

Resume of Chang-Hua Liu

chliu@ee.nthu.edu.tw

EDUCATION

University of Michigan, Ann Arbor **2008-2014**
– PhD, Department of Electrical Engineering and Computer Science

National Tsing Hua University (NTHU), Taiwan **2002-2006**
– Bachelor of Science, Department of Power Mechanical Engineering

EXPERIENCE

**Associate Professor at the Department of Electrical Engineering,
National Tsing Hua University** **2021/08-Present**

**Adjunct Associate Professor at the College of Semiconductor Research
National Tsing Hua University** **2022/08-Present**

**Assistant Professor at the Department of Electrical Engineering,
National Tsing Hua University** **2017/08-2021/07**

Postdoc at the Department of Physics, University of Washington **2015/09-2017/07**
(Prof. Xiaodong Xu's & Arka Majumdar's research group)
Research Topic: Photonic Light Emitters based on 2D Materials

**Postdoc at the Department of Materials Science and Engineering,
Northwestern University** **2014/02-2015/08**
(Prof. Lincoln Lauhon's research group)
Research Topic: Strong-coupling Optomechanics based on 2D Materials

**Research Assistant at the Department of Electrical Engineering,
University of Michigan** **2008/09-2014/01**
(Prof. Zhaohui Zhong's research group)
Ph.D. Thesis: Characterization of Nanoscale Junctions in Carbon Nanotubes and Graphene for Novel Device Applications

Research Assistant at Institution of Occupational Safety and Health, Taiwan **2008/01-2008/06**
(Dr. Yu-Lin Shen's research group)
Research Topic: Fiber-Optic Distributed Sensing by Brillouin Optical Correlation Domain Analysis

PUBLICATIONS

After joining NTHU

1. Po-Liang Chen, Tanveer Ahmed, Ching Kuo, Chung-Chun Lu, Der-Hsien Lien*, **Chang-Hua Liu***,
“Emerging 2D Materials and van der Waals Heterostructures for Advanced NIR, SWIR, and MWIR
Emitters”, *Small Methods* Accepted (2024). (*Invited Review Article*)
2. Ming-Deng Siao, Meng-Yu Tsai, Ashish Chhaganlal Gandhi, Yi-Chung Wu, Ta Fan, Li-Syuan Hao,

I-Ling Li, Sun-Zen Chen, **Chang-Hua Liu**, Yen-Fu Lin, and Chao-Hui Yeh*, “Two-dimensional phototransistors with van der Waals superstructure contacts for high-performance photosensing”, *ACS Applied Materials & Interfaces* Accepted (2024).

3. Pei-Yuan Wu, Wei-Qing Lee, **Chang-Hua Liu***, Chen-Bin Huang*, “Coherent control of enhanced second-harmonic generation in a plasmonic nanocircuit using a transition metal dichalcogenide monolayer”, *Nature Communications* 15, 1855 (2024).
4. Po-Liang Chen, Tian-Yun Chang, Pei-Sin Chen, Alvin Hsien-Yi Chan, Adzilah Shahna Rosyadi, Yen-Ju Lin, Pei-Yu Huang, Jia-Xin Li, Wei-Qing Li, Chia-Jui Hsu, Neil Na, Yao-Chang Lee, Ching-Hwa Ho, **Chang-Hua Liu***, “Van der Waals heterostructure mid-infrared emitters with electrically controllable polarization states and spectral characteristics”, *ACS Nano* 17, 10181 (2023).
5. Meng-Yu Tsai, Tsung-Han Tsai, Ashish Chhaganlal Gandhi, Hsueh-Lung Lu, Jia-Xin Li, Po-Liang Chen, Kai-Wen Chen, Sun-Zen Chen, Chia-Hao Chen, **Chang-Hua Liu**, Yen-Fu Lin, Po-Wen Chiu*, “Ultrafast and broad-band graphene heterojunction photodetectors with high gain”, *ACS Nano* 17, 25037 (2023).
6. Po-Liang Chen, Shyam Narayan Singh Yadav, **Chang-Hua Liu***, “Mid-Infrared light emitters based on black phosphorus and its alloys.” Semiconductors and Semimetals book chapter 7 published by Elsevier, 112, 219-248 (2023). (*Selected for the Cover Image*)
7. Shyam Narayan Singh Yadav, Po-Liang Chen, **Chang-Hua Liu***, Ta-Jen Yen*, “Plasmonic metasurface integrated black phosphorus-based mid-infrared photodetector with high responsivity and speed”, *Advanced Materials Interfaces* 10, 2202403 (2023).
8. Arka Majumdar, Johannes Fröch, Chang-Hua Liu, Hui Deng, Donguk Nam, Alexander Tartakovskii, “Photonics with 2D materials: introduction to the special issue”, *Optical Materials Express* 13, 2166 (2023).
9. Jia-Xin Li, Wei-Qing Li, Sheng-Hsiung Hung, Po-Liang Chen, Yueh-Chiang Yang, Tian-Yun Chang, Po-Wen Chiu, Horng-Tay Jeng*, **Chang-Hua Liu***, “Electric control of valley polarization in monolayer WSe₂ using a van der Waals magnet”, *Nature Nanotechnology* 17, 721-728 (2022). (*Selected as the Cover Image of Nature Nanotechnology July 2022 Issue*)
10. Tian-Yun Chang, Po-Liang Chen, Pei-Sin Chen, Wei-Qing Li, Jia-Xin Li, Ming-Yuan He, Jen-Te Chao, Ching-Hwa Ho, **Chang-Hua Liu***, “Van der Waals Heterostructure Photodetectors with Bias-Selectable Infrared Photoresponses.” *ACS Applied Materials & Interfaces* 14, 32265 (2022).
11. Po-Liang Chen, Yueyang Chen, Tian-Yun Chang, Wei-Qing Li, Jia-Xin Li, Seokhyeong Lee, Zhuoran Fang, Mo Li, Arka Majumdar, **Chang-Hua Liu***, “Waveguide-Integrated van der Waals Heterostructure Mid-Infrared Photodetector with High Performance.” *ACS Applied Materials &*

Interfaces 14, 24856 (2022). (*Selected as the Supplementary Cover*)

12. Adzilah Shahna Rosyadi, Alvin Hsien-Yi Chan, Jia-Xin Li, **Chang-Hua Liu**, Ching-Hwa Ho, "Formation of van der Waals Stacked p–n Homojunction Optoelectronic Device of Multilayered ReSe₂ by Cr Doping." *Advanced Optical Materials* 10, 2200392 (2022).
13. Tian-Yun Chang, Yueyang Chen, De-In Luo, Jia-Xin Li, Po-Liang Chen, Seokhyeong Lee, Zhuoran Fang, Wei-Qing Li, Ya-Yun Zhang, Mo Li, Arka Majumdar*, **Chang-Hua Liu***, "Black Phosphorus Mid-Infrared Light-Emitting Diodes Integrated with Silicon Photonic Waveguides", *Nano Letters* 20, 6824-6830 (2020).
14. Tian-Yun Chang, Po-Liang Chen, Jih-Heng Yan, Wei-Qing Li, Ya-Yun Zhang, De-In Luo, Jia-Xin Li, Kun-Ping Huang, **Chang-Hua Liu***, "Ultra-Broadband, High Speed, and High-Quantum-Efficiency Photodetectors Based on Black Phosphorus", *ACS Applied Materials & Interfaces* 12, 1201-1209 (2020).
15. **Chang-Hua Liu***, J. Zheng, S. Colburn, T. Fryett, Y. Chen, X. Xu and A. Majumdar, "Van der Waals materials integrated nanophotonic devices." *Optical Materials Express* 9, 384 (2019). (*Invited review article*)
16. F Hu, Y Luan, Jacob Speltz, D Zhong, **C.-H. Liu**, J Yan, DG Mandrus, X Xu, Zhe Fei, "Imaging propagative exciton polaritons in atomically thin WSe₂ waveguides." *Physical Review B* 100, 121301 (2019).
17. T. Fryett, K. Seyler, J. Zheng, **Chang-Hua Liu**, X. Xu and A. Majumdar, "Silicon photonic crystal cavity enhanced second-harmonic generation from monolayer WSe₂." *2D Materials* 4, 015031 (2017).
18. **Chang-Hua Liu***, J. Zheng, S. Colburn, T. Fryett, Y. Chen, X. Xu and A. Majumdar, "Ultrathin van der Waals metalenses." *Nano Letters* 18, 6961 (2018). (*Highlighted by Ceramics.org, Futurity.org, knowridge.com, Optics.org, Asianscientist.com, Techexplorist.com, Phys.org, ScienceDaily, PhotonicsViews.com, Newsbeez*)

Prior to joining NTHU

19. **Chang-Hua Liu**, G. Clark, T. Fryett, S. Wu, J. Zheng, F. Hatami, X. Xu and A. Majumdar, "Nanocavity integrated van der Waals heterostructure light emitting tunneling diode." *Nano Letters* 17, 200 (2016). (*Highlighted by PhysOrg, AzoNano, EurekAlert, Ecnmag, Nanowerk*)
20. J. Hu, **Chang-Hua Liu**, X. Ren, L. Lauhon, T. Odom, "Plasmonic lattice lenses for multi-wavelength achromatic focusing." *ACS Nano* 10, 10275 (2016).

21. Y. C. Chang, C. H. Liu, **Chang-Hua Liu**, S. Zhang, S. Marder, E. Narimanov, Z. Zhong and T. B. Norris, “Realization of mid-infrared graphene hyperbolic metamaterials.” *Nature communications* 7, 10568 (2016).
22. **Chang-Hua Liu**, I. S. Kim, S. Park, K. Yoon, S. Howell and L. Lauhon, “Optical control of mechanical mode-coupling within a MoS₂ resonator in the strong-coupling regime.” *Nano Letters* 15, 6727 (2015).
23. **Chang-Hua Liu**, Y. C. Chang, Y. Zhang, T. Norris and Z. Zhong, “Ultrafast lateral photo-Dember effect in graphene induced by nonequilibrium hot carrier dynamics.” *Nano Letters* 15, 4234 (2015).
24. **Chang-Hua Liu**, Y. C. Chang, T. B. Norris and Z. Zhong, “Room temperature ultra-broadband and high responsivity graphene photodetectors.” *Nature Nanotechnology* 9, 273 (2014). (*Highlighted by CBS News, Science Daily, World News, Discovery News, Photonics Online, PhysOrg, NextBigFuture, e!Science News, Wired UK, Huffington Post, Mashable, NewStatesman, gizmag*)
25. **Chang-Hua Liu**, N. M. Dissanayake, S. Lee, K. Lee and Z. Zhong, “Evidence for extraction of photoexcited hot carriers from graphene.” *ACS Nano* 6, 7172 (2012).
26. S. Lee, K. Lee, **Chang-Hua Liu** and Z. Zhong, “Homogeneous bilayer graphene film based flexible transparent conductor.” *Nanoscale* 4, 639 (2012).
27. **Chang-Hua Liu**, C.-C. Wu and Z. Zhong, “A fully tunable single-walled carbon nanotube diode.” *Nano Letters* 11, 1782 (2011).
28. C.-C. Wu, **Chang-Hua Liu** and Z. Zhong, “One-step direct transfer of pristine single-walled carbon nanotubes for functional electronics.” *Nano Letters* 10, 1032 (2010).
29. Y. Jung, M. N. Slipchenko, **Chang-Hua Liu**, A. E. Ribbe, Z. Zhong, C. Yang, and J.-X. Cheng, “Fast detection of the metallic state of individual single-walled carbon nanotubes using a transient-absorption optical microscope.” *Physical Review Letters* 105, 217401 (2010).
30. C.-C. Cheng, C. A. Chang, **Chang-Hua Liu** and J. A. Yeh, “A tunable liquid-crystal microlens with hybrid alignment.” *Journal of Optics A: Pure and Applied Optics* 8, 365 (2006).

SELECTED PRESENTATIONS

1. **Chang-Hua Liu**, “Advancing Sustainable Mid-Infrared Optoelectronics with Black Phosphorus-Based van der Waals Heterostructures” *Optics & Photonics Taiwan International Conference*, Taipei (2024). (Invited)
2. **Chang-Hua Liu**, “Fe₃GeTe₂ Two-Dimensional Magnet: Potential for Valleytronics Applications” *Bilateral Workshop on Low-dimensional Semiconductors*, Taipei (2024). (Invited)

3. **Chang-Hua Liu**, “Novel mid-infrared optoelectronics using black phosphorus-based van der Waals heterostructures” *2024 Asia-Pacific Workshop on Advanced Semiconductor Devices*, Gangneung (2024). (Invited)
4. **Chang-Hua Liu**, “Two-dimensional magnets for valleytronics applications” *Asia-Pacific Conference on Condensed Matter Physics*, Hualien (2023). (Invited)
5. **Chang-Hua Liu**, “Novel mid-infrared optoelectronics using black phosphorus-based van der Waals heterostructures” *Materials Research Society-Taiwan International Conference*, Hsinchu (2023). (Invited)
6. **Chang-Hua Liu**, “Novel mid-infrared photodetectors and emitters using black phosphorus-based heterostructures” *SPIE Photonics West*, San Francisco (2023). (Invited)
7. **Chang-Hua Liu**, “Novel optoelectronics based on van der Waals heterostructures” *Annual Meeting of the Physical Society of Taiwan*, Tainan (2023). (Invited)
8. **Chang-Hua Liu**, “Novel optoelectronics based on van der Waals heterostructures” *International Conference on Recent Progress of Graphene and Two-Dimensional Materials Research*, Taipei (2022). (Invited)
9. **Chang-Hua Liu**, “Black phosphorus optoelectronics for mid-infrared silicon photonics.” *SPIE Photonics West*, Digital Forum (2021). (Invited)
10. **Chang-Hua Liu**, “Optoelectronics and nanophotonics based on van der Waals materials.” *SPIE Optics + Photonics*, Digital Forum (2020). (Invited)
11. **Chang-Hua Liu**, “Optoelectronics and nanophotonics based on van der Waals materials.” *SPIE Photonics West*, San Francisco (2020). (Invited)
12. **Chang-Hua Liu**, “Developing ultrathin light emitters and metalenses based on van der Waals materials.” *SPIE Photonics West*, San Francisco (2019). (Invited)
13. **Chang-Hua Liu**, “Developing ultrathin light emitters and metalenses based on van der Waals materials.” *Recent Progress in Graphene and 2D Materials Research Conference*, Guilin (2018). (Invited)
14. **Chang-Hua Liu**, “Novel Optoelectronic Properties and Devices Based on cavity-integrated 2D materials.” *The 12th Cross-strait Symposium on Optoelectronics*, Hong Kong (2018). (Invited)
15. **Chang-Hua Liu**, “Optoelectronic devices based on cavity-integrated 2D materials.” *CLEO-PR*, Singapore (2017). (Invited)

HONORS

- Young Scholar Innovation Award, Foundation of the Advancement of Outstanding Scholarship (2023).
- Y. Z. Hsu Scientific Paper Award (2023).
- Ta-You Wu Memorial Award (2022).
- Lam Research Award (2022).
- Outstanding Young Electrical Engineer Award, Chinese Institute of Electrical Engineering (2022).
- New Faculty Research Award, National Tsing Hua University (2021).
- New Faculty Research Award, National Tsing Hua University EECS Dept. (2021).

PATENTS

- “Mid-infrared Light Emitting Diode and Manufacturing Method Thereof, Silicon Photonic Circuit and Manufacturing Method Thereof.” (US patent number US 11769859B2)
- “Emitters with electrically controllable polarization states and spectral characteristics.” (Taiwan patent number TW I854577) 、 (US patent application number US 18/479,109)

ADDITIONAL EXPERIENCE

- Director of the Division of Research Collaboration, Global Affairs Office, National Tsing Hua University (February 2023 – April 2024).
- Guest Editor for Optical Materials Express (Topic: Photonics with 2D Materials, 2023).
- Serving as a reviewer for Nature Communications, Physical Review Letters, Nano Letters, Advanced Materials, Advanced Optical Materials, Advanced Science, Optics Express, ACS Applied Electronic Materials, ACS Photonics, ACS Nano, ACS Applied Materials & Interfaces, Applied Physics Letters, Journal of Applied Physics, IEEE Transactions on Nanotechnology, Journal of Nanophotonics, Nanophotonics, Journal of Physical Chemistry, Small, npj 2D materials and applications.
- Military Service, Taiwan (January 2007 – December 2008).