

Joon-Seok "Jason" KIM

Curriculum Vitae

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Education

- Aug 2018 **Ph.D.**, THE UNIVERSITY OF TEXAS AT AUSTIN.
Department of Electrical and Computer Engineering
"Optoelectronic, Structural, and Topological Properties of van der Waals Layered Materials Under Extreme Conditions"
- May 2016 **M.S.E.**, THE UNIVERSITY OF TEXAS AT AUSTIN.
Department of Electrical and Computer Engineering
- Aug 2013 **B.S.**, SEOUL NATIONAL UNIVERSITY.
Department of Electrical and Computer Engineering (*Cum Laude*)

Professional Appointments

- 2018 - **Postdoctoral Researcher**, NORTHWESTERN UNIVERSITY.
(*present*) Department of Materials Science and Engineering

Publications

1. [**1st author**] **Joon-Seok Kim**, Rinkle Juneja, Nilesh P. Salke, Witold Palosz, Venkataraman Swaminathan, Sudhir Trivedi, Abhishek K. Singh, Deji Akinwande, and Jung-Fu Lin, "**Structural, Vibrational, and Electronic Topological Transitions of $\text{Bi}_{1.5}\text{Sb}_{0.5}\text{Te}_{1.8}\text{Se}_{1.2}$ under Pressure**", *Journal of Applied Physics*, **123**, 115903 (2018) [Cited (Web of Science; as of July 2019): 1, Impact Factor (as of 2018): 2.328]
2. [**1st author**] **Joon-Seok Kim**, Rafia Ahmad, Tribhuvan Pandey, Amrithesh Rai, Simin Feng, Jing Yang, Zhong Lin, Mauricio Terrones, Sanjay K. Banerjee, Abhishek K. Singh, Deji Akinwande, Jung-Fu Lin, "**Towards Band Structure and Band Offset Engineering of Monolayer $\text{Mo}_{(1-x)}\text{W}_{(x)}\text{S}_2$ via Strain**", *2D Materials*, **5**, 1 (2017) (*Media coverage by 2D Research*) [Cited: 5, IF: 7.343]
3. Yury Yuryevich Illarionov, Michael Wlatl, Gerhard Rzepa, Theresia Knobloch, **Joon-Seok Kim**, Deji Akinwande, and Tibor Grasser, "**Highly-Stable Black Phosphorus Field-Effect Transistors with Low Density of Oxide Traps**", *npj 2D Materials and Applications*, **1**, 23 (2017) [Cited: 12, IF: N/A]
4. Ke Chen, Rudresh Ghosh, Xianghai Meng, Anupam Roy, **Joon-Seok Kim**, Feng He, Sarah C. Mason, Xiaochuan Xu, Jung-Fu Lin, Deji Akinwande, Sanjay K. Banerjee, and Yaguo Wang "**Experimental evidence of exciton capture by mid-gap defects in CVD grown monolayer MoSe_2** ", *npj 2D Materials and Applications*, **1**, 15 (2017) (*Media coverage by 2D Research*) [Cited: 11, IF: N/A]

5. Yu Yu Illarionov, M Waltl, M Tech, **J-S Kim**, D Akinwande, T Grasser, "**Reliability of black phosphorus field-effect transistors with respect to bias-temperature and hot-carrier stress**", *IEEE International Reliability Physics Symposium (IRPS)* (2017) [Cited: 0, IF: 1.298]
6. Yu Yu Illarionov, G Rzepa, M Waltl, T Knobloch, **J-S Kim**, D Akinwande, T Grasser, "**Accurate mapping of oxide traps in highly-stable black phosphorus FETs**", *IEEE Electron Devices Technology and Manufacturing Conference (EDTM)* (2017) [Cited: 0, IF: N/A]
7. (Review) Deji Akinwande, Christopher J. Brennan, J. Scott Bunch, Philip Egberts, Jonathan R. Felts, Huajian Gao, Rui Huang, **Joon-Seok Kim**, Teng Li, Yao Li, Kenneth M. Liechti, Nanshu Lu, Harold S. Park, Evan J. Reed, Peng Wang, Boris I. Yakobson, Teng Zhang, Yong-Wei Zhang, Yao Zhou, and Yong Zhu, "**A Review on Mechanics and Mechanical Properties of 2D Materials - Graphene and Beyond**", *Extreme Mechanics Letters*, **13**, 47(2017) [Cited: 162, IF: 4.075]
8. [**1st author**] Pengchao Lu,* **Joon-Seok Kim**,* Jing Yang, Hao Gao, Juefei Wu, Dexi Shao, Bin Li, DaWei Zhou, Jian Sun, Deji Akinwande, Jung-Fu Lin, Dingyu Xing, "**Origin of the Superconductivity of Weyl Semimetal WTe₂ under Pressure**", *Physical Review B*, **94**, 224512 (2016) [Cited: 32, IF: 3.836]
9. Emily S. Walker, Seung Ryul Na, Daehwan Jung, Stephen D. March, **Joon-Seok Kim**, Tanuj Trivedi, Wei Li, Li Tao, Minjoo L. Lee, Kenneth M. Liechti, Deji Akinwande, and Seth R. Bank, "**Large-Area Dry Transfer of Single-Crystalline Epitaxial Bismuth Thin Films**", *Nano Letters*, **16**, 11 (2016) [Cited: 18, IF: 12.279]
10. Yury Yuryevich Illarionov, Michael Waltl, Gerhard Rzepa, **Joon-Seok Kim**, Seohee Kim, Ananth Dodabalapur, Deji Akinwande, and Tibor Grasser, "**Long-term Stability and Reliability of Black Phosphorus Field-Effect Transistors**", *ACS Nano*, **10**, 10 (2016) [Cited: 57, IF: 13.903]
11. Tribhuwan Pandey, Avinash P. Nayak, Jin Liu, Samuel T. Moran, **Joonseok Kim**, Lain-Jong Li, Jung-Fu Liu, Deji Akinwande, and Abhishek Singh, "**Pressure-Induced Charge Transfer Doping of Monolayer Graphene/MoS₂ Heterostructure**", *Small*, **12**, 30 (2016) [Cited: 15, IF: 10.856]
12. [**1st author**] **Joon-Seok Kim**, Samuel T. Moran, Avinash P. Nayak, Shahar Pedahzur, Itzel Ruiz, Gabriela Ponce, Daniela Rodriguez, Joanna Henny, Jin Liu, Jung-Fu Lin and Deji Akinwande, "**High Pressure Raman Study of Layered Mo_{0.5}W_{0.5}S₂ Ternary Compounds**", *2D Materials*, **3**, 2 (2016) [Cited: 2, IF: 7.343]
13. Sandra H Aldave, Maruthi N Yogeesh, Weinan Zhu, **Joonseok Kim**, Sushant S Sonde, Avinash P Nayak and Deji Akinwande, "**Characterization and sonochemical synthesis of black phosphorus from red phosphorus**", *2D Materials*, **3**, 1 (2016) [Cited: 21, IF: 7.343]
14. Cheng Tan, Yingnan Liu, Harry Chou, **Joon-Seok Kim**, Di Wu, Deji Akinwande, and Keji Lai, "**Laser-assisted Oxidation of Multi-layer Tungsten Diselenide Nanosheets**" *Applied Physics Letters*, **108**, 083112 (2016) [Cited: 8, IF: 3.521]
15. Rudresh Ghosh, **Joon-Seok Kim**, Anupam Roy, Harry Chou, Mary Vu, Sanjay Banerjee, and Deji Akinwande, "**Large area chemical vapor deposition growth of monolayer MoSe₂ and its controlled sulfurization to MoS₂**" *Journal of Materials Research*, **31**, 7 (2016) [Cited: 5, IF: 1.982]

16. Li Tao, Weinan Zhu, **Joon-Seok Kim**, and Deji Akinwande, "**(Invited) Silicene and Phosphorene: Progress on the Intriguing Case of Buckled Atomic Sheets**", *ESSDERC* (2015) [Cited: 0, IF: N/A]
17. Yingnan Liu, Cheng Tan, Harry Chou, Avinash Nayak, Di Wu, Rudresh Ghosh, Hsiao-Yu Chang, Yufeng Hao, Xiaohan Wang, **Joon-Seok Kim**, Richard Piner, Rodney S. Ruoff, Deji Akinwande, and Keji Lai, "**Thermal Oxidation of WSe₂ Nanosheets Adhered on SiO₂/Si Substrates**" *Nano Letters*, **15**, 8 (2015) [Cited: 37, IF: 12.279]
18. [**1st author**] **Joon-Seok Kim**, Yingnan Liu, Weinan Zhu, Seohee Kim, Di Wu, Li Tao, Ananth Dodabalapur, Keji Lai and Deji Akinwande, "**Toward Air-Stable Multilayer Phosphorene Thin-Films and Transistors.**" *Scientific Reports*, **5**, 8989 (2015) [Cited: 199, IF: 4.525]
19. Weinan Zhu, Maruthi N. Yogeesh, Shixuan Yang, Sandra H. Aldave, **Joon-Seok Kim**, Sushant Sonde, Li Tao, Nanshu Lu, and Deji Akinwande, "**Flexible Black Phosphorus Ambipolar Transistors, Circuits and AM Demodulator**" *Nano Letters*, **15**, 3 (2015) [Cited: 234, IF: 12.279]

Talks & Presentations

1. **J.-S. Kim**, R. Juneja, N.P. Salke, W. Palosz, V. Swaminathan, A. K. Singh, S. Trivedi, D. Akinwande, and J.-F. Lin, "Pressure-Induced Structural and Electronic Topological Transitions in Bi_{1.5}Sb_{0.5}Te_{1.8}Se_{1.2} Alloy", *APS March meeting*, March 2018 (Oral)
2. **J.-S. Kim**, R. Ahmad, T. Pandey, J. Yang, A. Singh, D. Akinwande, J.-F. Lin, "Band Structure Modulation of Monolayer TMDs using Pressure", *COMPRES Annual Meeting*, July 2017 (Poster)
3. **J.-S. Kim**, R. Ahmad, T. Pandey, A. Rai, S. Feng, J. Yang, M. Terrones, S. Banerjee, A. Singh, D. Akinwande, J.-F. Lin, "Pressure and Composition Tuning of Optical Band Gap in Monolayer Transition Metal Dichalcogenides", *2017 MRS Spring Meeting*, April 2017 (Oral)
4. **J.-S. Kim**, T. Pandey, A. Nayak, A. Singh, D. Akinwande, J.-F. Lin, "Graphene and 2D materials in Extremes", *Deep Carbon Observatory Extreme Physics and Chemistry Workshop*, December 2016 (Poster)
5. **J.-S. Kim**, S. Moran, A. Nayak, J.-F. Lin, D. Akinwande, "Tuning the Properties of van der Waals 2D Materials by Applying Pressure ", *2016 IUCr High Pressure Workshop*, September 2016 (Oral; IUCr Young Scientist Award)
6. **J.-S. Kim**, J. Yang, A. Nayak, J. Liu, J. Wu, T. Yoshino, J.-F. Lin, and D. Akinwande, "Effects of Hydrostatic Pressure on Red and Black Phosphorus", *COMPRES Annual Meeting*, July 2015 (Poster)
7. **J.-S. Kim**, Y. Liu, W. Zhu, S. Kim, D. Wu, L. Tao, A. Dodabalapur, K. Lai, D. Akinwande, "Toward Air-Stable Multilayer Phosphorene Thin-Films and Transistors", *APS March meeting*, March 2015 (Oral)
8. **J.-S. Kim**, Y. Liu, W. Zhu, S. Kim, A. Dodabalapur, K. Lai, and D. Akinwande, "Effect of Capping Layer on Aging of Phosphorene Nanosheets", *SWAN Center Onsite Review*, September 2014 (Poster)

9. **J.-S. Kim**, Y. Liu, W. Zhu, D. Wu, K. Lai, and D. Akinwande, "Effect of Capping Layer on Aging of Phosphorene Nanosheets", *2D Technology Applications - International Exchange Meeting*, August 2014 (Poster)

Scholarships & Awards

- May 2018 **Professional Development Award**, *UT Austin, Office of Graduate Studies*, Travel support on presenting original research at a major professional meeting.
- May 2017 **Professional Development Award**, *UT Austin, Office of Graduate Studies*, Travel support on presenting original research at a major professional meeting.
- Dec 2016 **IOP Publishing Reviewer Awards 2016**, *IOP Publishing, Journal of Physics: Condensed Matter* Outstanding Reviewers of 2016, Selected for quantity, timeliness and quality of their reviews in the year 2016.
- Dec 2016 **Professional Development Award**, *UT Austin, Office of Graduate Studies*, Travel support on presenting original research at a major professional meeting.
- Sep 2016 **IUCr Young Scientist Award**, *International Union of Crystallography (IUCr), 2016 High Pressure Workshop*, Travel support for selected young scientists on presenting outstanding research.
- Jun 2012 **Qualcomm IT Tour Awards**, *Qualcomm Inc.*, Awarded for winning contest to suggest creative outlook of future devices. Granted travel support to Qualcomm HQ, and presented before then-CEO Paul E. Jacobs..
- 2006 **National Science and Technology Scholarship**, *National Research Foundation of Korea*, 4-year college tuition support based on excellence in Korean SAT.

Experience

Research Experience

- Sept 2018 - **Postdoctoral Researcher**, NORTHWESTERN UNIVERSITY.
(present)
- Advisor: Prof. Lincoln J. Lauhon
 - Characterization of Mixed-Dimensional Heterostructures.
 - Scanning Probe Microscopy
- Jan 2014 – **Graduate Research Assistant**, THE UNIVERSITY OF TEXAS AT AUSTIN.
- Aug 2018
- Advisors:
 - Prof. Deji Akinwande (Electrical and Computer Engineering)
 - Prof. Jung-Fu "Afu" Lin (Geological Sciences; Materials Sciences & Engineering)
 - Characterization opto-electronic properties of van der Waals materials under pressure and strain
 - Investigated Raman spectroscopy of low-symmetry 2D materials under hydrostatic and lateral strain condition, using diamond anvil cells and flexible substrate structures.
 - Investigated band gap evolution as a function of compressive strain and composition of monolayer $\text{Mo}_{1-x}\text{W}_x\text{S}_2$
 - Analyzed structural and electronic phase transitions of WTe_2 and Bi-Sb-Te-Se topological insulator under pressure.

- Fabrication, measurement & characterization of 2D materials-based devices
 - Enhanced and characterized stability of phosphorene-based transistors using polymer-assisted encapsulation.
 - Fabricated flexible devices and samples.
- Development and optimization of chemical vapor deposition (CVD) method for large-area growth of transition metal dichalcogenides (TMDs):
 - Synthesized and optimized large-area growth of monolayer WS_2 using powder precursors.
 - Synthesized and optimized large-area growth of monolayer $MoSe_2$ using liquid phase diethyl selenide precursor.

Jul – Dec 2012 **Undergraduate Research Assistant**, SEOUL NATIONAL UNIVERSITY, Korea,
Micro Sensors and Actuators Lab.

- Advisor: Prof. Yong-Kweon Kim
- Development of LabVIEW code and operation of polydimethylsiloxane (PDMS)-based peristaltic micropumps & microvalves.

Jul – Aug 2008 **Undergraduate Research Assistant**, SEOUL NATIONAL UNIVERSITY, Korea,
National Creative Research Center for Plasmonics Application Systems.

- Advisor: Prof. Byoung-ho Lee
- Construction of super-resolution image capturing system for 3-D image acquisition application, using image scanner and view camera bellows.

Industry Experience

Aug 2009 – Jun 2012 **Software Test Engineer**, PIOLINK, Inc., Korea.

- Substitutionary Military Service
- Design and execution of software testing and quality control protocol for network switches
- Development of test automation system for daily-build development tool.

Skills & Certifications

Research Skills

- Fabrication** E-beam lithography, Photo lithography, Chemical Vapor Deposition (CVD), Metal Deposition, Atomic Layer Deposition (ALD), Reactive Ion Etching (RIE)
- Characterization** Photo-Conductive Atomic Force Microscopy (cAFM), Kelvin Probe Force Microscopy (KPFM), Raman spectroscopy, Transmission electron microscopy (TEM), Scanning Electron Microscope (SEM), Photoluminescence (PL) spectroscopy, Energy-dispersive X-ray spectroscopy (EDX), Electrical transport measurement, Ellipsometry, X-ray Diffraction (XRD)
- Pressure & Strain** Diamond Anvil Cell (DAC) preparation & operation, flexible sample characterization

Software Skills

Python, MATLAB, L-Edit, LaTeX, LabVIEW, SAS, PSpice, Multisim, C/C++, Java, TCL, Scheme

Language Skills

Korean (native), English (fluent)

Certifications

2016 **Introduction to Data Science in Python, Summer Statistics Institute 2016**, *Department of Statistics and Data Sciences, UT Austin.*

2011 **International Software Testing Qualifications Board, ISTQB**, Foundation Level.

Service

Referee

2016–Present *Physical Review B*

2016–Present *Nanotechnology*

2015–Present *Journal of Physics: Condensed Matter* (Awarded Outstanding Reviewers of 2016)

Others

Sept 2018- Northwestern University MRSEC Student and Postdoc Leadership Council

Apr 2017 Symposium Session Assistant, 2017 MRS Spring Meeting

Summer 2015 Outreach Program; Research Experience for High School Students