of $Sr0.8Bi_2Ta_2O_9/Al_2O_3/Si$ capacitors," J. Applied Physicas **94**[3] 1877-1881 (2003)

Applications of Electron Microscopes in Nano-materials

Abstract

Properties of materials, especially nano-materials, strongly depend their unique microstructure. Once the dependence of the properties on the microstructure is fully revealed, further improvement in properties becomes a controllable work. Electron microscopes are the most powerful analytical tools to explore microstructure to nano, even atomic scale. Besides morphology, crystal structure as well as composition can also be analyzed by electron microscopy.

Basic of interactions of high energy electrons with a specimen will be briefly introduced, then some practical cases will be discussed to understand how electron microscopes can help in R&D of science and engineering of nano-materials.

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