

BIOGRAPHICAL SKETCH

NAME in English Chao-Sung Lai	POSITION TITLE Professor, Department of Electronic Engineering		
NAME in Chinese 賴朝松			
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
National Chiao Tung University, Taiwan	B.S.	06/91	Electronic Engineering
National Chiao Tung University, Taiwan	Ph.D.	12/96	Electronic Engineering

A. Positions and Honors

Positions and Employment

1996-1997	Associate Researcher, National Nano Device Laboratory, Taiwan
1997-2001	Assistant Professor, Department of Electronic Engineering, Chang Gung University
2001-2002	Visiting Scholar, University of California, Berkeley, US
2001-2005	Associate Professor, Department of Electronic Engineering, Chang Gung University
2006-	Professor, Department of Electronic Engineering, Chang Gung University, Taiwan
2007-	Chairman, Department of Electronic Engineering, Chang Gung University, Taiwan
2007-	Director, Bio-Sensor Group, Bio-Medical Research Center, Chang Gung University

Other Experience and Professional Memberships

2005-	Member, American Electrochemical Society
2010-	Member, International Electrical Electronic Engineering
2010-	Guest Editor, Microelectronics Reliability

Honors

2004-2005	Supervisor, Chinese Chemical Sensing Technology Association
2006	Excellence in Research, Chang Gung University, Taiwan
2006	International Electron Devices and Materials Symposia(IEDMS) best paper awards
2009	International Electron Devices and Materials Symposia(IEDMS) best paper awards
2010	International Advisory Committee: IEEE EDSSC'10

B. Selected Peer-reviewed Publications (2005-2010) (in chronological order)

1. Chao Sung Lai*, W. C. Wu, K. M. Fan, and T. S. Chao, "Effects of Post CF₄ Plasma Treatment on the HfO₂ Thin Film", Jpn. J. Appl. Phys. Part1, 2005, Vol. 44, No. 4B, 2307-2310. (SCI)
2. Chao Sung Lai* and K. M. Fan, "Reoxidation after NH₃ Plasma Nitridation for Multiple-Thickness Oxynitrides", Jpn. J. Appl. Phys. Part1, 2005, Vol. 44, No. 8, 2005, pp.5964-5969 (SCI)
3. Chao Sung Lai*, Woei Cherng Wu, Jer Chyi Wang, and Tien Sheng Chao, "Characterization of CF₄-plasma fluorinated HfO₂ gate dielectrics with TaN metal gate" 2005, APPLIED PHYSICS LETTERS 86, 222905(SCI)
4. Shian-Jyh Lin, Chao-Sung Lai*, Shian-Hau Liao, Chung-Yuan Lee, Pei-Ing Lee, Shi-Ming Chiang, and Muh-Wang Liang, "A Novel Trench Capacitor Enhancement Approach by Selective Liquid-Phase Deposition", November, 2005, IEEE transactions on semiconductor manufacturing, vol. 18, No.4, 644-648.
5. Minchen Chang, Jengping Lin, Chao-Sung Lai, Ruey-Dar Chang, Steven N. Shih, Mao-Ying Wang, and Pei-Ing Lee "Si-H Bond Breaking Induced Retention Degradation During Packaging Process of 256 Mbit DRAMs

With Negative Wordline Bias" Electron Devices, IEEE Transactions on , VOL. 52, NO. 4, APRIL 2005, 484-491. (SCI)

6. C. M. Yang, Chao Sung Lai*, C.Y. Wang, C. E. Lue, "The Characterization of Stacked a-Si/SiGe/a-Si sensing Membrane", 2005, Microelectronic Engineering, 80, 46-49. (SCI)
7. Shan-hui Hsu, Chun-Yu Chen, Po Seng Lu, Chao-Sung Lai, and Chun-Jung Chen, "Oriented Schwann Cell Growth on Microgrooved Surfaces", 2005 BIOTECHNOLOGY AND BIOENGINEERING, VOL. 92, NO. 5, DECEMBER 5, 2005, 579-588. (SCI)
8. Tung-Ming Pan, Chao-Sung Lai, Hui-Hsin Hsu, Jer-Chyi Wang, Kuan-Di Wang, Chun-Lin Chen and Jian-De Lee, "Excellent frequency dispersion of thin gadolinium oxide high-k gate dielectrics", 2005, APPLIED PHYSICS LETTERS, 87, 262908 (SCI)
9. Chyuan Haur Kao, Chao Sung Lai*, and Chung Len Lee, "Oxide Grown on Polycrystal Silicon by Rapid Thermal Oxidation in N₂O", 2006, Journal of Electrochemical Society vol. 153, no. 2. G128-G133. (SCI)
10. Chao-Sung Lai*, Chia-Ming Yang, and Tseng-Fu Lu, "pH Sensitivity Improvement on 8nm Thick Hafnium Oxide by Post Deposition Annealing", 2006, Electrochemical and Solid-State Letters, 9(3), G90-92. (SCI)
11. Chao Sung Lai*, Woei Cherng Wu, Jer Chyi Wang and Tien Sheng Chao, "Characteristics of Fluorine Implantation for HfO₂ Gate Dielectrics with High Temperature Post-Deposition Annealing", Jpn. J. Appl. Phys. Part1, 2006, Vol. 45, No. 4B, pp. 2893-2897. (SCI)
12. Chao-Sung Lai*, Chia-Ming Yang, and Tseng-Fu Lu, "Thickness Effects on pH Response of HfO₂ Sensing Dielectric Improved by Rapid Thermal Annealing ", Jpn. J. Appl. Phys. Part1, 2006, Vol. 45, No. 4B, pp. 3807-3810. (SCI)
13. Liann-Be Chang, Hong-Hsi Ko, Yu-Lin Lee, Chao-Sung Lai, and Chih-Yao Wang "The Electrical and pH-Sensitive Characteristics of Thermal Gd₂O₃ / SiO₂ Stacked Oxide Capacitors", 2006, Journal of Electrochemical Society, 153 (4), G330-G332. (SCI)
14. Chung Steve S. ; Yeh C. H. ; Feng H. J. ; Lai C. S. ; Yang J.-J. ; Chen C. C. ; Jin Y. ; Chen S. C. ; Liang M. S. ; "The Impact of STI on the Reliability of a Narrow Width p-MOSFETs with Advanced ALD N/O Gate Stack", 2006, IEEE Transactions on Device and Materials Reliability, VOL. 6, No.1, 95-101. (SCI)
15. Chao-Sung Lai*, Shing-Kan Peng, Tung-Ming Pan, Jer-Chyi Wang, Kung-Ming Fan, "Work Function Adjustment by Nitrogen Incorporation in HfN_x Gate Electrode with Post Metal Annealing", 2006, Electrochemical and Solid-State Letters, 9 (7), G239-G241. (SCI)
16. Chao Sung Lai*, Woei Cherng Wu, Jer Chyi Wang, and Tien Sheng Chao, "Suppression of Interfacial Reaction for HfO₂ on Silicon by Pre-CF₄ Plasma Treatment" 2006, APPLIED PHYSICS LETTERS, 89, 072904 (SCI)
17. Chyuan Haur Kao, Chao Sung Lai*, and Chung Len Lee, "Polarity Asymmetry of Polyoxide Grown on Phosphorus In Situ Doped Polysilicon", 2006, Journal of Electrochemical Society, vol.153, no. 9, G860-865 (2006). (SCI)
18. Chao Sung Lai*, Yang, Chia-Ming, Wang, Chih-Yao, Wang, Ti-Chuan, and Pijanowska, Dorota G. "Chemical sensing properties of electrolyte/SiGe/SiO₂/Si structure" 2006, Japanese Journal of Applied Physics, Part 1, v 45, n 8 A, Aug 4, p 6192-6195 (SCI)
19. Chyuan Haur Kao, Chao Sung Lai*, and Chung Len Lee, "Electrical and Reliability Improvement in Polyoxide by Fluorine Implantation", 2007, Journal of Electrochemical Society, 154, H259. (SCI)
20. Chao Sung Lai*, Kung Ming Fan, Hsing Kan Peng, Shian Jyh Lin, Chung Yuan Lee, and Chi Fong Ai "Fluorine effects on the dipole structures of the Al₂O₃ thin films and characterization by spectroscopic ellipsometry", 2007, APPLIED PHYSICS LETTERS, 90, 172904 (SCI)
21. Liann-Be Chang, Hong-Hsi Ko, Ming-Jer Jeng, Yu-Lin Lee, and Chao-Sung Lai, "pH-Sensitive Gd₂O₃/SiO₂ Stacked Capacitors Prepared By Pure Water Anodic Oxidation", 2007, J. Electrochem. Soc. 154, J150. (SCI)
22. Woei Cherng Wu, Chao Sung Lai*, Jer Chyi Wang, Jian Hao Chen, Ming Wen Ma, and Tien Sheng Chao, "High-Performance HfO₂ Gate Dielectrics Fluorinated by Postdeposition CF₄ Plasma Treatment", 2007, Journal of Electrochemical Society, 154, H561 (2007) (SCI)
23. Wu, W.-C.; Chao, T.-S.; Peng, W.-C.; Yang, W.-L.; Wang, J.-C.; Chen, J.-H.; Lai, C.-S.; Yang, T.-Y.; Lee, C.-H.; Hsieh, T.-M.; Liou, J. C.; "Highly Reliable Multilevel and 2-bit/cell Operation of Wrapped Select Gate (WSG) SONOS Memory" Electron Device Letters, IEEE, Volume 28, Issue 3, March 2007 Page(s):214 -216. (SCI)
24. Chao Sung Lai, Chyuan Haur Kao, Chung Len Lee, and Tan Fu Lei , "Nitrogen Effects on the Integrity of Silicon Dioxide Grown on Polycrystalline Silicon", Journal of Electrochemical Society 154, H883. (2007) (SCI)

25. Chia-Ming Yang, Chao-Sung Lai*, Tseng-Fu Lu, Ti-Chuan Wang, and Dorota G. Pijanowska "Drift and Hysteresis Effects Improved by RTA Treatment on Hafnium Oxide in pH-Sensitive Applications" *J. Electrochem. Soc.* 155 J326 (2008) (SCI)
26. Kung Ming Fan, Chao Sung Lai*, Helena Silva, Chi Fong Ai, and Chih Rong Chen J., "Programming Speed Enhancement by NH₃ Plasma Nitridation of Tunneling Oxide for Ge Nanocrystals Memory" *Electrochem. Soc.* 155 H889 (2008) (SCI)
27. Chyuan Haur Kao, Chao Sung Lai*, M. C. Tsai, K. M. Fan, C. H. Lee, and C. S. Huang, "SiGe Nanocrystals Fabricated by One-Step Thermal Oxidation and Rapid Thermal Annealing", *Electrochem. Solid-State Lett.* 11 K44 (2008) (SCI)
28. Kung Ming Fan, Chao Sung Lai*, Hsing Kan Peng, Shian Jyh Lin, and Chung Yuan Lee, "Improvements on Interface Reliability and Capacitance Dispersion of Fluorinated ALD-Al₂O₃ Gate Dielectrics by CF₄ Plasma Treatment" *J. Electrochem. Soc.* 155 G51 (2008) (SCI)
29. Woei Cherng Wu, Chao Sung Lai*, Tzu Ming Wang, Jer Chyi Wang, Chih Wei Hsu, Ming Wen Ma, and Tien Sheng Chao, "Current Transport Mechanism for HfO₂ Gate Dielectrics with Fluorine Incorporation", *Electrochem. Solid-State Lett.* 11 H15 (2008) (SCI)
30. Woei Cherng Wu; Chao-Sung Lai*; Tzu-Ming Wang; Jer-Chyi Wang; Chih Wei Hsu; Ming Wen Ma; Wen-Cheng Lo; Tien Sheng Chao;" Carrier Transportation Mechanism of the TaN/HfO₂/Si Structure With Silicon Surface Fluorine Implantation", *Electron Devices, IEEE Transactions on* Volume 55, Issue 7, July 2008 Page(s):1639 - 1646(SCI)
31. Woei-Cherng Wu, Tien-Sheng Chao, Te-Hsin Chiu, Jer-Chyi Wang, Chao-Sung Lai, Ming-Wen Ma, and Wen-Cheng Lo, "Performance and Interface Characterization for Contact Etch Stop Layer–Strained nMOSFET with HfO₂ Gate Dielectrics under Pulsed-IV Measurement", *Electrochem. Solid-State Lett.* 11 H230 (2008). (SCI)
32. Chao Sung Lai*, Hsing Kan Peng, Chin Wei Huang, Kung Ming Fan, Yu Ching Fang, Li Hsu, Hui Chun Wang, Chung Yuan Lee, and Shian Jyh Lin "Characterizations of HfxMoyNz Alloys as Gate Electrodes for n- and p-Channel Metal Oxide Semiconductor Field Effect Transistors" *Japanese Journal of Applied Physics* 47 (2008) pp. 2442-2445 : (A11,H01) (SCI)
33. C. H. Kao, C. S. Lai* "Performance and Reliability Improvements in Thin-Film Transistors with Rapid Thermal N₂O Annealing", *Semiconductor Science and Technology* (2008), 23 No 2 025020. (SCI)
34. Chyuan Haur Kao, Chao Sung Lai*, Chen Sheng Huang and K.M. Fan, "Ge nanocrystal charge trapping devices fabricated by one-step oxidation on poly-SiGe", *Applied Surface Science* 255 (2008) 2512–2516.
35. Woei-Cherng Wu, Tien-Sheng Chao, Te-Hsin Chiu, Jer-Chyi Wang, Chao-Sung Lai, Ming-Wen Ma, and Wen-Cheng Lo, "Positive Bias Temperature Instability (PBTI) Characteristics of Contact-Etch-Stop-Layer-Induced Local-Tensile-Strained HfO₂ nMOSFET" *IEEE ELECTRON DEVICE LETTERS* (2008). (SCI)
36. Chao-Sung Lai*, Cheng-En Lue, Chia-Ming Yang, Marek Dawgul and Dorota G. Pijanowska "Optimization of a PVC Membrane for Reference Field Effect Transistors" *Sensors* (2009), 9, 2076-2087. (SCI)
37. Hsing-Kan Peng , Chao-Sung Lai*, Kung-Ming Fan, and Shian-Jyh Lin, "Negative Bias Temperature Instability of p-Channel Metal Oxide Semiconductor Field Effect Transistor with Novel HfxMoyNz Metal Gate Electrodes" *Japanese Journal of Applied Physics* (2009) 48 04C013. (SCI)
38. Min-HsienWu, Chih-Hung Cheng, Chao-Sung Lai, Tung-Ming Pan "Structural properties and sensing performance of high-k Sm₂O₃ membrane-based electrolyte–insulator–semiconductor for pH and urea detection" *Sensors and Actuators B* 138 (2009) 221–227. (SCI)
39. Jer-Chyi Wang, Chao-Sung Lai*, Yu-Kai Chen, Chih-Ting Lin, Chuan-Pu Liu, Michael R. S. Huang, and Yu-Ching Fang "Characteristics of Gadolinium Oxide Nanocrystal Memory with Optimized Rapid Thermal Annealing" *Electrochemical and Solid-State Letters* (2009), 12 6 H202-H204. (SCI)
40. Tung-Ming Pan, Jian-Chi Lin, Min-Hsien Wu, Chao-Sung Lai "Structural properties and sensing performance of high-k Nd₂TiO₅ thin layer-based electrolyte-insulator-semiconductor for pH detection and urea bio-sensing" *Biosensors and Bioelectronics* (2009). (SCI)
41. Pai-Chi Chou, Chao-Sung Lai*, Jer-Chyi Wang, Woei-Cherng Wu, Li-Chi Liu, Yu-Ching Fang, Li Hsu, and Hui-Chun Wang, "High-k HfxGdyOz Charge Trapping Layer in Silicon–Oxide–Nitride–Silicon Type Nonvolatile Memory by In situ Radio Frequency Dual-Sputtering Method", *Japanese Journal of Applied Physics* 48 (2009) (SCI)
42. Shian-Jyh Lin, Chao-Sung Lai*, Yi-Jung Chen, Sheng-Tsung Chen, Chia Chuan Hsu, Brady Huang, Graham Chuang, Neng-Tai Shih, Chung-Yuan Lee, and Pei-Ing Lee, "Gate-Induced Drain Leakage (GIDL)

Improvement for Millisecond Flash Anneal (MFLA) in DRAM Application”, IEEE TRANSACTIONS ON ELECTRON DEVICES, VOL. 56, NO. 8, AUGUST (2009) (SCI)

43. Tung-Ming Pan, Jian-Chi Lin, Min-Hsien Wu, Chao-Sung Lai, "Study of high-k Er₂O₃ thin layers as ISFET sensitive insulator surface for pH detection" Sensors and Actuators B 138619–624 (2009). (SCI)
44. Chao-Sung Lai*, Tseng-Fu Lu, Chia-Ming Yang, Yen-Chih Lin, Dorota G. Pijanowska, Bohdan Jaroszewicz, "Body effect minimization using single layer structure for pH-ISFET applications", Sensors and Actuators B: Chemical, Volume 143, Issue 2, 7 January 2010, Pages 494-499 (2010). (SCI)
45. Chao-Sung Lai*, Cheng-En Lue, Chia-Ming Yang, and Dorota G. Pijanowska, "Fluorine Incorporation and Thermal Treatment on Single and Stacked Si₃N₄ Membranes for ISFET/REFET Application" Journal of The Electrochemical Society, 157 (1) J8-J12 (2010). (SCI)
46. Cheng-En Lue, Chao-Sung Lai*, Jer-Chyi Wang, Ching-Mie Wu, and Chia-Ming Yang, "Differential Light Addressable Potentiometric Sensor with Poly(vinyl chloride) and HfO₂ Membranes for pH Sensors", Japanese Journal of Applied Physics 49 (2010) 04DL10. (SCI)
47. Cheng-En Lue, Chao-Sung Lai*, Hsin-Yu Chen, and Chia-Ming Yang, "Light Addressable Potentiometric Sensor with Fluorine-Terminated Hafnium Oxide Layer for Sodium Detection", Japanese Journal of Applied Physics 49 (2010) 04DL05. (SCI)
48. Hsing-Kan Peng, Chao-Sung Lai*, and Jer-Chyi Wang, "Threshold Voltage Tunability of p-Channel Metal Oxide Semiconductor Field-Effect Transistor with Ternary HfxMoyNz Metal Gate and Gd₂O₃ High-k Gate Dielectric", Japanese Journal of Applied Physics 49 (2010) 04DA15(SCI)
49. S. Maikap, A. Prakash, W. Banerjee, Anirban Das, C.-S. Lai, "Characteristics of pH sensors fabricated by using protein-mediated CdSe/ZnS quantum dots", Microelectronics Reliability 50 (2010) 747–752(SCI)
50. Jer-Chyi Wang, Pai-Chi Chou a, Chao-Sung Lai a,*, Wen-Hui Lee a, Chi-Fong Ai "Characteristics optimization of N₂O annealing on tungsten nanocrystal with W/Si dual-sputtered method for nonvolatile memory application", Microelectronics Reliability 50 (2010) 639–642. (SCI)
51. Cheng-En Lue, Jer-Chyi Wang, Dorota G. Pijanowska, Chia-Ming Yang, I-Shun Wang, Huang-Chia Lee, Chao-Sung Lai*, "Hysteresis effect on traps of Si₃N₄ sensing membranes for pH difference sensitivity", Microelectronics Reliability 50 (2010) 738–741. (SCI)
52. Tseng-Fu Lu , Jer-Chyi Wang, Chia-Ming Yang, Chung-Po Chang, Kuan-I Ho, Chi-Fong Ai, Chao-Sung Lai*, "Non-ideal effects improvement of SF₆ plasma treated hafnium oxide film based on electrolyte–insulator–semiconductor structure for pH-sensor application", Microelectronics Reliability 50 (2010) 742–746. (SCI)
53. Chao-Sung Lai*, Yi-Ting Lin, Cheng-En Lue, and Chia-Ming Yang , "Characterization on pH Sensing and Corrosion-Resistant of HfTaO Membrane with Post RTA Treatment for Food Industry", Sensor Lett. 8, 720–724 (2010). (SCI)
54. Cheng-En Lue, Chao-Sung Lai*, I-Shun Wang, and Chia-Ming Yang, "Sensitivity of Trapping Effect on Si₃N₄ Sensing Membrane for Ion Sensitive Field Effect Transistor/Reference Field Effect Transistor Pair Application", Sensor Lett. 8, 725–729 (2010). (SCI)
55. Jer-Chyi Wang, Chih-Ting Lin, Chao-Sung Lai*, and Jui-Lin Hsu "Nanostructure band engineering of gadolinium oxide nanocrystal memory by CF₄ plasma treatment", Appl. Phys. Lett. 97, 023513 (2010). (SCI)

C. Research Support

Ongoing Research Support

- | | | |
|--|----|-------------------|
| 99-2623-E-182-006-NU | PI | 01/01/10~12/31/10 |
| The application of plasma on non-volatile memory with metal gate/high-k dielectrics | | |
| The goal of this project is to develop the technology on the ion immersion implantation by high power plasma to introduce nitrogen of oxygen into metal gate/high-k dielectrics to improve the memory performance. | | |
| 99-2221-E-182-056-MY3 | PI | 08/01/10~07/31/13 |
| The process development of biosensor memory by Nano-wire R-RAM | | |
| The goal of this project is to combine the function of resistance random access memory and biosensors and applied to TB bio-markers. | | |
| 98-2221-E-182-057-MY3 | PI | 08/01/09~07/31/12 |

The development of novel biosensors with memory function
The goal of this project is to develop the novel structure biosensors and applied to DNA detection.

Completed Research Support (2006-2010)

98-NU -E-182 -003 - PI 08/01/06~07/31/09
The application of plasma on tungsten and germanium nano-crystal
The goal of this project is to develop the technology on the ion immersion implantation by high power plasma to introduce nitrogen of oxygen into tungsten and germanium nano-crystal.