**Welcome to Our Group**

Kaihui Liu’s group has been long engaged in studying growth mechanism and spectral physics for low-dimensional materials. We independently designed the meter-scale single-crystal manufacturing equipment, built the single nano-object level in-situ optical characterization system and developed two-dimensional material composite fibers for all-fiber integration devices. We have made several important progresses, including (1) realizing surficial and interfacial engineering of the growth of 2D materials; (2) developing global methods of synthesizing meter-sized single-crystal films; (3) fabricating structure-dependent devices. Professor Liu has published more than 100 scientific journals, including correspondence-authored Nature (2), Nature Nanotechnology (2), Nature Photonics, Nature Chemistry, Nature Communications (4), Advanced Materials (10), JACS (2), Nano Letters (5), PNAS and Science Bulletin.

**Breaking News**

- **202002**: The work of our group was selected as “one of the top ten research progress of China’s semiconductors in 2020”.
- **202011**: Professor Liu was selected in“The National Science Fund for Distinguished Young Scholars”. [Link1](#) [Link2](#)
- **202009**: Our research paper "Optical fibres with embedded two-dimensional materials for ultrahigh nonlinearity" was published on *Nature Nanotechnology*. [Link1](#) [Link2](#) [Link3](#)

- **202009**: Prof. Liu introduced ultra-violet.
- **202005**: Our research paper "Seeded growth of large single-crystal copper foils with high-index facets" was published on *Nature*. [Link1](#) [Link2](#) [Link3](#) [Link4](#) [Link5](#) [Link6](#) [Link7](#) [Link8](#) [Link9](#) [Link10](#) [Link11](#) Highlight
- **201911**: Professor Liu was selected in"Beijing Municipal Natural Science Foundation for Distinguished Young Scholars". [Link1](#)
- **201908**: Our research paper "Graphene photonic crystal fibre with strong and tunable light–matter interaction" was published on *Nature Photonics*. [Highlight](#) [Link1](#) [Link2](#) [Link3](#) [Link4](#)
- **201907**: Our research paper "Kinetic modulation of graphene growth by fluorine through spatially confined decomposition of metal fluorides" was published on *Nature Chemistry*. [Link1](#) [Link2](#) [Link3](#) [Link4](#) [Link5](#) [Link6](#)
201906: Guangming Daily do a live broadcast on our lab. Our laboratory participated in PKU Disciplines Season 1 Physics Episode.

201905: Our research paper "Epitaxial growth of a 100-square-centimetre single-crystal hexagonal boron nitride monolayer on copper" was published on Nature. Link1 Link2 Link3 Link4 Link5 Link6 Link7 Link8 Link9 Link10 Link11 Link12

201808: Our research paper "Measurement of complex optical susceptibility for individual carbon nanotubes by elliptically polarized light excitation" was published on Nature Communications. Link1 Link2

201804: Professor Liu was appointed as the Associate Editor for Science Bulletin .

201712: Professor Liu got the third prize of the 2017 Beijing Science & Technology Award .

201712: Professor Liu was selected as the 2017 Excellent Advisor Teacher in Undergraduate's Scientific Research .

201711: Professor Liu was selected as 2017 "Beijing Excellent Youth Professor". Link1 Link2

201711: Professor Liu was selected as 2017 Peking University "Huang Tingfang/Xin He Excellent Youth Scholar".

201711: Liu Group got a first in the third "Star of Nanotechnology" innovate business contest and a technology-leading prize.

201707: Our research paper "Ultrafast epitaxial growth of metre-sized single-crystal graphene on industrial Cu foil" was published on Science Bulletin. Link1 Link2 Link3 Link4

201612: Professor Liu was selected as one of the Ten "Xin Rui" Scholar of China 2016.

201608: Our research paper "Ultrafast growth of single-crystal graphene assisted by a continuous oxygen supply" was published on Nature Nanotechnology. Link1 Link2 Link3 Link4

201606: Professor Liu was granted the National Key R&D Plan as a sub-project leader.

201508: Professor Liu was selected in "NSFC Excellent Youth Scholar" of China.

Highlights & News

Network Electrodes by Single-Crystal Graphene Covering and Their Applications in Flexible Nanogenerator and Light-emitting Diode" was published on Nano Energy .

Year 2019

201911: Professor Liu was selected in "Beijing Municipal Natural
Research

Kaihui Liu's group has been long engaged in studying growth mechanism and spectral physics for low-dimensional materials. We independently designed the meter-scale single-crystal manufacturing equipment, built the single nano-object level in-situ optical characterization system and developed two-dimensional material composite fibers for all-fiber integration devices. We have made several important progresses, including (1) realizing surficial and interfacial engineering of the growth of 2D materials; (2) developing global methods of synthesizing meter-sized single-crystal films; (3) fabricating structure-dependent devices. Professor Liu has published more than 100 scientific journals, including correspondence-authored Nature (2), Nature Nanotechnology (2), Nature Photonics, Nature Chemistry, Nature Communications (4), Advanced Materials (10), JACS (2), Nano Letters (5), PNAS and Science Bulletin.

Current research interests

(1) Surficial and interfacial engineering of the growth mechanism of 2D materials
(2) Global technology of synthesizing meter-sized single-crystal films
(3) Advanced nano-spectroscopy characterization techniques
(4) Development of high-performance photoelectric detection and acoustic equipment

Position Opening

1-2 graduate students each year; 1-2 postdoc (for nano-structure and nano-spectroscopy)

independent research project for undergraduates.

Selected Publications


Full List

Year 2021

Full List

Year 2021


2. Bo Han, Chen Yang, Xiaolong Xu, Yuehui Li, Ruochen Shi, Kaihui Liu, Haicheng Wang*, Yu Ye*, Jing Lu, Dapeng Yu and Feng Gao. "Correlating the electronic structures of metallic/semiconducting MoTe2 interface to its atomic structures", National Science Review 2021, 8, nwwa087 PDF


6. Ning Li*, Xiangdong Guo*, Xiaoxia Yang*, Ruisi Qi, Tianyu Qiao, Yifei Li, Ruochen Shi, Yuehui Li, Kaihui Liu, Zhi Xu, Lei Liu, F. Javier García de Abajo, Qing Dai*, En-Ge Wang and Peng Gao*. "Direct observation of highly confined phonon polaritons in suspended monolayer hexagonal boron nitride", Nature Materials 2021, 20, 43 PDF

Year 2020


12. He Ma, Jing Liang, Hao Hong, Kehai Liu, Dingxin Zou, Muhong Wu and Kaihui Liu*. "Rich information of 2D materials revealed by optical second harmonic generation", Nanoscale 2020, 12, 22891. Link1 PDF


14. Lai-Peng Ma, Zhongbin Wu, Lichang Yin, Dingdong Zhang, Shichao Dong, Qing Zhang, Mao-Lin Chen, Wei Ma, Zhibin Zhang, Jinchong Du, Dong-Ming Sun, Kaihui Liu, Xiangfeng Duan, Dongge Ma, Hui-Ming Cheng and Wencai Ren*. "Pushing the conductance and transparency limit of monolayer graphene electrodes for flexible organic light-emitting diodes", PNAS 2020, 117, 25991. PDF


26. Bingtong Liu*, Jin Wang, Shuai Zhao, Cangyu Qu, Yuan Liu, Liran Ma, Zhilong Zhang, Kailui Liu, Quanhui Zheng and Ming Ma*. "Negative friction coefficient in microscale graphite/mica layered heterojunctions", *Science Advances 2020, 6, eaaz6787 PDF

27. Pan Chen*, Xiangli Zhong*, Jacob A. Zorn, Mingqiang Li, Yuanwei Sun, Adeel Y. Abid, Chuanhai Ren, Yuehui Li, Xiaomei Li, Xiumei Ma, Jinbin Wang, Kailui Liu, Zhi Xu, Congqing Tan*, Longqing Chen, Peng Gao* and Xuedong Bai*. "Atomic imaging of mechanically induced topological transition of ferroelectric vortices", *Nature Communications 2020, 11, 1840 PDF

28. Can Liu*, Li Wang*, Jiajie Qi* and Kailui Liu*. "Designed Growth of Large-Size 2D Single Crystals", *Advanced Materials 2020, 32, 2000046 Link1 Link2 Link3 Link4 Link5 Link6 PDF


32. Zhu-Jun Wang*, Jicheng Dong*, Linfen Li*, Guocai Dong, Yi Cui, Yang Yang, Weil Wei, Raul Olmstead, Qing Li, Li Wang, Xiaozhi Xu, Kailui Liu, Cédric Barroo, Joost W. M. Frenken, Qiang Fu, Xinhe Bao, Robert Schläfli, Peng Ding* and Marc-Georg Willinger*. "The Coalescence Behavior of Two-Dimensional Materials Revealed by Multi-Scale In Situ Imaging during Chemical Vapor Deposition Growth", *ACS Nano 2020, 14, 1902 PDF


35. Xiaomel Li², Congbing Tan², Chang Liu², Peng Gaob, Yuanwei Sun, Pan Chen, Mingqiang Li, Lei Liao, Ruixue Zhu, Jinhua Wang, Yanchong Zhao, Lifen Wang, Zhi Xu, Kaibei Liu, Xiangli Zhonga, Jie Wang and Xuedong Bai. "Atomic-scale observations of electrical and mechanical manipulation of topological polar flux closure", PNAS 2020, 117, 18954 PDF


37. Xujing Li¹, Li Yin¹, Zhengxun Lai, Mei Wu, Yu Sheng, Lei Zhang, Yuanwei Sun, Shulin Chen, Xiaomei Li, Jingmin Zhang, Yuelin Li, Kaibei Liu, Kiyoushi Wang, Dapeng Yu, Xuedong Bai, Wenbo Mi² and Peng Gaob. "Atomic origin of spin-valve magnetoresistance at the SrRuO₃ grain boundary", National Science Review 2020, 7, 753 PDF


Year 2019


40. Xiaobo Li¹, Qiao Wang¹, Jinhua Hong⁴, Dongyan Liu, Qiangfang Feng, Zhibin Lei, Kaibei Liu, Peng Ding⁴ and Hua Xu¹. "Nanocapsule Growth Model for Subdomain and Grain Boundary Formation in r1T Layered ReSe₂", Advanced Functional Materials 2019, 29, 1906285 PDF

41. Yuanwei Sun, Aadei Y. Abidi⁴, Congbing Tan⁴, Chunlai Ren, Mingqiang Li, Ning Li, Pan Chen, Yuehui Li, Jingmin Zhang, Xiangli Zhong⁴, Jinhua Wang, Min Liao, Kaibei Liu, Xuedong Bai, Yichun Zhou, Dapeng Yu and Peng Gaob. "Subunit cell-level measurement of polarization in an individual polar vortex", Science Advances 2019, 5, 4355

42. Chi Li², Ke Chen⁴, Mengxue Guan³, Xiaowei Wang, Xu Zhou, Feng Zhai, Jiayu Dai, Zhenjun Li, Zhipei Sun, Sheng Meng⁴, Kaibei Liu⁴ and Qing Dai⁴. "Extreme nonlinear strong-field photoemission from carbon nanotubes", Nature Communications 2019, 10, 4891 PDF


50. Can Lin*, Xiaozhi Xu*, Lu Qiu*, Muhong Wu*, Ruixi Qiao, Li Wang, Jinhuan Wang, Jingjing Niu, Jing Liang, Xu Zhou, Zhihong Zhang, Mi Peng, Peng Gao, Wenlong Wang, Xuedong Bai, Ding Ma, Ying Jiang, Xiaosong Wu, Dapeng Yu, Enge Wang, Jie Xiong*, Feng Ding* and Kaihui Liu*. "Kinetic modulation of graphene growth by fluorine through spatially confined deformation of metal fluorides". Nature Chemistry 2019, 11, 730 Link1 Link2 Link3 Link4 Link5 Link6 Link7 PDF

51. Jinghuan Yang†, Quan Sun*, Wei Liu, Zhibin Zhang, Xiaoyong Hu*, Kaihui Liu*, Hong Yang, Hironori Misawa and Qihuang Gong. "Engineering Ultrafast Carrier Dynamics at the Graphene/GaAs Interface by Bulk Doping Level". Advanced Optical Materials 2019, 7, 1900580 PDF

52. Shuchen Zhang*, Xiao Wang*, Fengrui Yao, Maoshuai He, Dewu Lin, He Ma, Yangyong Sun, Quichen Zhao, Kaihui Liu, Feng Ding* and Jin Zhang. "Controllable Growth of (n, n – 1) Family of Semiconducting Carbon Nanotubes". Chem 2019, 5, 1182 PDF


55. Bing Deng*, Zhaowei Xin, Ruiwen Xie, Shishu Zhang, Xiaozhi Xu, Jing Gao, Jilin Tang, Yue Qi, Yan Wang, Yan Zhao, Laihao Sun, Huihui Wang, Kaihui Liu, Mark H. Rammelli, La-Tao Wang, Zhengtang Luo, Lianming Tong, Xinyu Zhang, Changsheng Xie, Zhongfan Liu* and Hailin Peng*. "Scalable and ultrafast epitaxial growth of single-crystal graphene wafers for electrically tunable liquid-crystal microlens arrays". Science Bulletin 2019, 64, 659 PDF

56. Mingqiang Li†, Bo Wang, Heng-Jui Liu, Yen-Lin Huang, Jingmin Zhang, Xinmei Ma, Kaihui Liu, Dapeng Yu, Ying-Hao Chu, Long-Qing Chen and Peng Gao*. "Direct observation of weakened interface clamping effect enabled ferromagnetic domain switching". Acta Materialia 2019, 171, 184 PDF


58. Anhui Liu†, Yan Li`, Hongrui Ding*, Xiaoming Xu, Yanzhong Li, Guiping Ren, Jing Liang, Yuwei Liu, Hao Hong, Ning Chen, Shengyi Chu, Feifei Liu, Yan Li, Haoran Wang, Cong Ding, Changhui Yang, Long Li, Juan Liu, Jeffrey Dick, Kaihui Liu* and Michael F. Hochella Jr*. "Photoelectric conversion on Earth’s surface via widespread Fe- and Mn-mineral coatings". PNAS 2019, 116, 9741 Link1 Link2 Link3 Link4 PDF


60. Yan Sun*, Zhizhou Zou, Zhen Huang, Jiangbin Wu, Liulian Zhang, Yang Cheng, Jingyu Liu, Chao Zhu, Maotao Yu, Peng Yu, Wei Zhu, Yue Liu, Jian Zhou, Bowen Liu, Hongguang Xie, Yi Cao, Hai Li, Xinxan Wang, Kaihui Liu, Xiaoyong Wang, Jianpu Wu, Lin Wang* and Wei Huang*. "Band Structure Engineering of Interfacial Semiconductors Based on Atoms of Thin Lead Iodide Crystals". Advanced Materials 2019, 31, 1806562 PDF


70. Luojun Du, Jian Tang, Jing Liang, Mengzhou Liao, Zhiyan Jia, Qinghua Zhang, Yanzhong Zhao, Yong Yang, Dongxia Shi, Lin Gu, Jianyou Xiang, Kaihui Liu, Zhipei Sun* and Guangyu Zhang*. "Giant Valley Coherence at Room Temperature in 3R WS2 with Broken Inversion Symmetry", Research 2019, 6494565 PDF
<table>
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<th>Year</th>
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<td>2020</td>
<td>The National Science Fund for Distinguished Young Scholars</td>
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<td>2009</td>
<td>Pacesetter to Merit Student of Chinese Academy of Sciences</td>
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<td>2009</td>
<td>Zhuhui-Yuehua Outstanding Doctoral Scholarship of Chinese Academy of Sciences</td>
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<td>2007</td>
<td>“Best Presentation Award” of ICYS-ICMR Summer School, Tsukuba, Japan</td>
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<td>2006-2008</td>
<td>First-Class Scholarship of Chinese Academy of Sciences (3 times)</td>
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<td>2004</td>
<td>Excellent Graduate of Beijing</td>
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<td>2003</td>
<td>National Second-Class Scholarship</td>
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Contact Information

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Position Opening:
1-2 graduate student each year;
1-2 postdoc;
Independent research project for undergraduates.

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Collaborators

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- Prof. Zhongfan Liu (PKU and BGI)
- Prof. Feng Wang (UC Berkeley)