

# Seon Joon Kim, Ph.D.

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## PROFESSIONAL POSITIONS

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### 2018.03 ~ present: Postdoctoral Researcher

**Drexel University (USA)**

- Advisor: Prof. Yury Gogotsi

**KAIST-NNFC-Drexel FIRST Nano<sup>2</sup> Co-op Research Center**

- Advisors: Dr. Chi Won Ahn, Prof. Byeong-Soo Bae

- Controlling the surface properties and structural assembly of MXenes for sensing and electrochemical applications

### 2017.03 ~ 2018.02: Postdoctoral Researcher

**Korea Advanced Institute of Science and Technology (KAIST), Korea**

- Advisor: Prof. Hee-Tae Jung

- Engineering 2D nanomaterials (Graphenes, MoS<sub>2</sub>, MXenes) and their interfaces for electrocatalysts and gas sensors

- Graphene oxide based thin film membranes for water desalination/organic solvent filtration

- Carbon based membranes for functional interlayers in energy storage devices

### 2011.03 ~ 2017.02: Graduate Student Researcher

**Korea Advanced Institute of Science and Technology (KAIST), Korea**

- Advisor: Prof. Hee-Tae Jung

- Ph.D. Dissertation: Orientation and interface control of various two-dimensional materials and its electrochemical applications

- Synthesis of carbon nanomaterials, two-dimensional (2D) nanomaterials

- Characterization, control, and manipulation of polycrystalline CVD graphene

- Structure controlled thin films for electrocatalysis

### 2014.02 ~ 2014.08: Visiting Research Scholar

**Drexel University, USA**

- Advisor: Prof. Yury Gogotsi

- Synthesis and application of MXenes (Two-dimensional metal carbides)

- Participation in a project on lithium ion batteries, published two papers as first author during 6 months

## EDUCATION (LANGUAGE OF EDUCATION IS ENGLISH)

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**Ph.D.** in Dept. of Chemical and Biomolecular Engineering, KAIST, South Korea **2017**  
- Received the highest rank in the department during admission

**B.S.** in Dept. of Chemical and Biomolecular Engineering, KAIST, South Korea **2011**  
- Graduated with **Summa cum Laude**

## RESEARCH SKILLS & EXPERTISE

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### Synthesis of nanomaterials

- Synthesis, utilization of oriented 2D materials (MXenes, Graphene, planar/vertically aligned TMDs, etc.)

- Thin film deposition (Chemical vapor deposition (CVD), E-beam/thermal deposition)
- Synthesis of various carbon materials
- Composites of nanomaterials with unique structures and morphologies

#### Material characterization

- Film and material characterization (SEM, TEM, AFM, XPS, XRD, Raman, UV-vis spectroscopy, etc.)
- Experience in characterizing materials with synchrotron (Grazing incidence XRD)
- Experience in handling polarized optical microscope (POM)

#### Device characterization

- Basic fabrication and analysis of electrochemical techniques (Three-electrode setup, Coin cell assembly (LIBs) / CV, EIS (Biologic), Battery tester (ARBIN))
- Fabrication of thin film membranes for separation processes
- Experience in fabricating thin films for gas sensing applications

#### Language skill

- Korean (Native)
- English (Fluent) – several years of residence in US

### PUBLICATIONS

1. **Seon Joon Kim**, Ohmin Kwon, Dae Woo Kim, Jihan Kim, Hee-Tae Jung, “Influence of graphene film thickness and domain boundaries on MoS<sub>2</sub> wrinkle nanostructures”, submitted
2. **Seon Joon Kim**, Hyeong-Jun Koh, Yury Gogotsi, Hee-Tae Jung, “MXenes sense gas maximally”, **C&EN**, 96, 11, 2018
3. **Seon Joon Kim**, Dae Woo Kim, Kyeong Min Cho, Kyoung Min Kang, Junghoon Choi, Daeok Kim, Hee-Tae Jung, “Ultrathin graphene oxide laminates on freestanding carbon nanotube supports for enhanced selective permeation in organic solvents”, **Sci. Rep.**, 8, 1959, 2018
4. **Seon Joon Kim**, Hyeong-Jun Koh, Chang E. Ren, Ohmin Kwon, Kathleen Maleski, Soo-Yeon Cho, Babak Anasori, Choong-Ki Kim, Yang-Kyu Choi, Jihan Kim, Yury Gogotsi, Hee-Tae Jung, “Metallic Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene gas sensors with ultrahigh signal-to-noise ratio”, **ACS Nano**, 12, 986-993, 2018  
- [selected as ACS Editors' Choice (one journal per day among all journals published by ACS)]  
- [selected as Front Cover]
5. Sungwoo Jang, **Seon Joon Kim (co-first author)**, Hyeong-Jun Koh, Doo Hyung Jang, Soo-Yeon Cho, Hee-Tae Jung, “Highly Periodic Metal Dichalcogenide Nanostructures with Complex Shapes, High Resolution, and High Aspect Ratios”, **Adv. Funct. Mater.**, 27, 1703842, 2017
6. **Seon Joon Kim**, Dae Woo Kim, Hyung Ouk Choi, Hee-Tae Jung, “Thickness control of CVD-grown graphene film by oxygen plasma etching with recycled use of Ni catalyst”, **J. Nanosci. Nanotechnol.**, 17, 4907-4913, 2017
7. **Seon Joon Kim**, Dae Woo Kim, Joonwon Lim, Soo-Yeon Cho, Sang Ouk Kim, Hee-Tae Jung, “Large-area buckled MoS<sub>2</sub> films on the graphene substrate”, **ACS Appl. Mater. Interfaces**, 8, 13512-13519, 2016
8. Chuanfang (John) Zhang, **Seon Joon Kim (co-first author)**, Michael Ghidui, Meng-Qiang Zhao, Michel W. Barsoum, Valeria Nicolosi, Yury Gogotsi, “Layered Orthorhombic Nb<sub>2</sub>O<sub>5</sub>@Nb<sub>4</sub>C<sub>3</sub>T<sub>x</sub> and TiO<sub>2</sub>@Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> Hierarchical Composites for High Performance Li-ion Batteries”, **Adv. Funct. Mater.**, 26, 4143-4151, 2016
9. **Seon Joon Kim**, Michael Naguib, Mengqiang Zhao, Chuanfang Zhang, Hee-Tae Jung, Michel W. Barsoum, Yury Gogotsi, “High mass loading, binder-free MXene anodes for high areal capacity Li-ion batteries”, **Electrochim. Acta**, 163, 246-251, 2015
10. **Seon Joon Kim**, Dae Woo Kim, Hee-Tae Jung, “Key Growth Parameters Affecting the Domain Structure of Chemical Vapor Deposition (CVD)-Growth Graphene on Nickel”, **RSC Adv**, 3, 22909-22913, 2013
11. Dae Woo Kim, In Kim, Jidon Jang, Yoon Tae Nam, Kangho Park, Ki Ok Kwon, Kyeong Min Cho, Junghoon Choi, Daeok Kim, Kyoung Min Kang, **Seon Joon Kim**, Yousung Jung, Hee-Tae Jung, “One dimensional building block for molecular separation: laminated graphitic nanoribbons”, **Nanoscale**, 9, 19114-19123, 2017
12. Sungwoo Jang, Cheolgyu Kim, Jung Jin Park, Ming Liang Jin, **Seon Joon Kim**, O Ok Park, Taek-Soo Kim,

- Hee-Tae Jung, "A high aspect ratio serpentine structure for use as a strain-insensitive, stretchable transparent conductor", *Small*, 14, 1702818, 2017
13. Kyoung Min Kang, Dae Woo Kim, Chang E. Ren, Kyeong Min Cho, **Seon Joon Kim**, Junghoon Choi, Yoon Tae Nam, Yury Gogotsi, Hee-Tae Jung, "Selective molecular separation on  $Ti_3C_2T_x$ -graphene oxide membranes during pressure-driven filtration: comparison with graphene oxide and MXenes", *ACS Appl. Mater. Interfaces*, 9, 44687-44694, 2017
  14. Chuanfang Zhang, Majid Beidaghi, Michael Naguib, Maria Lukatskaya, Meng-Qiang Zhao, Boris Dyatkin, Kevin Cook, **Seon Joon Kim**, Brandon Eng, Xu Xiao, Donghui Long, Wenming Qiao, Bruce Dunn, Yury Gogotsi, "Synthesis and Charge Storage Properties of Hierarchical Niobium Pentoxide/Carbon/Niobium Carbide", *Chem. Mater.*, 28, 3937-3943, 2016
  15. Cheng Jin An, Sungwoo Jang, Kyoung Min Kang, **Seon Joon Kim**, Ming Liang Jin, Hee-Tae Jung, "A combined graphene and periodic Au nanograte structure: fundamentals and application as a flexible transparent conducting film in a flexible organic photovoltaic cell", *Carbon*, 103, 488-496, 2016
  16. Mihye Wu, Ju Young Jo, **Seon Joon Kim**, Yeon Kim, Yongku Kang, Hee-Tae Jung, Ha Kyun Jung, "Hydrous Amorphous  $RuO_2$  nanoparticles Supported on Reduced Graphene Oxide for Non-aqueous Li-O<sub>2</sub> Batteries", *RSC Adv*, 6, 23467-23470, 2016
  17. Kyoung Hwan Kim, Kyeong Min Cho, Dae Woo Kim, **Seon Joon Kim**, Jaeho Choi, Sang Jin Bae, Sounghee Park, Hee-Tae Jung, "The role of layer-controlled graphene for tunable microwave heating and their applications to the synthesis of inorganic thin films", *ACS. Appl. Mater. Interfaces*, 8, 5556-5562, 2016
  18. Dae Woo Kim, **Seon Joon Kim**, Hyung Ouk Choi, Hee-Tae Jung, "Epitaxial Crystallization Behaviors of Various Metals on a Graphene Surface", *Adv Mater. Interfaces*, 3, 1500741, 2016
  19. Seong-Jun Park, Dae Woo Kim, Sung Woo Jang, Ming Liang Jin, **Seon Joon Kim**, Jong Min Ok, Jong-Seon Kim, Hee-Tae Jung, "Fabrication of graphite grids via stencil lithography for highly sensitive motion sensors", *Carbon*, 96, 491-496, 2016
  20. Soo-Yeon Cho, **Seon Joon Kim**, Youhan Lee, Jong-Seon Kim, Woo-Bin Jung, Hae-Wook Yoo, Jihan Kim, Hee-Tae Jung, "Highly Enhanced Gas Adsorption Properties in Vertically Aligned  $MoS_2$  Layers", *ACS Nano*, 9, 9314-9321, 2015
  21. Kyoung Hwan Kim, Dong Jin Lee, Kyeong Min Cho, **Seon Joon Kim**, Jung-Ki Park, Hee-Tae Jung, "Complete magnesiothermic reduction reaction of vertically aligned mesoporous silica channels to form pure silicon nanoparticles", *Sci. Rep.*, 5, 9014, 2015
  22. Dae Woo Kim, Jong Min Ok, Woo-Bin Jung, Jong-Seon Kim, **Seon Joon Kim**, Hyung Ouk Choi, Yun Ho Kim, Hee-Tae Jung, "Direct Observation of Molybdenum Disulfide,  $MoS_2$ , Domains by Using a Liquid Crystalline Texture Method", *Nano Lett.*, 15, 229-234, 2015
  23. Dae Woo Kim, **Seon Joon Kim**, Jae Sung Kim, Minju Shin, Gyu-Tae Kim, Hee-Tae Jung, "The Influence of Cu lattices on the Structure and Electrical Properties of Graphene Domains during Low-pressure Chemical Vapor Deposition", *ChemPhysChem*, 16, 1165-1171, 2015
  24. Cheng Jin An, **Seon Joon Kim**, Hyung Ouk Choi, Dae Woo Kim, Sung Woo Jang, Ming Liang Jin, Jong-Min Park, Jong Kil Choi, Hee-Tae Jung, "Ultraclean transfer of CVD-grown graphene and its application to flexible organic photovoltaic cells", *J. Mater. Chem. A*, 2, 20474-20480, 2014
  25. Hyung Ouk Choi, Dae Woo Kim, **Seon Joon Kim**, Kyeong Min Cho, Hee-Tae Jung, "Combining the Silver Nanowire Bridging Effect with Chemical Doping for Highly Improved Conductivity of CVD-grown Graphene Films", *J. Mater. Chem. C*, 2, 5902-5909, 2014
  26. Hyung Ouk Choi, Dae Woo Kim, **Seon Joon Kim**, Seung Bo Yang, Hee-Tae Jung, "Role of 1D Metallic Nanowires in Polydomain Graphene for Highly Transparent Conducting Films", *Adv Mater.*, 26, 4575-4581, 2014
  27. Dae Woo Kim, Jinsup Lee, **Seon Joon Kim**, Seokwoo Jeon, Hee-Tae Jung, "The effects of the crystalline orientation of Cu domains on the formation of nanoripple arrays in CVD-grown graphene on Cu", *J. Mater. Chem. C*, 1, 7819-7824, 2013

## PATENTS

1. Korean Patent, Patent number 10-2017-0178063:

Hee-Tae Jung, **Seon Joon Kim**, Hyeong-Jun Koh, Yury Gogotsi, MXENE CHEMIREISTOR GAS SENSOR AND FABRICATION METHOD THEREOF

2. PCT Patent, Patent number PCT/KR2017/000733:  
Hee-Tae Jung, **Seon Joon Kim**, Hyeong-Jun Koh, Yury Gogotsi, MXENE CHEMIREISTOR GAS SENSOR AND FABRICATION METHOD THEREOF

## **HONORS & AWARDS**

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- Best Oral Presentation Award, 2016 Spring Meeting, The Polymer Society of Korea, 2016
- Outstanding Oral Presentation Award, Graduate Symposium, Dept. of Chemical and Biomolecular Engineering, KAIST, 2015
- Grand Prize (First Prize), Photo Contest “Scientific Life”, Korea Foundation for the Advancement of Science & Creativity (KOFAC), 2014
- Korean government scholarship, KAIST-BK 21 Plus program for research studies abroad, 2014  
**- Selected as the most outstanding study of the year in the program**
- Outstanding Poster Awards, Graduate Symposium, Dept. of Chemical and Biomolecular Engineering, KAIST, 2013
- National Science & Technology Scholarship, Korean Government, 2011~2017
- Daelim Industries Scholarship, Korean Institute of Chemical Engineers, 2010  
**- Awarded to only one person per university**
- Honor Student, Dept. of Chemical and Biomolecular Engineering, KAIST, 2009
- Full KAIST Scholarship for International Summer Session Course at UC Berkeley, 2009  
**- Awarded to the top 10 students in the university**
- National Science & Technology Scholarship, Korean Government, 2007~2011

## **PRESENTATIONS**

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### International Presentations

1. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Fully-patterned graphene grown underneath copper films via solid carbon sources”, 24<sup>th</sup> ISChE, Gyeongju, Korea, 2011
2. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Observation of the Domain Structure of Graphene Grown on Polycrystalline Ni by Chemical Vapor Deposition”, 25<sup>th</sup> ISChE, Okinawa, Japan, 2012
3. **Seon Joon Kim**, Dae Woo Kim, Joonwon Lim, Soo-Yeon Cho, Sang Ouk Kim, and Hee-Tae Jung, “Large-area buckled MoS<sub>2</sub> films”, European Materials Research Society (E-MRS) Spring Meeting, Lille, France, 2016
4. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Graphene oxide membranes on chemically stable, free-standing CNT supports for high flux organic solvent nanofiltration”, Materials Research Society (MRS) Fall Meeting, Boston, USA, 2017

### Domestic Presentations

1. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Observation of Graphene Domains on Nickel grown by CVD Methods using Optical Birefringence Visualization”, The Polymer Society of Korea: Spring Meeting, Daejeon, 2012
2. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Investigating the Domain Structure of Multi-Layer Graphene Grown on Nickel Surface using Chemical Vapor Deposition”, The Polymer Society of Korea: Fall Meeting, Changwon, 2012
3. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, “Domain Structure Observation of Graphene Grown on Ni by CVD via Optical Birefringence Visualization”, The Korean Institute of Chemical Engineers: Spring Meeting, Gwangju, 2013
4. **Seon Joon Kim**, Chuanfang Zhang, Yury Gogotsi, Hee-Tae Jung, “One-Pot Synthesis of Nb<sub>2</sub>O<sub>5</sub>@Niobium Carbide MXene Hierarchical Composite for Energy Storage Devices”, The Korean Institute of Chemical

Engineers: Fall Meeting, Ilsan, 2015

5. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, "Large-area MoS<sub>2</sub> Wrinkles Induced by the Graphene Interface", The Korean Materials Research Society: Spring Meeting, Gyeongju, Korea, 2016
6. **Seon Joon Kim**, Dae Woo Kim, and Hee-Tae Jung, "Large-area Buckled MoS<sub>2</sub> Films on the Graphene Interface, The Polymer Society of Korea: Spring Meeting, Daejeon, 2016
7. **Seon Joon Kim**, and Hee-Tae Jung, "Influence of Graphene Substrates on the Large-area Buckling of MoS<sub>2</sub> and its Electrochemical Properties, The Korean Institute of Chemical Engineers: Spring Meeting, Jeju, 2017