

# Cheol-Joo Kim

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## Research

The main purpose of my research is to develop versatile and scalable techniques to artificially design materials with atomic-level precisions that current state-of-the-art techniques cannot provide. Thereby, my team discover novel properties in the materials and explore their potential applications for emerging technology.

## Experiences

- 2017-Present Assistant Professor, Dept. of Chemical Engineering,  
**Pohang University of Science and Technology, Korea**
- 2011-2016 Postdoctoral Associate, Dept. of Chemistry and Chemical Biology,  
**Cornell University**

## Education

- 2006-2011 Ph. D., Dept. of Materials Science and Engineering,  
**Pohang University of Science and Technology, Korea**
- 2002-2006 B.S., Dept. of Materials Science and Engineering,  
**Pohang University of Science and Technology, Korea**

## Awards

- Best Poster Award, Gordon Research Conference on Graphitic Carbon Materials 2014
- Fostering Next-generation Researchers Fellowship, National Research Foundation of Korea 2012
- Chang Kun Soo Best Thesis Award, Pohang University of Science and Technology 2011
- Best Paper Award, The 18<sup>th</sup> Korean Conference on Semiconductors 2011
- Bronze Prize, The 17<sup>th</sup> Samsung Humantech Thesis Award 2011

## Publications

Google Scholar Link: <https://scholar.google.com/citations?user=rCzCZ5cAAAAJ&hl=en>

1. MY Choi <sup>†</sup> , CW Choi <sup>†</sup> , SY Choi*, and <b>CJ Kim*</b> , "Selective Atomic Stitching of Monolayer Crystals via Nanoscale Chambers"	<i>Submitted (2022)</i>
2. GC Noh <sup>†</sup> , HY Song <sup>†</sup> , HN Choi <sup>†</sup> , JH Jeong, YJ Lee, MY Choi, SY Oh, MG Kim, MK Jo, YY Jo, EP Park, ER Moon, TS Kim, HJ Chai, W Huh, CH Lee, <b>CJ Kim</b> , HJ Yang, SW Song, HY Jeong, YS Kim, GH Lee, JS Lim, CG Kim, TM Chung*, JY Kwak*, and KB Kang*, "Large Memory Window of van der Waals Heterostructure Device using MOCVD grown 2D Layered Ge4Se9"	<i>Submitted (2022)</i>
3. SJ Yang <sup>†</sup> , MY Choi <sup>†</sup> , and CJ Kim*, "Engineering Grain Boundaries in Two-dimensional Electronic Materials"	<i>Submitted (2022)</i>
4. S Cha <sup>†</sup> , M Kim <sup>†</sup> , Y Kim <sup>†</sup> , S Choi, S Kang, H Kim, GY Cho, MJ Park, <b>CJ Kim</b> , BJ Kim, JD Lee*, MH Jo*, and J Kim*, "Gate-tunable Quantum Pathways of Massless Dirac Fermions in High Harmonic Generation"	<i>Submitted (2022)</i>
5. T Zou, HJ Kim, S Kim, A Liu, MY Choi, H Jung, H Zhu, I You, Y Reo, YS Kim*, <b>CJ Kim*</b> , and YY Noh*, " High-performance Solution-processed 2D P-type WSe2 Transistors and Circuits through Molecular Doping"	<i>Submitted (2022)</i>

6. MY Choi <sup>†</sup> , CW Choi <sup>†</sup> , SJ Yang, HJ Lee, SY Choi, JH Park, J Heo, SY Choi*, and <b>CJ Kim*</b> , "Substrate-Dependent Growth Modes of Monolayer MoS <sub>2</sub> : Vapor-Liquid-Solid and Vapor-Solid-Solid Process"	<i>ACS Appl. Nano Mater.</i> 5, 4336–4342 (2022)
7. SJ Yang <sup>†</sup> , JH Jung <sup>†</sup> , ES Lee, E Han, MY Choi, DS Jung, SY Choi, JH Park, DS Oh, SW Noh, KJ Kim, PY Huang, CC Hwang and <b>CJ Kim*</b> , "Wafer-scale Programmed Assembly of One-atom-thick Crystals"	<i>Nano Lett.</i> 22, 1518-1524 (2022)
8. NJ Kim <sup>†</sup> , SY Choi <sup>†</sup> , SJ Yang, JW Park, JH Park, N.N. Nguyen, KH Park, SM Ryu, KW Cho and <b>CJ Kim*</b> , "Graphene Nanoribbon Grid of Sub-10 nm Width with High Electrical Connectivity"	<i>ACS Appl. Mater. Interfaces</i> 13, 28593-28599 (2021)
9. JH Park <sup>†</sup> , SJ Yang <sup>†</sup> , CW Choi, SY Choi* and <b>CJ Kim*</b> , "Pristine Graphene Insertion at Metal/Semiconductor Interface to Minimize Metal-induced Gap States"	<i>ACS Appl. Mater. Interfaces</i> 13, 22828-22835 (2021)
10. SE Jun, SH Choi, SY Choi, TH Lee, CY Kim, JW Yang, WO Choe, IH Im, <b>CJ Kim*</b> and H.W Jang*, "Direct Synthesis of Molybdenum Phosphide Nanorods on Silicon Using Graphene at the Heterointerface for Efficient Photoelectrochemical Water Reduction"	<i>Nano-Micro Lett.</i> 13, 81 (2021)
11. N.N. Nguyen, HC Lee, KK Baek, MS Yoo, HS Lee, HS Lim, SY Choi, <b>CJ Kim</b> , SW Nam* and KW Cho*, "Atomically Smooth Graphene-based Hybrid Template for the Epitaxial Growth of Organic Semiconductor Crystals"	<i>Adv. Funct. Mater.</i> 31, 2008813 (2021)
12. SY Choi, N.N. Nguyen, YJ Lee, SJ Yang, KP Kim, KW Cho and <b>CJ Kim*</b> , "Nanoscale Molecular Building Blocks for Layer-by-layer Assembly"	<i>Adv. Mater. Interfaces</i> 7, 2000522 (2020)
13. SB Yu, DS Yoon, YJ Lee, H Han, NJ Kim, <b>CJ Kim</b> , KW Ihm, TS Oh and JW Son*, "Metal Nanoparticle Exsolution on a Perovskite Stannate Support with High Electrical Conductivity"	<i>Nano Lett.</i> 20, 3538-3544 (2020)
14. SJ Yang, S. Choi, K. Kim and <b>CJ Kim*</b> , "All-Dry Transfer of Graphene Film by Van der Waals Interaction"	<i>Nano Lett.</i> 19, 3590-3596 (2019)
15. H. Patel, L. Huang, <b>CJ Kim</b> , J. Park, M. W. Graham*, "Stacking Angle-tunable Photoluminescence from Interlayer Excitons in Twisted Bilayer Graphene"	<i>Nat. Commun.</i> 10, 1445 (2019)
16. <b>CJ Kim</b> , A. Sánchez-Castillo, Z. Ziegler, Y. Ogawa, C. Noguez and J. Park*, "Chiral Atomically Thin Films"	<i>Nat. Nanotechnol.</i> 11, 520-524 (2016)
17. C. Gutiérrez, <b>CJ Kim</b> , L. Brown, E. B. Lochocki, K. M. Shen, J. Park and A. N. Pasupathy*, "Imaging Chiral Symmetry Breaking from Kekulé Bond Order in Graphene"	<i>Nat. Phys.</i> 12, 950-958 (2016)
18. C. Gutiérrez, L. Brown, <b>CJ Kim</b> , J. Park and A. N. Pasupathy*, "Klein Tunneling and Electron Trapping in Nanometre-scale Graphene Quantum Dots"	<i>Nat. Phys.</i> 12, 1069-1075 (2016)
19. M. Guimaraes <sup>†</sup> , H. Gao <sup>†</sup> , Y. Han, K. Kang, S. Xie, <b>CJ Kim</b> , D. Muller, D. C. Ralph and J. Park*, "Atomically-thin Ohmic Edge Contacts Between Two-dimensional Materials"	<i>ACS Nano</i> 10, 6392-6399 (2016)
20. K. Kang <sup>†</sup> , S. Xie <sup>†</sup> , L. Huang, Y. Han, P. Y. Huang, K. F. Mak, <b>CJ Kim</b> , D. Muller and J. Park*, "High-mobility Three-atom-thick Semiconducting Films with Wafer Scale Homogeneity"	<i>Nature</i> 520, 656-660 (2015)
21. L. Brown <sup>†</sup> , E. B. Lochocki <sup>†</sup> , J. Avila, <b>CJ Kim</b> , Y. Ogawa, R. W. Havener, DK Kim, E. J. Monkman, D. E. Shai, H. I. Wei, M. P. Levendorf, M. Asensio, K. M. Shen and J. Park*, "Polycrystalline Graphene with Single Crystalline Electronic Structure"	<i>Nano Lett.</i> 14, 5706-5711 (2014)
22. <b>CJ Kim</b> , L. Brown, M. W. Graham, R. Hovden, R. W. Havener, P. L. McEuen, D. A. Muller and J. Park*, "Stacking Order Dependent Second Harmonic Generation and Topological Defects in <i>h</i> -BN Bilayers"	<i>Nano Lett.</i> 13, 5660-5665 (2013)
23. R. W. Havener, <b>CJ Kim</b> , L. Brown, J. W. Kevek, J. D. Sleppy, P. L. McEuen and J. Park*, "Hyperspectral Imaging of Structure and Composition in Atomically Thin Heterostructures"	<i>Nano Lett.</i> 13, 3942-3946 (2013)
24. HS Lee, <b>CJ Kim</b> , D. Lee, R. R. Lee, K. Kang, I. Hwang and MH Jo*,	<i>Nano Lett.</i>

"Large Electroabsorption Susceptibility Mediated by Internal Photoconductive Gain in Ge Nanowires"	12, 5913-5918 (2012)
25. L. H. Herman, <b>CJ Kim</b> , Z. Wang, MH Jo and J. Park*, "Depolarization Effect in Optical Absorption Measurements of One- and Two-dimensional Nanostructures"	<i>Appl. Phys. Lett.</i> 101, 123102 (2012)
26. M. P. Levendorf†, <b>CJ Kim</b> †, L. Brown, P. Y. Huang, R. W. Havener, D. A. Muller and J. Park*, "Graphene and Boron Nitride Lateral Heterostructures for Atomically Thin Circuitry"	<b>Nature</b> , 488, 627-632 (2012)
27. G. Lee, Y. S. Woo, JE Yang, GS Kim, D. Lee, K. Kang, <b>CJ Kim</b> and MH Jo*, "Vectorial Nanowire Growth by Local Kinetic Manipulation"	<i>J. Cryst. Growth</i> 345, 56-60 (2012)
28. WM Lee, J. H. Sung, K. Chu, X. Moya, D. Lee, <b>CJ Kim</b> , N. D. Mathur, S. W. Cheong, C. H. Yang and MH Jo*, "Spatially Resolved Photodetection in Leaky Ferroelectric BiFeO <sub>3</sub> "	<i>Adv. Mater.</i> 24, 49-53 (2012)
29. YS Shin, D. Lee, HS Lee, YJ Cho, <b>CJ Kim</b> and MH Jo*, "Determination of the Photocarrier Diffusion Length in Intrinsic Ge Nanowires"	<i>Opt. Express</i> 19, 6119-6124 (2011)
30. <b>CJ Kim</b> , HS Lee, YJ Cho, JE Yang, R. R. Lee, J. K. Lee and MH Jo*, "On-nanowire Band-graded Photodetectors"	<i>Adv. Mater.</i> 23, 1025-1029 (2011)
31. <b>CJ Kim</b> †, HS Lee†, YJ Cho, K. Kang and MH Jo*, "Diameter-dependent Internal Gain in Ohmic Ge Nanowire Photodetectors" (*equal contribution)	<i>Nano Lett.</i> 10, 2043-2048 (2010)
32. G. Lee, Y. S. Woo, JE Yang, D. Lee, <b>CJ Kim</b> and MH Jo*, "Directionally Integrated VLS Nanowire Growth in a Local Temperature Gradient"	<i>Angew.</i> 48, 7366-7370 (2009)
33. S. H. Lee, K. Jeon, W. Lee, A. Choi, H. Jung, <b>CJ Kim</b> and MH Jo*, "P-type Si-nanowire-based Field-effect Transistors for Electric Detection of a Biomarker: Matrix Metalloproteinase-9"	<i>J. Korean Phys. Soc.</i> 55, 232-235 (2009)
34. (Invited Review Paper) K. Kang, <b>CJ Kim</b> and MH Jo*, "Unconventional Roles of Metal Catalysts in Chemical-vapor Syntheses of Single-crystalline Nanowires"	<i>J. App. Phys.</i> 105, 122407 (2009)
35. <b>CJ Kim</b> , D. Lee, HS Lee, G. Lee, GS Kim and MH Jo*, "Vertically Aligned Si Intra-nanowire p-n Diodes by Large-area Epitaxial Growth"	<i>Appl. Phys. Lett.</i> 94, 173105 (2009)
36. HS Lee†, K. S. Kim†, <b>CJ Kim</b> , S. K. Hahn and MH Jo*, "Electrical Detection of VEGFs for Cancer Diagnoses Using Anti-VEGF Aptamer-modified Si Nanowire FETs"	<i>Biosensors Bioelectron.</i> 24, 1801-1805 (2009)
37. (Invited Review Paper) K. Heo, <b>CJ Kim</b> , MH Jo and S. Hong*, "Massive Integration of Inorganic Nanowire-based Structures on Solid Substrates for Device Applications"	<i>J. Mater. Chem.</i> 19, 901-908 (2009)
38. K. Kang, D. A. Kim, HS Lee, <b>CJ Kim</b> , JE Yang and MH Jo*, "Low-temperature Deterministic Growth of Ge Nanowires Using Cu Solid Catalysts"	<i>Adv. Mater.</i> 20, 4684-4690 (2008)
39. I. Sa, BM Lee, <b>CJ Kim</b> , MH Jo and BJ Lee*, "Thermodynamic Analysis for the Size-dependency of Si <sub>1-x</sub> Ge <sub>x</sub> Nanowire Composition Grown by a Vapor-liquid-solid Method"	<i>CALPHAD</i> 32, 669-674 (2008)
40. JE Yang, WH Park, <b>CJ Kim</b> , Z. H. Kim and MH Jo*, "Axially Graded Heteroepitaxy and Raman Spectroscopic Characterizations of Si <sub>1-x</sub> Ge <sub>x</sub> Nanowires"	<i>Appl. Phys. Lett.</i> 92, 263111 (2008)
41. K. Kang, S. Kim, <b>CJ Kim</b> and MH Jo*, "The Role of NiO <sub>x</sub> Overlayers on Spontaneous Growth of NiSi <sub>x</sub> Nanowires from Ni Seed Layers"	<i>Nano Lett.</i> 8, 431-436 (2008)
42. <b>CJ Kim</b> , K. Kang, Y. S. Woo, KG Ryu, H. Moon, JM Kim, DS Zang and MH Jo*, "Spontaneous Chemical Vapor Growth of NiSi Nanowires and Their Metallic Properties"	<i>Adv. Mater.</i> 19, 3637-3642 (2007)
43. <b>CJ Kim</b> , WH Park, JE Yang, HS Lee, S. Maeng, Z. H. Kim, H. M. Jang and MH Jo*, "Fabrication of Si <sub>1-x</sub> Ge <sub>x</sub> Alloy Nanowire Field-effect Transistors"	<i>Appl. Phys. Lett.</i> 91, 033104 (2007)

44. JE Yang, CB Jin, <b>CJ Kim</b> and MH Jo*, "Band-gap Modulation in Single-crystalline Si <sub>1-x</sub> Ge <sub>x</sub> Nanowires"	<i>Nano Lett.</i> 6, 2679-2684 (2006)
45.	

## Patent

1. J. Park, M. P. Levendorf, <b>CJ Kim</b> , L. Brown, "Thin Film Compositions and Methods"	<i>U.S. Patent</i> , No. 9,947,749 (2018)
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## Conference Presentations

1	"Assembly of Atomically Thin Crystals for Nano-topotechnology", <i>Korean Physical Society Fall Meeting</i> , Online, Korea	2021
2	"Assembly of Atomically Thin Crystals for Nano-topotechnology", <i>RPGR 2021</i> , Seoul, Korea	2021
3	"Wafer-scale, van der Waals Structures with Configurable Atomic Structures", <i>Sogang Univ. Dept. of Physics Colloquium</i> , Online, Korea	2021
4	"Artificial van der Waals Crystals", <i>Future Directions in Nanomaterial Synthesis: Workshop</i> , Online, USA	2021
5	"Artificial van der Waals Crystals", <i>2020 ENGE</i> , Jeju, Korea	2020
6	"Manufacturing Tools for Two-dimensional Materials", <i>Korean Ceramic Society Spring Meeting</i> , Daejeon, Korea	2020
7	"Building Artificial Crystals by Twisting One Atomic Layer at a Time", <i>Muju International Winter School Series</i> , Muju, Korea	2020
8	"All-Dry Transfer of Graphene Film by Van der Waals Interactions", <i>2019 International Meeting on Information Display</i> , Gyeongju, Korea	2019
9	"All-Dry Transfer of Graphene Film by Van der Waals Interactions", <i>The 30<sup>th</sup> International Conference on Molecular Electronics and Devices</i> , Busan, Korea	2019
10	"Growth, Patterning and Assembly of Atomically Thin Circuitry", <i>Korean Graphene Society Winter School</i> , Seoul, Korea	2019
11	"Chiral Atomically Thin Films", <i>Korean Physical Society Spring Meeting</i> , Daejeon, Korea	2018
12	"Chiral Atomically Thin Films", <i>Korean Ceramic Society Spring Meeting</i> , Changwon, Korea	2018
13	"Layer-by-layer Assembly of Crystalline Films", <i>The 4<sup>th</sup> International Conference on Advanced Electromaterials</i> , Jeju, Korea	2017
14	"Layer-by-layer Assembly of Atomically Thin Films for Designing 2D Metamaterials", <i>Korean Institute of Chemical Engineers Society Fall Meeting</i> , Daejeon, Korea	2017
15	"Layer-by-layer Assembly of Atomically Thin Films for Designing 2D Metamaterials", <i>Korean Physical Society Fall Meeting</i> , Gyeongju, Korea	2017
16	"Layer-by-layer Assembly of Atomically Thin Films for Designing 2D Metamaterials", <i>IBS Colloquium: Physics Department in POSTECH</i> , Pohang, Korea	2017
17	"Atomically Thin Circuitry with Structural Programming at Molecular-scale", <i>The 4<sup>th</sup> Korean Symposium on Graphene and 2D Materials</i> , Buyeo, Korea	2017
18	"Chiral Atomically Thin Films", <i>Gordon Research Conference on Two Dimensional Electronics Beyond Graphene</i> , South Hadley, US	2016
19	"Giant Circular Dichroism in Two-atom-thick Graphene Metamaterials", <i>Graphene Week</i> , Manchester, UK	2015
20	"Emergence of Superlattice in Graphene Epitaxy on Copper (111)", <i>Gordon Research Conference on Graphitic Carbon Materials</i> , Lewiston, US	2014
21	"Graphene and Hexagonal Boron Nitride Heterostructures for Atomically Thin Circuitry", <i>Gordon Research Conference on Graphitic Carbon Materials</i> , Davidson, US	2012
22	"On-Nanowire Band-Graded Si:Ge Photodetectors", <i>US Airforce-Korea Joint Symposium</i> , GyungJu, Korea	2011

23	"Broadband Photodetection in Si:Ge Nanocrystals", <i>SPIE Optics and Photonics</i> , San Diego, US	2011
24	"Broadband Photocarrier Dynamics in Axially Graded Si <sub>1-x</sub> Ge <sub>x</sub> Nanowires", <i>International Conference on the Physics of Semiconductors</i> , Seoul, Korea	2010
25	"Photogenerated Carrier Dynamics in Group IV Semiconductor Nanowires: Drift vs. Diffusion by Scanning Optical Probes", <i>MRS</i> , San Francisco, US	2010
26	"Vertically Aligned Si Intra-nanowire <i>p-n</i> Diodes by Large-area Epitaxial Growth", <i>MRS</i> , Boston, US	2009
27	"Growth and Optical Characterizations of Si:Ge Alloy Nanowires for Photonic Applications", <i>International Conference on the Physics of Semiconductors</i> , Rio de Janeiro, Brazil	2008
28	"Axial Modulation Doped Si Nanowire Field-Effect Transistors", <i>MRS</i> , San Francisco, US	2008
29	"Nanowire Axial Heterostructure Field-Effect Transistor for High Sensitivity Nanosensors", <i>MRS</i> , San Francisco, US	2007
30	"Nanowire Axial Heterostructure Field-Effect Transistor for High Sensitivity Nanosensors", <i>MRS</i> , San Francisco, US	2007

### **Synergistic Activities**

- Reviewer for *Nat. Mater.*, *Nano Lett.*, *ACS Nano*, *Adv. Mater.*