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## Koohee Han

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### EDUCATION

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- Aug. 2013 – **North Carolina State University** Raleigh, NC, USA  
Ph.D. Candidate in Chemical and Biomolecular Engineering  
Thesis: *Directed Assembly and Manipulation of Reconfigurable Clusters from Anisotropic Particles*  
Advisor: Prof. Orlin D. Velev, INVISTA Professor
- 2011 – 2013 **University of Seoul** Seoul, Korea  
Master of Science in Energy and Environmental System Engineering  
Thesis: *Fabrication of Multilayer Thin Films for Energy Efficient Window Applications by the Sol-Gel Process*  
Advisor: Prof. Jung Hyeun Kim
- 2006 – 2011 **University of Seoul** Seoul, Korea  
Bachelor of Science in Chemical Engineering

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### PROFESSIONAL EXPERIENCE

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- Summer 2016 **Apple Inc., Intern – Module Process Engineer** Cupertino, CA, USA
- Development of Advanced Interconnection Technologies for Module Process
- 2013 – **North Carolina State University, Graduate Research Assistant**
- Directed assembly and manipulation of hierarchically ordered clusters from anisotropic particles:
    - 1) Fabrication of metallo-dielectric Janus spheres and patchy microcubes, 2) self-assembly of Janus spheres, 3) electric and magnetic field-directed assembly and manipulation of Janus spheres and patchy microcubes, 4) establishment of new assembly and actuation principles for reconfigurable clusters from patchy microcubes, 5) analysis of cluster transformations and dynamic patterns for small clusters, and 6) development of a new class of active colloidal structures such as self-propelling microswimmers
- 2011 – 2013 **University of Seoul, Graduate Research Assistant**
- Development of solar control coatings by using nanostructured thin films:
    - 1) Design of wavelength-selective reflection/transmission multilayer thin film structure based on the transfer-matrix method (*e.g.*, high- and anti-reflection coatings), 2) sol-gel synthesis of TiO<sub>2</sub> and SiO<sub>2</sub> coating solutions, 3) fabrication of multilayer thin film structure by sol-gel spin coating technique, 4) characterization of multilayer structure using SEM, UV-Vis-NIR spectrophotometer, and spectroscopic ellipsometry, and 5) development of energy-efficient window coating exhibiting high reflection at near-infrared region and high transmission at visible region
  - Obtaining new expressions for the slip correction factor by measuring electrical mobility of nanoparticles: Investigation for the effect of the surface energy of polystyrene, silica, and gold nanoparticles on the accommodation of air molecules to the particle surfaces
- 2010 – 2011 **University of Seoul, Undergraduate Research Assistant**
- Fabrication and characterization of dye-sensitized solar cells (DSSC)

## RESEARCH INTERESTS

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- Colloidal assembly: Directed and self-assembly, anisotropic building blocks (*e.g.*, Janus/patchy particles)
- Materials science: Soft matter, stimuli-responsive materials, nanostructured materials
- Optical applications: Photonic crystals, optical coatings

## TEACHING EXPERIENCE AND STUDENT MENTORSHIP

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### *Korean Language Tutoring*

Nov. 2015 – Abby Zlamal Twin Oak Academy

### **North Carolina State University, Graduate Teaching Assistant**

Spring 2016 Colloid Science and Nanoscale Engineering (CHE 596) – TA Evaluation 5.0/5.0  
2014 Chemical Engineering Thermodynamics I (CHE 315) and II (CHE 316)

### **North Carolina State University, Mentoring**

Spring & Fall 2016 Andrew Murphy NC State University  
Summer 2014 Nidhi M. Diwakar Worcester Polytechnic Institute  
Spring 2014 Aakash Kumar NC State University

### **University of Seoul, Graduate Teaching Assistant**

2011 – 2013 Chemistry and Experiment for 4 Semesters  
2012 Undergraduate Research Program

### **University of Seoul, Mentoring**

2012 – 2013 Juseok Choi University of Seoul

## AWARDS AND HONORS

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### **North Carolina State University**

Jan. 2014 – *MRSEC Graduate Fellow*, Research Triangle Material Research and Engineering Center (RT-MRSEC) funded by the National Science Foundation (NSF)

Nov. 13, 2015 *Best Poster Award* – 3<sup>rd</sup> place, MRS/ASM/AVS Joint Symposium, Raleigh, NC USA

May. 12, 2015 *Best Poster Award* – 3<sup>rd</sup> place, Magnetically Stimulated Soft Matter Conference, Athens, GA, USA

Sep. 3, 2014 *Best Poster Award* – 1<sup>st</sup> place, Triangle Student Research Competition, Research Triangle Park, NC, USA

Aug. 7, 2014 *Best Poster Award* – 1<sup>st</sup> place, US-German Soft Matter Workshop, Beverly, MA, USA

### **University of Seoul**

#### *Graduate*

2011 – 2012 Scholarship for Excellent Achievement for 4 Semesters

#### *Undergraduate*

2006 – 2010 Scholarship for Excellent Achievement for 7 Semesters

## PROFESSIONAL ORGANIZATIONS

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- Materials Research Society (MRS)
- American Physical Society (APS)

## PUBLICATIONS

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- [1] **K. Han**, J. H. Kim, "Reflectance Modulation of Transparent Multilayer Thin Films for Energy Efficient Window Applications", *Materials Letters* **65**, 2466-2469 (2011). [link](#)
- [2] **K. Han**, J. H. Kim, "Fabrication of TiO<sub>2</sub>/SiO<sub>2</sub> Multilayer Film Structure by the Sol-Gel Process with Efficient Thermal Treatment Methods", *Applied Surface Science* **263**, 69-72 (2012). [link](#)
- [3] H. Jung, **K. Han**, G. W. Mulholland, D. Y. H. Pui, J. H. Kim, "Effect of the Surface Energy of Particle Materials on the Accommodation of Gas Molecules to the Particle Surfaces", *Journal of Aerosol Science* **65**, 42-48 (2013). [link](#)
- [4] J. Choi, **K. Han**, J. H. Kim, "Enhanced Near Infrared Reflectance of TiO<sub>2</sub>/SiO<sub>2</sub>/TiO<sub>2</sub> Multilayer Structure using a Base-Catalyzed SiO<sub>2</sub> film", *Thin Solid Films* **569**, 100-103 (2014). [link](#)
- [5] J. H. Kim, **K. Han**, "Multilayer Structure Manufacture Method for Sol-Gel Process", *Korea Patent*, #10-1432040-0000 (Aug. 2014).
- [6] B. Bharti, D. Rutkowski, **K. Han**, A. Kumar, C. K. Hall, O. D. Velev, "Capillary Bridging As a Tool for Assembling Discrete Clusters of Patchy Particles", submitted (2016).
- [7] **K. Han**, C. W. Shields IV, N. D. Diwakar, B. Bharti, G. P. López, O. D. Velev, "Magnetic Assembly and Manipulation of Self-Reconfiguring Structures from Patchy Microcubes", manuscript *in preparation* (2016).
- [8] O. D. Velev, **K. Han**, "Design of New Classes of Multi-Responsive Soft Matter by Combining Active Particles and Matrices", manuscript *in preparation* (2016).

## PRESENTATIONS

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### Oral Presentations

- [1] **K. Han**, Bhuvnesh Bharti, C. W. Shields IV, G. P. López, Paulo E. Arratia, O. D. Velev, "A New Class of Colloidal Swimmers Based on Magnetically Actuated Assemblies of Metallo-Dielectric Microcubes", 2016 AIChE Annual Meeting, San Francisco, CA, USA
- [2] U. Ohiri, **K. Han**, C. W. Shields IV, G. P. López, N. M. Jokerst, O. D. Velev, "Development of a New Generation of Remotely Powered Self-Propelling Active Particles", 2016 ACS Colloid and Surface Science Symposium, Cambridge, MA, USA
- [3] **K. Han**, C. W. Shields IV, G. P. López, B. Bharti, O. D. Velev, "Motile Microbots from Dynamically Interacting and Self-Reconfiguring Assemblies of Metallo-Dielectric Janus Microcubes", 2016 APS March Meeting, Baltimore, MD, USA
- [4] **K. Han**, C. W. Shields IV, G. P. López, B. Bharti, O. D. Velev, "Dynamically Interacting Self-Reconfiguring Assemblies of Janus Microcubes: New Actuation Principles for Microbots and Colloidal Origami", 2015 International Chemical Congress of Pacific Basin Societies, Honolulu, Hawaii, USA
- [5] **K. Han**, C. W. Shields IV, N. D. Diwakar, B. Bharti, G. P. López, O. D. Velev, "Microbots and Colloidal Origami: Dynamically Interacting and Self-Reconfiguring Assemblies of Metallo-Dielectric Janus Microcubes", 2015 AIChE Annual Meeting, Salt Lake City, UT, USA.
- [6] B. Bharti, **K. Han**, C. W. Shields IV, G. P. López, O. D. Velev, "Programmed Assembly of Patchy Microcubes into Self-Reconfiguring Reversibly-Actuating Structures", 2015 ACS Colloid and Surface Science Symposium, Pittsburgh, PA, USA.
- [7] **K. Han**, C. W. Shields IV, B. Bharti, G. P. López, O. D. Velev, "Prototypes of Soft Robotic Components Based on Novel Dynamic Patterns from Metallo-Dielectric Microcubes Driven by External Fields", 2014 MRS Fall Meeting, Boston, MA, USA.
- [8] C. W. Shields IV, **K. Han**, B. Bharti, O. D. Velev, G. P. López, "Directed Assembly of Microactuators: Field-Controlled Folding and Bending of Chains of Patchy Microcubes", 2014 ACS Colloid and Surface Science Symposium, Philadelphia, PA, USA.

*Selected Poster Presentations*

- [1] **K. Han**, B. Bharti, C. W. Shields IV, G. P. López, O. D. Velev, “Directed Assembly of Hierarchically Ordered Clusters from Anisotropic Microparticles”, 2016 APS March Meeting, Baltimore, MD, USA
- [2] **K. Han**, C. W. Shields IV, B. Bharti, G. P. López, O. D. Velev, “Field-Directed Assembly and Manipulation of Chains of Metallo-Dielectric Microcubes”, 2015 MRS/ASM/AVS Joint Symposium, Raleigh, NC, USA. **Best Poster Award - 3<sup>rd</sup> place.**
- [3] **K. Han**, C. W. Shields IV, B. Bharti, G. P. López, O. D. Velev, “Magnetic Assembly and Manipulation of Self-Reconfiguring Structures from Patchy Microcubes”, 2015 Triangle Student Research Competition, Research Triangle Park, NC, USA. **Excellent Abstract was awarded.**
- [4] **K. Han**, C. W. Shields IV, B. Bharti, N. M. Diwakar, G. P. López, O. D. Velev, “Magnetic Field Directed-Assembly and Manipulation of Motile Microbots from Metallo-Dielectric Microcubes”, 2015 Magnetically Stimulated Soft Matter Conference, Athens, GA, USA. **Best Poster Award - 3<sup>rd</sup> place.**
- [5] **K. Han**, C. W. Shields IV, B. Bharti, N. M. Diwakar, G. P. López, O. D. Velev, “Prototypes of Soft Robotic Components Based on Novel Dynamic Patterns from Metallo-Dielectric Microcubes Driven by External Fields”, 2014 Triangle Student Research Competition, Research Triangle Park, NC, USA. **Best Poster Award - 1<sup>st</sup> place.**
- [6] **K. Han**, C. W. Shields IV, B. Bharti, N. M. Diwakar, G. P. López, O. D. Velev, “Assembling Metallo-Dielectric Microcubes into Soft Robotic Components Based on Novel Dynamic Patterns”, 2014 US-German Soft Matter Workshop, Beverly, MA, USA. **Best Poster Award - 1<sup>st</sup> place.**

**OUTREACH**


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2016	Apr. 20	NC Science Festival	NC State University, Raleigh, NC, USA.
	Jan. 28	Taste of Engineering	NC State University, Raleigh, NC, USA.
2015	Apr. 24	Nano Days	NC State University, Raleigh, NC, USA.
	Apr. 13	NC Science Festival	Duke University, Durham, NC, USA.
	Jan. 20	Taste of Engineering	NC State University, Raleigh, NC, USA.
2014	Apr. 25	Nano Days	NC State University, Raleigh, NC, USA.
	Apr. 10	NC Science Festival	Duke University, Durham, NC, USA.
	Feb. 27	Taste of Engineering	NC State University, Raleigh, NC, USA.
2009	Jul. 26 – Aug. 4	Korean Youth International Volunteer Corps	Life Primary School, Sihanoukville, Cambodia.