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Che-Hao Liao

Basic Info

Che-Hao Liao, Ph.D.
Postdoctoral Fellow
Advanced Semiconductor Laboratory
Division of Computer, Electrical, Mathematical Science and Engineering (CEMSE)
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Education

- **PH.D., National Taiwan University, Taipei, Taiwan, 2006-2012**
  - Ph.D. in Photonics and Optoelectronics
  - Research: Growth and Characterization of Regularly Patterned InGaN/GaN QW Nanorod Arrays
  - Ph.D. Advisor: Prof. C. C. Yang
- **M.S., Chang Gung University, Tao Yuan, Taiwan, 1999-2001**
  - M.S. in Electronic Engineering
  - Research: The process of high quality Low-temperature poly-Si TFT
  - M.S. Advisor: Prof. M. C. Wang
- **B.S., Chang Gung University, Tao Yuan, Taiwan, 1995-1999**
  - B.S. in Electrical Engineering

Selected Awards and Honors

- 1st Prize, KAUST-Asia Wide Bandgap Semiconductor Workshop, Saudi Arabia, 2019
- Stunning Performance Awards, Nano-structure Photo Contest-SEM Imaging 2012, Taiwan, 2012
- Stunning Performance Awards, Nano-structure Photo Contest-SEM Imaging 2013, Taiwan, 2013
- Scholarship A awards, College of Electrical Engineering and Computer Science, NTU, Taiwan, 2008
- Honorary member of the “Phi Tau Phi Scholastic Honor Society” of R.O.C., CGU, Taiwan, 2001

Research Interests

- Epitaxial Growth of Nitride and Oxide semiconductor and other advance materials by MOCVD
- Design, fabrication, and characterization of Nitride and Oxide semiconductor high power and photonic devices, such as HEMT, UV and visible light-emitting diodes and laser diodes

Publication Summary

- 44 journal and 117conference publications
- 1 Book Chapter
- 5 U.S. patents

- Certified reviewer for Elsevier, IEEE, SPIE, and OSA

Work Experience

- **Epitaxy Growth Div., RD center, Genesis Photonics Inc, Tainan, Taiwan, 2015-2017**
  Senior RD Engineer
  - In charge of three Veeco K465i MOCVD for GaN-based Blue LED epi-wafer (2, 4, and 6 inch) mass production
  - Research and development of new epi-wafer structures growth for high power, high brightness LED, and improve the ESD characteristic of epi-wafer.
- **Electronic Materials Div., LCD dept., Nan Ya Plastics Co., Tao Yuan, Taiwan, 2002-2006**
  Research and development engineer
  - Implemented Double STN-LCD panels for wide temperature range display applications, which are assembling on vehicles and vessels. Products earned the purchase order from Stonebridge Vehicles Ltd for VOLVO trucks.
  - Designed and fabricated the trans-reflectance color STN-LCD panels for personal digital assistor (PDA), global positioning system (GPS) modules and consumer electronics for out-door applications
  - Developed TFT-LCD panels for the portable devices and cell phones, integrated the process with vendor empty TFT-cell and the production line, and transfer to the mass production.

Volunteering activities

- KAUST photonics summer camp 2018
- KAUST photonics summer camp 2019
- KAUST-Asia wide bandgap semiconductor workshop 2019
- KAUST Microelectronic Camp 2020

Professional Membership

- IEEE, SPIE, OSA

Research Experience

- **King Abdullah University of Science and Technology (KAUST), Saudi Arabia, 2017-present**
  Postdoctoral fellow
  - Lab Safety Representative of Advance Semiconductor Laboratory
  - In charge of TNS MOCVD SR-4000HT for AlGaN-based DUV LED and LD epitaxial growth
  - Nitride and Oxide material growth by MOCVD and PLD, device fabriacrtion and characterization
- **Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, Taiwan, 2012-2014**
  Postdoctoral Researcher

- Design and grow the special epi-structures for GaN crystal quality improvement or novel devices fabrication, such as ELO, Nano-pattern, novel substrates and vertical LED growth
- MOCVD epitaxy growth of nitride-based nanorods, InGaN/GaN core-shell nanorod LED array, and their emission wavelength variation properties study for solid state lighting applications
- Crystal quality evaluations, material analysis, optical and electrical property measurements

Skills

- **MOCVD epitaxy growth**
  Nitride-based semiconductor epitaxy (Visible light and DUV), Core-shell nanorod LED growth.
- **Display technology**
  LCD panel research and development, Excimer Laser annealing of LTPS TFT fabrication.
- **Nanofabrication**
  Nano-imprint Lithography, Mask-Aligner, PECVD, RIE, E-gun, Sputter, ALD, PLD and RTA.
- **Material analysis and device characterizations**
  XRD, AFM, SEM, FIB, CL, TEM / PL, EL, I-V and L-I measurement.

Journal Reviews

1. Annals of Physics, Elsevier
2. IEEE Journal of Quantum Electronics, IEEE
3. Journal of Nanophotonics, SPIE
4. Matrials Science in Semiconductor Processing, Elsevier
5. Optics Express, OSA
6. Optical Materials Express, OSA

Patents

1. Xiaohang Li, Che-Hao, "Semiconductor Device with an Aluminum Group-III Oxide Active Layer" ,**U.S. Application** No. 62/799,140.
2. C. C. Yang, Che-Hao Liao, Charng-Gan Tu, Horng-Shyang Chen, Chia-Ying Su, "Multi-section Rod Semiconductor Light-emitting Device and Manufacturing Method Thereof," **US patent** No. 9,478,701 B2 (10/25/2016-08/08/2034), Oct. 2016.
3. C. C. Yang, Hung-Yu Tseng, Wei-Fang Chen, Che-Hao Liao, Yu-Feng Yao, "Fabrication Method of Nanoparticle," **US patent** No. 8,753,559 B2 (06/17/2014-08/17/2032), Jun. 2014.
4. C. C. Yang, Che-Hao Liao, Shao-Ying Ting, Horng-Shyang Chen, Wen-Ming Chang, Yu-Feng Yao, Chih-Yen Chen, Hao-Tsung Chen, "Semiconductor Light-emitting Device and Manufacturing Method Thereof," **US patent** No. 8,759,814 B2 (06/24/2014-09/13/2032), Jun. 2014.
5. Cheng-Hung Lin, Che-Hao Liao, Chih-Yen Chen, Chieh Hsieh, C. C. Yang, "METHOD FOR FORMING LIGHT EMITTING DEVICE," **US patent** No. 8,153,457 B1 (04/10/2012-03/14/2031), Apr. 2012.
6. Hung-Chih Yang, Ming-Chi Hsu, Ta-Cheng Hsu, Chih-Chung Yang, Tsung-Yi Tang, Yung-Sheng Chen, Wen-Yu Shiao, Che-Hao Liao, Yu-Jiun Shen, Sheng-Horng Yen, "Light-emitting diode structure," **US patent** No. 2011/0175126 A1 (07/21/2011-01/15/2030), Jul. 2011.

Journal Publications

1. Manjari Garg, Ashutosh Kumar, Haiding Sun, Che-Hao Liao, Xiaohang Li, and Rajendra Singh*, "Temperature dependent electrical studies on Cu/AlGaN/GaN Schottky barrier diodes with its microstructural characterization," J. Alloys Compd., Vol. 806, p. 852, 2019. (SCI).
2. Zhongjie Ren, Yi Lu, Hsin-Hung Yao, Haiding Sun, Che-Hao Liao, Jiangnan Dai, Changqing Chen, Jae-Hyun Ryou, Jianchang Yan, Junxi Wang, Jinmin Li, and Xiaohan Li*, "III-III-nitride Deep UV LED without Electron Blocking Layer," IEEE Photon. J., Vol. 11(2), p. 8200511, Apr. 2019. (SCI).
3. Manjari Garg, Tejas Rajendra Naik, Ravi Pathak, Valipe Ramgopal Rao, Che-Hao Liao, Kuang-Hui Li, Haiding Sun, Xiaohang Li, and Rajendra Singh*, "Surface passivation process for AlGaN/GaN HEMT heterostructures using phenol functionalized-Porphyrin based organic molecules," J. Appl. Phys. Vol. 124, p. 195702, Nov. 2018. (SCI).
4. Charng-Gan Tu, Chia-Ying Su, Che-Hao Liao, Chieh Hsieh, Yu-Feng Yao, Hao-Tsung Chen, Chun-Han Lin, Chi-Ming Weng, Yean-Woei Kiang*, and C. C. Yang*, "Regularly patterned multi-section GaN nanorod arrays grown with a pulsed growth technique," Nanotechnology, Vol. 27, No. 2, p. 025303-1~12, Jan. 2016. (SCI)
5. Charng-Gan Tu, Yu-Feng Yao, Che-Hao Liao, Chia-Ying Su, Chieh Hsieh, Chi-Ming Weng, Chun-Han Lin, Hao-Tsung Chen, Yean-Woei Kiang, and C. C. Yang*, "Multi-section core-shell InGaN/GaN quantum-well nanorod light-emitting diode array," Optics Express, Vol. 23, No. 17, p. 21919~21930, Aug. 2015. (SCI)
6. Chun-Han Lin, Chia-Ying Su, Erwin Zhu, Chieh Hsieh, Charng-Gan Tu, Yu-Feng Yao, Hao-Tsung Chen, Che-Hao Liao, Horng-Shyang Chen, Yean-Woei Kiang, and C. C. Yang*, "Thermally induced variations of strain condition and emission behavior in flat and bendable lightemitting diodes on different substrates," Optics Express, Vol. 23, No. 12, p. 15491~15503, Jun. 2015. (SCI)
7. Yu-Feng Yao, Charng-Gan Tu, Ta-Wei Chang, Hao-Tsung Chen, Chi-Ming Weng, Chia-Ying Su, Chieh Hsieh, Che-Hao Liao, Yean-Woei Kiang, and C. C. Yang*, "Growth of Highly Conductive Ga-Doped ZnO Nanoneedles," ACS Appl. Mater. Interfaces, Vol. 7, No. 19, pp. 10525~10533, Apr. 2015. (SCI)
8. Charng-Gan Tu, Chia-Ying Su, Che-Hao Liao, Chieh Hsieh, Yu-Feng Yao, Hao-Tsung Chen, Chun-Han Lin, Horng-Shyang Chen, Yean-Woei Kiang, C.C. Yang*, "Regularly-patterned nanorod light-emitting diode arrays grown with metalorganic vapor-phase epitaxy," Superlattices and Microstructures Vol. 83, p. 329~341, Mar. 2015. (SCI)
9. Yang Kuo, Chun-Han Lin, Horng-Shyang Chen, Chieh Hsieh, Charng-Gan Tu, Pei-Ying Shih, Chung-Hui Chen, Che-Hao Liao, Chia-Ying Su, Yu-Feng Yao, Hao-Tsung Chen, Yean-Woei Kiang*, and Chih-Chung Yang*, " Surface plasmon coupled light-emitting diode: Experimental and numerical studies," Jpn. J. Appl. Phys. Vol. 54, No. 2S, p. 02BD01-1~10, Feb. 2015. (SCI)
10. Charng-Gan Tu, Che-Hao Liao, Yu-Feng Yao, Horng-Shyang Chen, Chun-Han Lin, Chia-Ying Su, Pei-Ying Shih, Wei-Han Chen, Erwin Zhu, Yean-Woei Kiang, and C. C. Yang*, "Regularly patterned non-polar InGaN/GaN quantum-well nanorod light-emitting diode array," Optics Express, Vol. 22, No. S7, p. A1799~A1809, Nov. 2014. (SCI)
11. Duanjun Cai*, Na Lin, Hongmei Xu, Che-Hao Liao and C. C. Yang*, "Extraordinary N atom tunneling in formation of InN shell layer on GaN nanorod *m*-plane sidewall," Nanotechnology, Vol. 25, p. 495705-1~7, Oct. 2014. (SCI)
12. Che-Hao Liao, Charng-Gan Tu, Wen-Ming Chang, Chia-Ying Su, Pei-Ying Shih, Hao-Tsung Chen, Yu-Feng Yao, Chieh Hsieh, Horng-Shyang Chen, Chun-Han Lin, Chih-Kang Yu, Yean-Woei Kiang, and C. C. Yang*, "Dependencies of the emission behavior and quantum well structure of a regularly-

patterned, InGaN/GaN quantum-well nanorod array on growth condition," Optics Express, Vol. 22, No. 14, p. 17303~17319, Jul. 2014. (SCI)

13. Chih-Yen Chen, Wen-Ming Chang, Wei-Lun Chung, Chieh Hsieh, Che-Hao Liao, Shao-Ying Ting, Kuan-Yu Chen, Yean-Woei Kiang*, C. C. Yang*, Wei-Siang Su, and Yung-Chen Cheng, "Crack-free GaN deposition on Si substrate with temperature-graded AlN buffer growth and the emission characteristics of overgrown InGaN/GaN quantum wells," Journal of Crystal Growth, Vol. 396, p. 1~6, Jun. 2014. (SCI)
14. D. Dobrovolskas, J. Mickevičius, S. Nargelas, H. S. Chen, C. G. Tu, C.-H. Liao, C. Hsieh, C. Y. Su, G. Tamulaitis* and C. C. Yang*, "InGaN/GaN MQW Photoluminescence Enhancement by Localized Surface Plasmon Resonance on Isolated Ag Nanoparticles," Plasmonics, Vol. 9, p.1183~1187, May, 2014. (SCI)
15. Chun-Han Lin, Chieh Hsieh, Charng-Gan Tu, Yang Kuo, Horng-Shyang Chen, Pei-Ying Shih, Che-Hao Liao, Yean-Woei Kiang, C. C. Yang*, Chih-Han Lai, Guan-Ru He, Jui-Hung Yeh, and Ta-Cheng Hsu, "Efficiency improvement of a vertical light-emitting diode through surface plasmon coupling and grating scattering," Optics Express, Vol. 22, No. S3, p. A842~A856, May 2014. (SCI)
16. Yu-Feng Yao, Chen-Hung Shen, Wei-Fang Chen, Pei-Ying Shih, Wang-Hsien Chou, Chia-Ying Su, Horng-Shyang Chen, Che-Hao Liao, Wen-Ming Chang, Yean-Woei Kiang, and C. C. Yang*, "Void Structures in Regularly Patterned ZnO Nanorods Grown with the Hydrothermal Method," Journal of Nanomaterials, Vol. 2014, Article ID 756401, Mar. 2014. (SCI)
17. Chih-Yen Chen, Zhan Hui Liu, Chun-Han Lin, Chia-Ying Su, Ta-Wei Chang, Pei-Ying Shih, Horng-Shyang Chen, Che-Hao Liao, Chieh Hsieh, Wang-Hsien Chou, Chen-Hung Shen, Yean-Woei Kiang*, and C. C. Yang*, "Strain reduction and crystal improvement of an InGaN/GaN quantum-well light-emitting diode on patterned Si (110) substrate," Applied Physics Letters, Vol. 103, No. 14, p. 141914-1~4, Oct. 2013. (SCI)
18. Horng-Shyang Chen, Yu-Feng Yao, Che-Hao Liao, Charng-Gan Tu, Chia-Ying Su, Wen-Ming Chang, Yean-Woei Kiang, and C. C. Yang*, "Light-emitting Device with Regularly Patterned Growth of an InGaN/GaN Quantum-well Nanorod Light-emitting Diode Array," Optics Letters, Vol. 38, No. 17, p. 3370~3373, Sept. 2013. (SCI)
19. Chun-Han Lin, Charng-Gan Tu, Horng-Shyang Chen, Chieh Hsieh, Chih-Yen Chen, Che-Hao Liao, Yean-Woei Kiang, and C. C. Yang*, "Vertical light-emitting diodes with surface gratings and rough surfaces for effective light extraction," Optics Express, Vol. 21, No. 15, p. 17686~17694, Jul. 2013. (SCI)
20. Yung-Sheng Chen, Che-Hao Liao, Yu-Lun Chueh, Chie-Tong Kuo, and Hsiang-Chen Wang*, "Plan-View Transmission Electron Microscopy Study on Coalescence Overgrowth of GaN Nano-columns by MOCVD," Optical Materials Express Vol. 3, Issue 9, pp. 1459-1467, 2013. (SCI)
21. J. Mickevičius, D. Dobrovolskas, I. Šimonyte, G. Tamulaitis, C.-Y. Chen, C.-H. Liao, H.-S. Chen and C. C. Yang*, "Unintentional annealing of the active layer in the growth of InGaN/GaN quantum well light-emitting diode structures," Phys. Status Solidi A 210, No. 8, p. 1657-1662, 2013. (SCI)
22. Yung-Sheng Chen, Che-Hao Liao, Yung-Chen Cheng, Chie-Tong Kuo, and Hsiang-Chen Wang*, "Nanostructure Study of the Coalescence Growth of GaN Columns with Molecular Beam Epitaxy," Optical Materials Express Vol. 3, Issue 9, pp. 1450-1458, 2013. (SCI)
23. Horng-Shyang Chen, Shao-Ying Ting, Che-Hao Liao, Chih-Yen Chen, Chieh Hsieh, Yu-Feng Yao, Hao-Tsung Chen, Yean-Woei Kiang*, and C. C. Yang*, "Vertical CdZnO/ZnO Quantum-well Light-emitting Diode," IEEE Photonics Technology Letters, Vol. 25, No. 3, p. 317~319, Feb. 2013. (SCI)
24. Che-Hao Liao, Wen-Ming Chang, Yu-Feng Yao, Hao-Tsung Chen, Chia-Ying Su, Chih-Yen Chen, Chieh Hsieh, Horng-Shyang Chen, Charng-Gan Tu, Yean-Woei Kiang*, C. C. Yang*, and Ta-Cheng

Hsu, "Cross-sectional sizes and emission wavelengths of regularly patterned GaN and core-shell InGaN/GaN quantum-well nanorod arrays," Journal of Applied Physics, Vol. 113, No. 5, p. 054315-1~9, Feb. 2013. (SCI)

25. Hsiang-Chen Wang*, Che-Hao Liao, Yu-Lun Chueh, Chih-Chung Lai, Po-Ching Chou, and Shao-Ying Ting, "Crystallinity improvement of ZnO thin film by hierarchical thermal annealing," Optical Materials Express, Vol. 3, Issue 2, pp. 295-306, 2013. (SCI)
26. Hsiang-Chen Wang*, Che-Hao Liao, Yu-Lun Chueh, Chih-Chung Lai, Li-His Chen, and Raymond Chien-Chao Tsiang, "Synthesis and characterization of ZnO/ZnMgO multiple quantum wells by molecular beam epitaxy," Optical Materials Express, Vol. 3, Issue 2, pp. 237-247, 2013. (SCI)
27. Chieh Hsieh, Horng-Shyang Chen, Che-Hao Liao, Chih-Yen Chen, Chun-Han Lin, Cheng-Hung Lin, Shao-Ying Ting, Yu-Feng Yao, Hao-Tsung Chen, Yean-Woei Kiang, and C. C. Yang*, "Photoelectrochemical Liftoff of Patterned Sapphire Substrate for Fabricating Vertical Light-emitting Diode," IEEE Photonics Technology Letters, Vol. 24, No. 19, p. 1775~1777, Oct. 2012. (SCI)
28. Shao-Ying Ting, Yu-Feng Yao, Wei-Lun Chung, Wen-Ming Chang, Chih-Yen Chen, Hao-Tsung Chen, Che-Hao Liao, Horng-Shyang Chen, Chieh Hsieh, and C. C. Yang*, "Comparison of Emission Characteristics between the CdZnO/ZnO Quantum Wells on ZnO and GaN Templates," Optics Express, Vol. 20, No. 20, p. 21860~21874, Sept. 2012. (SCI)
29. Che-Hao Liao, Wen-Ming Chang, Horng-Shyang Chen, Chih-Yen Chen, Yu-Feng Yao, Hao-Tsung Chen, Chia-Ying Su, Shao-Ying Ting, Yean-Woei Kiang, and C. C. Yang*,"Geometry and composition comparisons between *c*-plane disc-like and *m*-plane core-shell InGaN/GaN quantum wells in a nitride nanorod," Optics Express, Vol. 20, No. 14 , p. 15859~15871, 2 July 2012. (SCI)
30. Wen-Ming Chang, Che-Hao Liao, Chih-Yen Chen, Chieh Hsieh, Tsung-Yi Tang, Yean-Woei Kiang, and C. C. Yang*, "Spiral deposition with alternating indium composition in growing an InGaN nano-needle with the vapor-liquid-solid growth mode," Journal of Nanomaterials, Vol. 2012, Article ID 653195, 7 pages, Jul. 2012. (SCI)
31. Shao-Ying Ting, Horng-Shyang Chen, Wen-Ming Chang, Jeng-Jie Huang, Che-Hao Liao, Chih-Yen Chen, Chieh Hsieh, Yu-Feng Yao, Hao-Tsung Chen, Yean-Woei Kiang*, and C. C. Yang*, "MBE-grown CdZnO/ZnO Multiple Quantum-well Light-emitting Diode on MOCVD-grown p-type GaN," IEEE Photonics Technology Letters, Vol. 24, No. 11, p. 909~911, 1 June 2012.(SCI)
32. Chih-Yen Chen, Chieh Hsieh, Che-Hao Liao, Wei-Lun Chung, Hao-Tsung Chen, Wenyu Cao, Wen-Ming Chang, Horng-Shyang Chen, Yu-Feng Yao, Shao-Ying Ting, Yean-Woei Kiang, C. C. Yang* and Xiaodong Hu, "Effects of overgrown p-layer on the emission characteristics of the InGaN/GaN quantum wells in a high-indium light-emitting diode," Optics Express, Vol. 20, No. 10 , p. 11321~11335, 7 May 2012. (SCI)
33. Shao-Ying Ting, Po-Ju Chen, Hsiang-Chen Wang*, Che-Hao Liao, Wen-Ming Chang, Ya-Ping Hsieh, and C. C. Yang, "Crystallinity improvement of ZnO thin film on different buffer layers grown by MBE," Journal of Nanomaterials, Vol. 2012, Article ID 929278, 7 pages, doi:10.1155/2012/929278, 2 February 2012. (SCI)
34. G. Tamulaitis, D. Dobrovolskas, J. Mickevičius,V. Kazlauskienė, J. Miškinis, E. Kuokštis, P. Onufrijevs, A. Medvids,J.-J. Huang, C.-Y. Chen, C.-H. Liao, C. C. Yang, "Suppression of defect-related luminescence in laser-annealed InGaN epilayers," Physica Status Solidi C, Vol. 9, No. 3-4, p. 1021~1023, Feb 2012. (SCI)
35. Che-Hao Liao, Chih-Yen Chen, Horng-Shyang Chen, Kuang-Yu Chen, Wei-Lun Chung, Wen-Ming Chang, Jeng-Jie Huang, Yu-Feng Yao, Yean-Woei Kiang, and C. C. Yang, "Emission efficiency dependence on the overgrown p-GaN thickness in a high-indium InGaN/GaN quantum-well light-emitting diode," IEEE Photonics Technology Letters, Vol. 23, No. 23, p. 1757~1759, Dec 2011. (SCI)

36. Che-Wei Huang, Hung-Yu Tseng, Chih-Yen Chen, Che-Hao Liao, Chieh Hsieh, Kuan-Yu Chen, Hung-Yu Lin, Horng-Shyang Chen, Yu-Lung Jung, Yean-Woei Kiang, and C. C. Yang, "Fabrication of Surface Metal Nanoparticles and Their Induced Surface Plasmon Coupling with Subsurface Quantum Wells," Nanotechnology, Vol. 22, No. 47, p. 475201-1~8, Nov. 2011. (SCI)
37. Yang Kuo, Shao-Ying Ting, Che-Hao Liao, Jeng-Jie Huang, Chih-Yen Chen, Chieh Hsieh, Yen-Cheng Lu, Cheng-Yen Chen, Kun-Ching Shen, Chih-Feng Lu, Dong-Ming Yeh, Jyh-Yang Wang, Wen-Hung Chuang, Yean-Woei Kiang, and C. C. Yang*, "Surface plasmon coupling with radiating dipole for enhancing the emission efficiency of a light-emitting diode," Optics Express, Vol. 19, No. 14 (S4), p. A914~A929, 4 July 2011. (SCI: 3.278, 3/71)
38. Ping-Han Wu, Xuan-Yu Yu, Chung-Wei Cheng, Che-Hao Liao, Shih-Wei Feng, and Hsiang-Chen Wang*, "Ultrafast ablation dynamics in fused silica with a white light beam probe," Optics Express, Vol. 19, p. 16390, 2011. (SCI: 3.749)
39. Cheng-Hung Lin, Chih-Yen Chen, Che-Hao Liao, Chieh Hsieh, Yean-Woei Kiang, and C. C. Yang*, "Sapphire Substrate Liftoff with Photoelectrochemical Etching for Vertical Light-emitting Diode Fabrication," IEEE Photonics Technology Letters, Vol. 23, No. 10, p. 654~656, 15 May 2011. (SCI: 1.815, 56/246)
40. Darius Dobrovolskas, Jūras Mickevičius, Vida Kazlauskienė, Juozas Miškinis, Edmundas Kuokštis, Gintautas Tamulaitis, Pavels Onufrijevs, Artur Medvids, Jeng-Jie Huang, Chih-Yen Chen, Che-Hao Liao, C. C. Yang, "Influence of laser annealing on defect-related luminescence of InGaN epilayers," Journal of Luminescence, Vol. 131, No. 7, p. 1322~1326, Mar. 2011. (SCI)
41. Kun-Ching Shen, Che-Hao Liao, Zan-Yao Yu, Jyh-Yang Wang, Cheng-Hung Lin, Yean-Woei Kiang*, and C. C. Yang*, "Effects of the intermediate SiO_2 layer on polarized output of a light-emitting diode with surface plasmon coupling," Journal of Applied Physics, Vol. 108, Issue 11, p. 113101-1~8, 1 December 2010. (SCI: 2.072, 24/108)
42. Chih-Feng Lu, Che-Hao Liao, Chih-Yen Chen, Chieh Hsieh, Yean-Woei Kiang*, and C. C. Yang*, "Reduction in the efficiency droop effect of a light-emitting diode through surface plasmon coupling," Applied Physics Letters, Vol. 96, No. 26, p. 261104-1~3, 30 June 2010. (SCI: 3.554, 14/108)
43. Tsung-Yi Tang, Wen-Yu Shiao, Yung-Sheng Chen, Cheng-Hung Lin, Wen-Ming Chang, Che-Hao Liao, Kun-Ching Shen, C. C. Yang*, Ming-Chi Hsu, Jui-Hung Yeh, and Ta-Cheng Hsu, "Nitride Nanocolumns for the Development of Light-emitting Diode," IEEE Transactions on Electron Devices, Vol. 57, No. 1, p. 71~78, January 2010. (SCI: 2.445, 26/246)
44. Yung-Sheng Chen, Wen-Yu Shiao, Tsung-Yi Tang, Wen-Ming Chang, Che-Hao Liao, Cheng-Hung Lin, Kun-Ching Shen, C. C. Yang*, Ming-Chi Hsu, Jui-Hung Yeh, and Ta-Cheng Hsu, "Threading Dislocation Evolution in Patterned GaN Nanocolumn Growth and Coalescence Overgrowth," J. Applied Physics, Vol. 106, No. 2, p. 023521-1~6, 15 July 2009. (SCI: 2.072, 24/108)

Conference Proceedings and Presentations

1. Che-Hao Liao, Yara Banda, Gaia Da Prato, Kuang-Hui Li, and Xiaohang Li, "β-$(AlGa)_2O_3$ solar-blind photodetector fabricated by high-temperature driven interdiffusion method," Photonics West 2020, 11281-21 (oral), San Francisco, US, Feb. 2020.
2. Yi Lu, Zhongjie Ren, Hsin-Hung Yao, Che-Hao Liao, and Xiaohang Li, "Electron-blocking-layer-free deep ultraviolet light-emitting diode," Photonics West 2020, 11302-50 (oral), San Francisco, US, Feb. 2020.
3. Che-Hao Liao, Kuang-Hui Li, and Xiaohang Li, "Band gap tunable β-$(Al_xGa_{1-x})_2O_3$ thin film achieved by ultra-high temperature annealing," The 3rd International Workshop on Gallium Oxide and Related Materials (IWGO-3), Poster B (poster), Ohio, USA, Aug. 2019.

4. Rahaf Shalabi1, Xuechun Zhang, Kuang-Hui Li, Che-Hao Liao and Xiaohang Li, "β-Ga_2O_3 solar-blind photodetector on thermal pretreated *c*-plane and *r*-plane sapphire substrates by pulsed laser deposition," The 3rd International Workshop on Gallium Oxide and Related Materials (IWGO-3), Poster B (poster), Ohio, USA, Aug. 2019.
5. Che-Hao Liao, Feras AlQatari, and Xiaohang Li, "Energy bandgap versus lattice constant and direct-to-indirect bandgap transitions in boron III-nitride alloys," Photonics West 2019, 10912-14 (oral), San Francisco, US, Feb. 2019.
6. Haiding Sun, Che-Hao Liao, Ronghui Li, Kuang-Hui Li, Young Jae Park, Theeradetch Detchprohm, Russell D. Dupuis, and Xiaohang Li, "Emerging BAlN/$Al_xGa_{1-x}N$ hetrostructures for ultraviolet emitters and power electronic device," Photonics West 2019, 10918-5 (oral), San Francisco, US, Feb. 2019.
7. Che-Hao Liao, Kuang-Hui Li, Carlos Gerardo Torres-Castanedo, Guozheng Zhang, and Xiaohang Li, "Ultra-high temperature annealing of β-Ga_2O_3 thin film," Photonics West 2019, 10919-23 (oral), San Francisco, US, Feb. 2019.
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Selected Research highlights

1. Core-shell MQW Nanorod Arrays growth

• Che-Hao Liao et al., "Dependencies of the emission behavior and quantum well structure of a regularly-patterned, InGaN/GaN quantum-well nanorod array on growth condition," Optics Express, Vol. 22, No. 14 , p. 17303, 2014.

• Che-Hao Liao et al., "Cross-sectional sizes and emission wavelengths of regularly patterned GaN and core-shell InGaN/GaN quantum-well nanorod arrays," Journal of Applied Physics, Vol. 113, No. 5 , p. 054315-1~9, 2013.

• Che-Hao Liao et al., "Geometry and composition comparisons between c-plane disc-like and m-plane core-shell InGaN/GaN quantum wells in a nitride nanorod," Optics Express, Vol. 20, No. 14 , p. 15859~15871, 2012.

2.Nitride semicondictor research

• Che-Hao Liao et al., "Emission efficiency dependence on the overgrown p-GaN thickness in a high-indium InGaN/GaN quantum-well light-emitting diode," IEEE Photonics Technology Letters, Vol. 23, No. 23, p. 1757, 2011.

3.Oxide semicondictor research

• Che-Hao Liao et al., "Close-to-full-composition-range ternary β-$(Al_xGa_{1-x})_2O_3$ thin film formed based on β-Ga_2O_3/sapphire template," plan to submit to Crystal Growth and Design.

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