

# Hong-Kang Tian

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## Research Interests

- Computational Electrochemistry, First-principles Calculations, Numerical Simulations, Machine Learning Interatomic Potential, Interface and Surface Science.

## Education

- Ph.D. in Chemical Engineering, Michigan State University (MSU), USA 2015/08 - 2019/12
- M.S. in Chemical Engineering, National Taiwan University (NTU), Taiwan 2011/08 - 2013/07
- B.S. in Chemical Engineering, National Cheng Kung University (NCKU), Taiwan 2007/08 - 2011/07

## Employment

- Associate Professor, Department of Chemical Engineering, NCKU, Taiwan 2025/02 - present
- Associate Professor (joint), Academy of Innovative Semiconductor and Sustainable Manufacturing, NCKU 2025/02 - present
- Assistant Professor, Department of Chemical Engineering, NCKU, Taiwan 2021/08 - 2025/02
- Assistant Professor (joint), Academy of Innovative Semiconductor and Sustainable Manufacturing, NCKU 2022/08 - 2025/02
- Postdoctoral Researcher, National Institute of Material Science (NIMS), Japan 2019/12 - 2021/05
- Research Intern, BASF, Michigan, USA 2018/06 - 2018/09
- Teaching Staff, Department of Chemical Engineering, NTU, Taiwan 2014/08 - 2015/07
- Second Lieutenant, Chief Counselor, R.O.C. Army, Taiwan 2013/08 - 2014/07

## Awards and Honors

- 2030 Cross-Generation Young Scholars Award, National Science and Technology Council 2025/08
- Emerging Investigator, *Chemical Communications* 2025/08
- Emerging Investigator, *Journal of Materials Chemistry A* 2024/10
- Chemical Engineering Masterpiece Award, Taiwan Institute of Chemical Engineers 2024/10
- Rising Star Award, College of Engineering of NCKU 2024/03
- Sustainable Interdisciplinary Research Award, NCKU North America Alumni Foundation 2024/01
- Outstanding Basic Research, NEES Accomplishment Meeting, US Department of Energy 2016/09

## Invited International Talk

- International Workshop On Multiscale, Multiphysics, And Multidisciplinary Research On Materials And Structures (m3MS), Singapore 2025/09
- The 11th General Conference of the Asian Consortium on Computational Materials Science (ACCMS-11), Yokohama, Japan 2025/06

- ECI Mixed Conducting and Nonstoichiometric Compounds VIII, Tainan, Taiwan 2024/11
- Pacific Rim Meeting on Electrochemical and Solid-State Science (PRiME), Hawaii, USA 2024/10
- Invited lecture at Institute of Science Tokyo, Japan 2024/09

## Academic-Industry Collaborative Projects

- “Numerical Simulations of Wet Chemical Cleaning and Lateral Etching Behavior for Small Trenches and Nano-Sheets” , 2025/03-2026/02  
Taiwan Semiconductor Manufacturing Company (TSMC, 台積電)
- “Finite Element Simulation for Optimizing Charge–Discharge Behavior” , 2024/03-2026/02  
Delta Electronics-Cyntec, 台達電子-乾坤科技
- “Effects of Vanadium Ion Diffusion and Equilibrium on Capacity” , 2025/04-2025/11  
Industrial Technology Research Institute (ITRI, 工研院)
- “Development of Electroplating Models to Investigate Bath Composition for Enhanced Deposition Rate and Improved Coplanarity” , 2023/10-2024/09  
Advanced Semiconductor Engineering (ASE, 日月光半導體)
- “Development of Synthesis and Coating Techniques for Perovskite Quantum Dots” , ITRI 2024/04-2024/11  
(工研院)
- “Investigation of Vanadium Ion Diffusion and Equilibrium” , ITRI (工研院) 2024/04-2024/11

## Publications [Google Scholar](#)

(\* marks contributions as the first author or corresponding author)

- \*1. Lu, F. F., Luong, H. D., Jang, S. H., Jalem, R., Tateyama, Y. \*, **Tian, H.-K. \***, “Dual influence of protonation on Li-ion transport in garnet solid electrolytes: A first-principles study”, *Journal of Power Sources (IF: 8.1)*, 628, 235906, 2025. [link](#)
- \*2. Chen, H.-K., **Tian, H.-K. \***, “Interfacial insights for divergent dendrite formation mechanisms in lithium and magnesium anodes”, *Journal of Materials Chemistry A (IF: 10.7)*, 12(34), 22584-22596, 2024. [link](#)
- \*3. Lu, F.-F., **Tian, H.-K. \***, “Dopant-induced modulation of lithium-ion conductivity in cubic garnet solid electrolytes: a first-principles study”, *Physical Chemistry Chemical Physics (IF: 3.3)* 25(28), 18973–18982, 2023. [link](#)
- \*4. Wang, L.-C., Kuo, Y.-C., Kuo, Y.-T., Chang, K.-L., Chen, Y.-C., Wang, W.-J., Hung, M.-Y., Hsu, F.-Y., Aich, P., Lin, Y.-W., Su, C.-H., Manoharan, D., Chien, Y.-H. \*, Li, W.-P. \*, **Tian, H.-K. \***, Yeh, C.-S. \*, “Utilizing Electron-Sink-Enhanced Nanoshells for Amplified Nanoplasmonic SERS-Based In Situ Detection of Cancer Cells, Linking Signal Enhancement with Cellular Damage”, *Advanced Materials (IF: 27.4)*, 2417950, 2025. [link](#)
- \*5. Zhong, W.-J., Hung, M.-Y., Kuo, Y.-T., **Tian, H.-K. \***, Tsai, C.-N., Wu, C.-J., Lin, Y.-D., Yu, H.-C., Lin, Y.-G., Wu, J.-J. \*, “Dual-Vacancy-Engineered ZnIn<sub>2</sub>S<sub>4</sub> Nanosheets for Harnessing Low-Frequency Vibration Induced Piezoelectric Polarization Coupled with Static Dipole Field to Enhance Photocatalytic H<sub>2</sub> Evolution”, *Advanced Materials (IF: 27.4)* 2403228, 2024. [link](#)
- \*6. Wang, L.-C., Chen, H.-K., Wang, W.-J., Hsu, F.-Y., Huang, H.-Z., Kuo, R.-T., Li, W.-P. \*, **Tian, H.-K. \***, Yeh, C.-S. \*, “Boosting Upconversion Efficiency in Optically Inert Shelled Structures with Electroactive Membrane through Electron Donation”, *Advanced Materials (IF: 27.4)* 2404120, 2024. [link](#)
- \*7. Wang, L.-C., Chiou, P.-Y., Hsu, Y.-P., Lee, C.-L., Hung, C.-H., Wu, Y.-H., Wang, W.-J., Hsieh, G.-L., Chen, Y.-C., Chang, L.-C., Su, W.-P., Manoharan, D., Liao, M.-C., Thangudu, S., Li, W.-P. \*, Su, C.-H. \*, **Tian, H.-K. \***, Yeh, C.-S. \*, “Prussian blue analog with separated active sites to catalyze water driven enhanced catalytic treatments”, *Nature Communications (IF: 16.6)* 14(1), 4709, 2023. [link](#)

- \*8. Lee, W. S., Maeda, H., Kuo, Y.-T., Muraoka, K., Fukui, N., Takada, K., Sasaki, S., Masunaga, H., Nakayama, A., **Tian, H.-K.**, Nishihara, H.\*, Sakaushi, K.\*, “Spontaneous-Spin-Polarized 2D  $\pi$ -d Conjugated Frameworks Towards Enhanced Oxygen Evolution Kinetics”, *Small* (IF: 13.3) 2404120, 2024. [link](#)
- \*9. Prameswari, J., Chou, P.-T., Hung, M.-Y., Peng, P.-Y., Lu, Y.-R., Chen, C.-L., **Tian, H.-K.**, Lin, Y.-C.\*, “Boosted reverse water-gas shift activity via exsolved Cu and Ni in silicalite-1”, *Chemical Communications* (IF: 4.3), 24, 100534, 2024. [link](#)
10. Huang, P. W., Zhang, Q. C., Hung, M. Y., Lin, Y. C., **Tian, H.-K.**, Lee, Y. L., Jan, J.-S., Teng, H.\*, “Gel electrolyte design for nonflammable lithium-ion batteries with high-rate and high-voltage characteristics”, *Chemical Engineering Journal* (IF: 13.4), 157195, 2024. [link](#)
- \*11. Huang, Z. L., Yeh, C. H., Wang, M. Y., Lau, V. W. H., **Tian, H.-K.**, Shih, C. F.\*, “Comprehensive study on phase stability of lead-free Sn-based perovskite  $\text{FAXMA1-xSnI3}$ ”, *Materials Today Advances* (IF: 8.1), 24, 100534 2024. [link](#)
12. Hsia, H.-H., Chen, Y.-L., Tai, Y.-T., **Tian, H.-K.**, Kung, C.-W.\*, Liu, W.-R.\*, “Two-Dimensional Metal–Organic Frameworks/Epoxy Composite Coatings with Superior  $\text{O}_2/\text{H}_2\text{O}$  Resistance for Anticorrosion Applications”, *ACS Applied Materials & Interfaces* (IF: 8.3), 16 (31), 41421-41434, 2024. [link](#)
- \*13. Chen, C.-H., Chen, H.-K., Huang, W.-H., Chen, C. L., Choojun, K., Sooknoi, T., **Tian, H.-K.**, Lin, Y.-C.\*, “Reversal of methanation-oriented to RWGS-oriented Ni/SiO<sub>2</sub> catalyst by the exsolution of Ni<sup>2+</sup> confined in silicalite-1”, *Green Chemistry* (IF: 11.034) 25(19), 7582–7597, 2023. [link](#)
- \*14. K Trangwachirachai, A-L Huang, H-K Chen, C-L Chen, J-F Lee, **Tian, H.-K.**, Y-C Lin\*, “Reduction of supported GaN and its application in methane conversion”, *Materials Today Chemistry* (IF: 7.613) 30, 101500, 2023. [link](#)
- \*15. Gu, Y. J., Lo, Y. A., Li, A. C., Chen, Y. C., Li, J. H., Wang, Y. sen, **Tian, H. K.**, Kaveevivitchai, W.\*, Kung, C. W.\*, “A Single Potassium-Ion Conducting Metal – Organic Framework”, *ACS Applied Energy Materials* (IF: 6.024) 5(7), 8573–8580, 2022. [link](#)
16. Gao, B., Jalem, R., **Tian, H. K.**, Tateyama, Y.\*, “Revealing Atomic-Scale Ionic Stability and Transport around Grain Boundaries of Garnet  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$  Solid Electrolyte”, *Advanced Energy Materials* (IF: 29.368) 12, 3, 2102151, 2022. [link](#)
17. Jalem, R., Gao, B., **Tian, H. K.**, Tateyama, Y.\*, “Theoretical study on stability and ion transport property with halide doping of  $\text{Na}_3\text{SbS}_4$  electrolyte for all-solid-state batteries”, *Journal of Materials Chemistry A* (IF: 12.732) 10(5), 2235–2248, 2022. [link](#)
18. Muto, S., Yamamoto, Y., Sakakura, M., **Tian, H. K.**, Tateyama, Y., Iriyama, Y.\*, “STEM-EELS Spectrum Imaging of an Aerosol-Deposited NASICON-Type LATP Solid Electrolyte and LCO Cathode Interface”, *ACS Applied Energy Materials* (IF: 6.024) 5, 1, 98–107, 2022. [link](#)
- \*19. **Tian, H. K.**, Jalem, R., Matsui, M., Mandai, T., Somekawa, H., Tateyama, Y.\*, “Tuning the performance of a Mg negative electrode through grain boundaries and alloying toward the realization of Mg batteries”, *Journal of Materials Chemistry A* (IF: 12.732) 9, 15207-15216, 2021. [link](#)
- \*20. **Tian, H. K.**, Jalem, R., Gao, B., Yamamoto, Y., Muto, S., Sakakura, M., Iriyama, Y., Tateyama, Y.\*, “Electron and Ion Transfer across Interfaces of the NASICON-Type LATP Solid Electrolyte with Electrodes in All-Solid-State Batteries: A Density Functional Theory Study via an Explicit Interface Model”, *ACS Appl. Mater. Interfaces* (IF: 8.758) 12, 49, 54752–54762, 2020. [link](#)
- \*21. **Tian, H.-K.**, Chakraborty, A., Talin, A. A., Eisenlohr, P., Qi, Y.\*, “Evaluation of the electrochemo-mechanically induced stress in all-solid-state Li-ion batteries”, *Journal of The Electrochemical Society* (IF: 3.721) 167.9, 090541, 2020. [link](#)
- \*22. **Tian, H. K.**, Liu, Z., Ji, Y., Chen, L. Q., Qi, Y.\*, “Interfacial Electronic Properties Dictate Li Dendrite Growth in Solid Electrolytes”, *Chemistry of Materials* (IF: 9.567) 31.18, 7351-7359, 2019. [link](#)

23. Xu, J., **Tian, H.-K.**, Qi, J., Qi, Y., Zhang, Q., Xiao, X.\* , “Mechanical and Electronic Stabilization of Solid Electrolyte Interphase with Sulfite Additive for Lithium Metal Batteries”, *Journal of The Electrochemical Society* (IF: 3.721) 166.14, A3201, 2019. [link](#)
- \*24. **Tian, H. K.**, Xu, B., Qi, Y.\* , “Computational Study of Lithium Nucleation Tendency in  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$  (LLZO) and Rational Design of Interlayer Materials to Prevent Lithium Dendrites”, *Journal of Power Sources* (IF: 8.247) 392, 79-86, 2018. [link](#)
- \*25. **Tian, H.-K.**, Qi, Y.\* , “Simulation of the Effect of Contact Area Loss in All-Solid-State Li-Ion Batteries”, *Journal of The Electrochemical Society* (IF: 3.721) 164.11, E3512, 2017. [link](#)