

DEHUI LI

PERSONAL PARTICULARS:

Professor

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ACADEMIC TRAINING

Jan. 2010-Oct. 2013: Ph.D., Physics, Nanyang Technological University, Singapore Thesis: Optical and Optoelectronic properties of one-dimensional CdS nanostructures Advisor: Prof. Qihua Xiong

Sept. 2006-Jul. 2009: M.S., Physics, Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China Thesis: Research on the interaction of highly charged ions with PC nanocapillaries Advisor: Prof. Guoqing Xiao

Sept. 2002-Jul. 2006: B.S., Applied Physics and Computer Science with honors, Xi'an Jiaotong University, Xi'an, China

PROFESSIONAL EXPERIENCE

Sept. 2016-present: Professor, School of Optical and Electronic Information, Huazhong University of Science and Technology, Wuhan, China

Sept. 2013-Sept. 2016: Postdoctoral fellow, University of California, Los Angeles, US Advisor: Prof. Xiangfeng Duan

RESEARCH INTERESTS

Our current research focuses on rational design and synthesis of functional semiconducting nanomaterials and heterostructures, systematic investigations on their physical properties and exploring their potential applications in nanoelectronics and nanophotonics such as field-effect transistor, photodetectors and light-emitting devices.

1. Rational design and synthesis of mono- and few-layer two-dimensional transition metal dichalcogenide microplates and their heterostructures; fabrication of the vertical stacking structures based on the as-synthesized microplates or exfoliated microplates by using aligned and transferred method.

2. Investigations on their fundamental properties such as carrier transport among layers and how depletion electric-field, defects and impurities, confined geometry and anisotropy alter their optical and electronic properties by using optical spectroscopy and electrical transport measurement.

3. Exploring the applications of these heterostructures in nanoelectronics and nanophotonics, especially in ultrathin flexible light-emitting devices and circular-polarized light-emitting devices.

4. Studies on how external electric-field affect the phase transition process in the organolead halide perovskite crystals and exploring their applications in the electric-field-modulation dual color photodetection and light-emitting devices.

AWARDS & HONORS

1. NML Researcher Award, Nano-micro Letters. (2016)
2. World Future Foundation PhD Prize in Environmental and Sustainability Research, World Future Foundation (2014)
3. Chinese Government Award for Outstanding Self-financed Students, China Scholarship Council (2013)
4. Nanyang research scholarship, Nanyang Technological University, Singapore (2010-2014)
5. Western student scholarship, Institute of Modern Physics, Chinese Academy of Sciences (2007 & 2008)
6. Distinction in graduation from Xi'an Jiaotong University (2006)
7. Excellent Student of Xi'an Jiaotong University for Academic Distinction (2003, 2004 & 2005)
8. Xi'an Jiaotong University's Scholarship for Academic Distinction (2002, 2003, 2004 & 2005)
9. Xi'an Jiaotong University's Scholarship for Academic Distinction, Sponsored by Hejian Technology (Suzhou) Co. Ltd (2004)

RESEARCH GRANTS

1. Thousand Youth Talents Plan, China (PI), 2016-2022, 6,000,000 RMB
2. NSFC general program, "Studies on valleytronics in the vertical heterostructures based on multilayer transition metal dichalcogenides"(PI), 2017-2020, 620,000 RMB

PREFESSONAL SOCIETY MEMEBERSHIP & ACTIVITIES

1. Materials Research Society and SPIE
2. Serve as reviewers for Advanced Materials, Advanced Functional Materials, Nano Letters, Scientific Reports, Nanoscale, Journal of Material Chemistry, Optical Communications, Current Applied Physics, Journal of Physics D

PUBLICATIONS

1. Wang H, Fang C, Luo H, et al. Recent progress of the optoelectronic properties of 2D Ruddlesden-Popper perovskites[J]. *Journal of Semiconductors*, 2019,40(4):041901.
2. Ma J, Fang C, Chen C, et al. Chiral 2D Perovskites with High Degree of Circularly Polarized Photoluminescence[J]. *ACS Nano*, 2019,13(3):3659-3665.
3. Li J, Wang J, Ma J, et al. Self-trapped state enabled filterless narrowband photodetections in 2D layered perovskite single crystals[J]. *Nature Communications*, 2019, 10(1): 806.
4. Fang C, Wang H, Shen Z, et al. High-Performance Photodetectors Based on Lead-Free 2D Ruddlesden- Popper Perovskite/MoS₂ Heterostructures[J]. *ACS applied materials & interfaces*, 2019,11(8):8419-8427.
5. Zhao Y, Zhang S, Lu Y, et al. A Strategy toward New Low - Dimensional Hybrid Halide Perovskites with Anionic Spacers[J]. *Small*, 2019, 2019: 1804152.
6. Wang J, Shen H, Li W, et al. The Role of Chloride Incorporation in Lead - Free 2D Perovskite (BA) 2SnI₄: Morphology, Photoluminescence, Phase Transition, and Charge Transport[J]. *Advanced Science*, 2019: 1802019.
7. Lan S, Li W, Wang S, et al. Vapor - Phase Growth of CsPbBr₃ Microstructures for Highly Efficient Pure Green Light Emission[J]. *Advanced Optical Materials*, 2019, 7(2): 1801336.
8. Shen H, Li J, Wang H, et al. Two-Dimensional Lead-Free Perovskite (C₆H₅C₂H₄NH₃)

- 2CsSn2I7 with High Hole Mobility[J]. *The journal of physical chemistry letters*, 2018, 10(1): 7-12.
9. Li L, Li J, Lan S, et al. Two-Step Growth of 2D Organic–Inorganic Perovskite Microplates and Arrays for Functional Optoelectronics[J]. *The journal of physical chemistry letters*, 2018, 9(16): 4532-4538.
10. Wang J, Li J, Lan S, et al. Controllable growth of centimeter-size 2D perovskite heterostructural single crystals for highly narrow dual-band photodetectors[J]. *arXiv preprint arXiv:1807.02807*, 2018.
11. Li J, Wang J, Zhang Y, et al. Fabrication of single phase 2D homologous perovskite microplates by mechanical exfoliation[J]. *2D Materials*, 2018, 5(2): 021001.
12. Fang C, Li J, Wang J, et al. Controllable growth of two-dimensional perovskite microstructures[J]. *CrystEngComm*, 2018, 20(41): 6538-6545.
13. Wang J, Li J, Tan Q, et al. Controllable synthesis of two-dimensional Ruddlesden–Popper-type perovskite heterostructures[J]. *The journal of physical chemistry letters*, 2017, 8(24): 6211-6219.
14. Wang Y, Guan X, Li D, et al. Chemical vapor deposition growth of single-crystalline cesium lead halide microplatelets and heterostructures for optoelectronic applications[J]. *Nano Research*, 2017, 10(4): 1223-1233.
15. **D. H. Li**, H.-C. Cheng, H. Wu, Y. L. Wang, J. Guo, G. M. Wang, Y. Huang, X. F. Duan. Gate-Induced Insulator to Band-Like Transport Transition in Organolead Halide Perovskite. *J. Phys. Chem. Lett.* 2017, 8, 429.
16. **D. H. Li**, H.-C. Cheng, Y. L. Wang, Z. P. Zhao, G. M. Wang, H. Wu, Q. Y. He, Y. Huang, X. F. Duan. The Effect of Thermal Annealing on Charge Transport in Organolead Halide Perovskite Microplate Field-Effect Transistors. *Adv. Mater.* 2017, 29, 1601959.
17. **D. H. Li**, H. Wu, H.-C. Cheng, G. M. Wang, Y. Huang, X. F. Duan. Electronic and ionic transport dynamics in organolead halide perovskites. *ACS Nano* 2016, 7, 6933.
18. **D. H. Li**, G. M. Wang, H.-C. Cheng, C.-Y. Chen, H. Wu, Y. Liu, Y. Huang, X. F. Duan. Size-dependent phase transition in methylammonium lead iodide perovskite microplate crystals. *Nature Commun.* 2016, 7, 11330.
19. **D. H. Li**, R. Cheng, H. L. Zhou, C. Wang, A. X. Yin, Y. Chen, N. O. Weiss, Y. Huang, X. F. Duan. Electric field induced strong enhancement of electroluminescence in multi-layer MoS₂. *Nature commun.* 2015, 6, 7509.
20. G. M. Wang*, **D. H. Li***, H.-C. Cheng, Y. J. Li, C.-Y. Chen, A. X. Yin, Z. P. Zhao, Z. Y. Lin, H. Wu, Q. Y. He, M. N. Ding, Y. Liu, Y. Huang, X. F. Duan. Wafer-scale growth of large arrays of perovskite microplate crystals for functional electronics and optoelectronics. *Science Advances*. 2015, 1, e1500613. *Those authors contribute equally to this work.
21. **D. H. Li**, Y. Liu, M. D. L. Meta, C. Magen, J. Arbiol, Y. P. Feng, Q. H. Xiong. Strain induced spatially indirect excitation recombination in zinc-blende/wurtzite CdS heterostructures. *Nano Res.* 2015, 8, 3035.
22. **D. H. Li**, J. Zhang, X. J. Wang, B. L. Huang, Q. H. Xiong. Solid-State Semiconductor Optical Cryocooler Based on CdS Nanobelts. *Nano Lett.* 2014, 14, 4724.
23. J. Zhang*, **D. H. Li***, R. J. Chen, Q. H. Xiong. Laser cooling of a semiconductor by 40 Kelvin. *Nature*. (Cover) 2013, 493, 504. *Those authors contribute equally to this work.
24. **D. H. Li**, J. Zhang, Q. H. Xiong. Laser cooling of CdS nanobelts: Thickness matters. *Optics Express*. 2013, 21, 19302.
25. **D. H. Li**, J. Zhang, Q. H. Xiong. Surface depletion induced quantum confinement in CdS nanobelts. *ACS Nano*. 2012, 6, 5283.
26. **D. H. Li**, J. Zhang, Q. Zhang, Q. H. Xiong. Electric-Field-Dependent photoconductivity in CdS nanowires and nanobelts: exciton ionization, Franz-Keldysh, and Stark effects. *Nano Lett.* 2012, 12, 2993.

27. **D. H. Li**, Y. Y. Wang, Y. T. Zhao, G. Q. Xiao, D. Zhao, Z. F. Xu, F. L. Li. The influence of the charged back side on the transmission of highly charged ions through PC nanocapillaries, *Nucl. Instrum. Meth. B.* 2009, 267, 469.

28. **D. H. Li**, Y. Y. Wang, Y. T. Zhao, G. Q. Xiao, D. Zhao, Z. F. Xu, F. L. Li. Guiding of highly charged ions through PC nanocapillaries, *Chinese Phys. Lett.* 2009, 26, 063402.

29. **D. H. Li**, Y. T. Zhao, Y. Y. Wang, D. Zhao, G. Q. Xiao, A. Qayyum. Studies on kinetic electron emission from the interaction of slow multi-charged He²⁺, O²⁺ and Ne²⁺ ions with W surface, *J. At. Mol. Phys.* 2008, 25, 777. (in Chinese)

30. R. S. Singh, **D. H. Li**, Q. H. Xiong, I. Santoso, X. J. Yu, W. Chen, A. Rusydi, A. T. Wee. Anomalous photoresponse in the deep-ultraviolet due to resonant excitonic effects in oxygen plasma treated few-layer graphene. *Carbon.* 2016, 106, 330.

31. H.-C. Cheng, G. M. Wang, **D. H. Li**, Q. Y. He, A. X. Yin, Y. Liu, H. Wu, M. N. Ding, Y. Huang, X. F. Duan. van der Waals heterojunction devices based on organohalide perovskites and two-dimensional materials. *Nano Lett.* 2016, 16, 367.

32. Y. L. Wang, X. Guan, **D. H. Li**, H. C. Cheng, X. D. Duan, Z. Y. Lin, X. F. Duan. Chemical vapor deposition growth of single-crystalline cesium lead halide microplatelets and heterostructures for optoelectronic applications. *Nano Research.* 2016, 10, 1007.

33. Y. Liu, H. Wu, H. C. Cheng, S. Yang, E. Zhu, Q. Y. He, M. N. Ding, **D. H. Li**, J. Guo, N. O. Weiss, Y. Huang, X. F. Duan. Toward barrier free contact to molybdenum disulfide using graphene electrodes. *Nano Lett.* 2015, 15, 3030.

34. R. Cheng, **D. H. Li**, H. L. Zhou, C. Wang, A. X. Yin, S. Jiang, Y. Liu, Y. Chen, Y. Huang, X. F. Duan. Electroluminescence and Photocurrent Generation from Atomically Sharp WSe₂/MoS₂ Heterojunction p-n Diodes. *Nano Lett.* 2014, 14, 5590.

35. B. Peng, Z. P. Li, E. Mutlugun, P. L. H. Martinez, **D. H. Li**, Q. Zhang, Y. Gao, H. V. Demir, Q. H. Xiong. Quantum Dots on Vertically Aligned Gold Nanorod Monolayer: Plasmon Enhanced Fluorescence. *Nanoscale.* 2014, 6, 5592

36. K. T. Nguyen, **D. H. Li**, P. Borah, X. Ma, Z. Liu, L. L. Zhu, G. Grüner, Q. H. Xiong and Y. L. Zhao. Photoinduced

Charge Transfer within Polyaniline-Encapsulated Quantum Dots Decorated on Graphene. *ACS Appl. Mater. Interfaces.* 2013, 5, 8105.

37. B. Peng, G. Y. Li, **D. H. Li**, S. Dodson, Q. Zhang, J. Zhang, Y. H. Lee, H. V. Demir, X. Y. Ling, and Q. H. Xiong. Vertically Aligned Gold Nanorod Monolayer on Arbitrary Substrates: Self-Assembly and Femtomolar Detection of Food Contaminants. *ACS Nano.* 2013, 7, 5993.

38. M. X. Wang, S. K. Batabyal, Z. G. Li, **D. H. Li**, S. G. Mhaisalkar, Y. M. Lam. Nanocrystalline copper indium selenide (CuInSe₂) particles for solar energy harvesting. *RSC Advance.* 2013, 3, 9829.

39. J. Zhang, **D. H. Li**, R. J. Chen, Q. H. Xiong. Laser cooling of a semiconductor by 40 kelvin: an optical refrigerator based on cadmium sulfide. *Proc. of SPIE Vol.* 2013, 8638, 863808.

40. R. Chen, **D. H. Li**, H. L. Hu, Y. Y. Zhao, Y. Wang, N. Wang, S. J. Wang, Y. Zhang, J. Hu, Z. X. Shen, Q. H. Xiong. Tailoring optical properties of silicon nanowires by Au nanostructure decorations: enhanced Raman scattering and photodetection. *J. Phys. Chem. C.* 2012, 116, 4416.

41. X. L. Li, H. L. Hu, **D. H. Li**, Z. X. Shen, Q. H. Xiong, S. Z. Li, H. J. Fan. Ordered array of gold semishells on TiO₂ spheres: An ultrasensitive and recyclable SERS substrate. *ACS Appl. Mater. Inter.* 2012, 4, 2180.

42. M. I. B. Utama, Q. Zhang, S. F. Jia, **D. H. Li**, J. B. Wang, Q. H. Xiong. Epitaxial II-VI tripod nanocrystals: A generalization of van der Waals epitaxy for nonplanar polytypic

nanoarchitectures. *ACS Nano*. 2012, 6, 2281.

43. M. I. B. Utama, J. Zhang, R. Chen, X. L. Xu, **D. H. Li**, H. D. Sun, Q. H. Xiong. Synthesis and optical properties of II-VI 1D nanostructures. *Nanoscale*. 2012, 4, 1422.

44. J. C. Ho, S. K. Batabyal, S. S. Pramana, J. Lum, V. T. Pham, **D. H. Li**, Q. H. Xiong, A. I. Tok, L. H. Wong. Optical and electrical properties of wurtzite copper indium sulfide nanoflakes. *Materials Express*. 2012, 2, 344.

45. X. L. Xu, B. Peng, **D. H. Li**, J. Zhang, L. M. Wong, Q. Zhang, S. J. Wang, Q. H. Xiong. Flexible visible-infrared metamaterials and their applications in highly sensitive chemical and biological sensing. *Nano Lett*. 2011, 11, 3232.

46. X. S. Shen, L. Y. Chen, **D. H. Li**, L. F. Zhu, H. Wang, C. C. Liu, Y. Wang, Q. H. Xiong, H. Y. Chen. Assembly of colloidal nanoparticles directed by the microstructures of polycrystalline ice. *ACS Nano*. 2011, 5, 8426.

47. B. Liu, R. Chen, X. L. Xu, **D. H. Li**, Y. Y. Zhao, Z. X. Shen, Q. H. Xiong, H. D. Sun. Exciton-related photoluminescence and lasing in CdS nanobelts. *J. Phys. Chem. C*. 2011, 115, 12826.

48. J. Gao, R. Chen, **D. H. Li**, L. Jiang, J. C. Ye, X. C. Ma, X. D. Chen, Q. H. Xiong, H. D. Sun, T. Wu. UV light emitting transparent conducting tin-doped indium oxide (ITO) nanowires. *Nanotechnology*. 2011, 22, 195706.

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51. Z. Q. Luo, J. Z. Shang, S. H. Lim, **D. H. Li**, Q. H. Xiong, Z. X. Shen, J. Y. Lin, T. Yu. Modulating the electronic structures of graphene by controllable hydrogenation. *Appl. Phys. Lett*. 2010, 23, 233111.

52. R. Chen, **D. H. Li**, P. Liu, Z. P. Peng, G. G. Gurzadyan, Q. H. Xiong, H. D. Sun. Optical and excitonic properties of crystalline ZnS nanowires: toward efficient ultraviolet emission at room temperature. *Nano Lett*. 2010, 10, 4956.

53. X. M. Chen, F. Y. Xi, X. Y. Qiu, J. X. Shao, G. Q. Xiao, Y. Cui, G. Z. Sun, J. Wang, Y. F. Chen, H. P. Liu, Y. Z. Yin, Y. Y. Wang, **D. H. Li**, F. J. Lou, X. A. Wang, J. K. Xu, C. L. Zhou. Guiding of 150 keV O⁶⁺ ions through nanocapillaries in an uncoated Al₂O₃ membrane: special time dependence of the transmission profile width. *Chinese Physics B*. 2009, 18, 1955.

54. Y. Y. Wang, G. Q. Xiao, Y. T. Zhao, **D. H. Li**, D. Zhao, Z. F. Xu, F. L. Li. Guided transmission of xenon ions through nanocapillaries in PC foils. *Journal of Physics: Conference Series*. 2009, 163, 012082.

55. Y. Y. Wang, **D. H. Li**, Y. T. Zhao, G. Q. Xiao, Z. F. Li, X. M. Chen. Surface nanostructure formation by the interaction of slow xenon ions on HOPG surface. *Journal of Physics: Conference Series*. 2009, 194, 132032.

56. Y. T. Zhao, G. Q. Xiao, H. S. Xu, H. W. Zhao, J. W. Xia, G. M. Jin, X. W. Ma, Y. Liu, Z. H. Yang, P. M. Zhang, Y. Y. Wang, **D. H. Li**, H. Y. Zhao, W. L. Zhan, Z. F. Xu, D. Zhao, F. L. Li, X. M. Chen. An outlook of heavy ion driven plasma research at IMP-Lanzhou. *Nucl. Instrum. Meth. B*. 2009, 267, 163.