



## **Dr. Iltai Isaac Kim**

Assistant Professor  
Department of Engineering  
School of Engineering and Computing Science  
College of Science and Engineering  
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### **RESEARCH INTERESTS**

- Near-surface phenomena study: effective refractive index, adsorption, density, nanoscale film thickness
- Opto-mechanical property measurement using optical diagnostics
- Coated surface monitoring technology development based on optics
- Ultra-sensitive, super-resolution, and three-dimensional surface plasmon resonance imaging coupled with hyperbolic metamaterials, ultrafast and nanoscale scanning.
- Nano-bio-chemical sensing and micro/nanoscale thermal-fluids applications using nano-biophotonics and M/NEMS technique.

### **TEACHING INTERESTS**

- Fluid mechanics, Experimental thermal-fluids, and Gas dynamics.
- Optical diagnostics and Microfabrication (M/NEMS).
- Heat transfer, Convection, Radiation, Fluid Machinery, Combustion, and Iron & Steel Manufacturing.
- \* Courses Taught:
  - Fluid Mechanics: ENGR 3315/ENTC 3306
  - Fluid mechanics Laboratory: ENTC 3220/ENTC 3406-201,
  - Micro Electrical/Mechanical Systems (MEMS): ENGR 4390

### **PROFESSIONAL EXPERIENCE**

- **Assistant Professor**, TAMU-Corpus Christi, July 2014~present.
- **Co-organizer of International Symposium**, the 17th International Symposium on Flow Visualization (ISFV), June, Gatlinburg, TN, 2016.
- **Journal Reviewers**
  - Scientific Reports, Oct. 2015~present.
  - Langmuir, Dec. 2013 ~ present.
  - Optics Express, Sep. 2013 ~ present.
  - Optics Letters, Applied Optics June 2012 ~ present.
  - Experiments in Fluids, Jan. 2010 ~ present.
  - Sensors, Nov. 2016 ~ present.
- **Committee Members in Academic Society**
  - **ASME Nanoscale Thermal Transport (K-9)**
  - **ASME Heat transfer Visualization (K-22) in Heat Transfer Division**
- **Visiting Scientist**, Sandia National Lab, Jan. 2014-June 2014.
- **Postdoctoral Scientist**, Sandia National Lab, Jan. 2012~Jan. 2014.
- **Postdoctoral Fellow**, Argonne National Lab, Jan. 2009~Dec. 2011.
- **Research Assistant**, UT, 2004-2008.



- **Research Engineer and Assistant Manager, POSCO**, Pohang, Korea, 1995-2003.
  - Served as a mentor for undergraduate and graduate students.
- **Teaching Instructor, POSTECH, Flow visualization course funded by AFERC**, Pohang, Korea, August, 1993.
- **Research Assistant, POSTECH**, Pohang, Korea, 1992-1994.

## ACADEMIC SERVICES

- **Faculty Mentor in Engineering Day at TAMU-CC**: Feb. 2015.
- **Member in Faculty Search Committee**: 2015, 2016 and 2018
- **Faculty Mentor and Judges in Capstone Design Project**: 2015, 2016, and 2017.
- **Faculty Mentor in Islander Day**: 2015, 2017, and 2018.
- **Judges in First Tech Challenge**: 2017, 2018, and 2019.
- **Director in Science Olympiad**:, 2016, 2017 (Bottle rocket), and 2019 (egg drop).
- **Leading organizer** in MOU with Sejong Academy and Science & Arts in Korea, Jan. 30, 2018:
  - Winter STEM camp at SASA, Jan. 1-6, 2019 (2 faculty members from TAMU-CC)

## EDUCATION

- **Ph.D in Mechanical, Aerospace & Biomedical Engineering**: December 2008.  
**University of Tennessee**, Knoxville.
  - \* Ph.D degree course in Mechanical Engineering, **Texas A & M University**: 2003-2004. (Doctoral coursework completed, qualifying exam passed with a top score, and transferred with an adviser)
  - \* Thesis: *Label-free mapping of near-field transport properties of micro/nano-fluidic phenomena using surface plasmon resonance (SPR) reflectance imaging.* (Advisor: Dr. Kenneth Kihm).
- **M.S in Mechanical Engineering** - February 1994.  
**Pohang University of Science & Technology (POSTECH)**, Pohang, Korea.
  - \* Thesis: *A study on the Plume Flow of Attitude Control Thruster and the Plume Impingement Phenomena on the Satellite Structure.* (Advisor: Drs. Chung-Hwan Chun & Kang Yul Huh).
- **B.S in Mechanical Engineering** – February 1992.  
**Pohang University of Science & Technology (POSTECH)**, Pohang, Korea. (Advisor; Dr. C. M. Lee)

## HONORS, AWARDS, AND CERTIFICATIONS

- **Invited speaker in 13th International Nanotech Symposium & Nano-Convergence Expo**, NANO KOREA 2015, “Nano-bio-chemical sensing and energy conversion”, July 1-3, 2015.
- **Selected as an award for an attendance to Pan American Studies Institute (PASI) workshop on “Frontiers of Casimir Physics” in Ushuaia, Argentina, Oct. 6-17, 2012 funded by NSF** (\$7,000 equivalent as a PI).
- **Selected as an award for 2009 NRC Research Associateship Program** among 50 qualified applicants in **NIST/NIH Joint Research** (\$55,000/one year for 2 years as a PI):  
High resolution thermal energy detection in photothermal therapy of tumors with 3-D wide-field surface plasmon resonance microscopy.
- **Cover title in *Langmuir* journal**: Unveiling of hidden complex cavities formed during nanocrystalline self assembly, volume **25**, 1881-1884, 2009.
  - **Highlighted at Science in *Vertical News***: April 2009.

- **KUSCO-KSEA Graduate Student Scholarship**, 2008.
- **SARIF Summer GRA Award at University of Tennessee**, 2008.
- **Korean honor scholarship from Korea government**, 2004.
- **A scholarship from department of mechanical engineering at TAMU**, 2004.
- **A director's award for the excellent engineering work**, The development of RH-OB oxygen enrichment burner, Pohang, POSCO, 2000.
- **CEO's award for the excellent paper** (The heat technical conference), The thermal fluid analysis of the reheating furnaces of wire rod mills by computer simulation for the modification of dam structures inside the furnace, Gwangyang, POSCO, 1999.

## PUBLICATIONS AND PRESENTATIONS

### Papers in Peer-Reviewed Journals

- J. S. Park, Y. Lie, H. J. Kim, H. C. Kim, and **I. Kim**, Development of aperture total internal reflection (A-TIR) for micro droplet and fingerprinting patterns characterization, *Optics Communications* (IF: 1.961), **453**, 124414, 2019.
- J. S. Park, R. Cabosky, Z. Ye, and **I. Kim**, Investigating the mechanical and optical properties of thin PDMS film by flat-punched indentation, *Optical Materials* (IF: 2.320) **85**, 153-161, 2018.
- **I. Kim**, S. Paik, Y. Jeon, J. S. Park, H. Kim and H. Kim, Full-field thickness measurement of ultrathin liquid film in receding contact-induced nano-channel using surface plasmon resonance, *Optics Express* (IF: 3.356) **26**, 20975, 2018.
- S. Campione, **I. Kim**, D. D. Ceglia, G. A. Keeler, and T. S. Luk, Experimental verification of epsilon-near-zero plasmon polariton modes in degenerately doped semiconductor nanolayers, *Optics Express*, (IF: 3.307) **24**, 18782, 2016.
- **I. Kim** and K. Kihm, Nano sensing and energy conversion using surface plasmon resonance, *Materials*, (IF: 2.728) **8**, 4332, 2015.
- T. S. Luk, S. Campione, **I. Kim**, S. Feng, Y. C. Jun, S. Liu, J. B. Wright, I. Brener, P. B. Catrysse, S. Fan, and M. B. Sinclair, Directional perfect absorption using deep subwavelength low-permittivity films, *Phys. Rev. B* (IF: 3.736) **90**, 085411, 2014.
- **I. Kim** and K. Kihm, Progressive dryout of nanofluids on the hydrophilic and hydrophobic surfaces, *Journal of Heat Transfer* (IF: 2.055) **135**, 080911, 2013.
- H. Yi, **I. Kim**, and K. Kihm, Dryout Patterns of Nanofluids With Different Initial Concentrations of Nanoparticles (47nm, Al<sub>2</sub>O<sub>3</sub>), *Journal of Heat Transfer* (IF: 2.055) **135**, 080910, 2013.
- T. S. Luk, **I. Kim**, Campione, S.W. Howell, G. S. Subramania, R. Grubbs, I. Brenner, H. Chen, S. Fan, and, M. Sinclair, Near-infrared surface Plasmon polariton dispersion control with hyperbolic metamaterials, *Optics Express* (IF: 3.525) **21**, 11107, 2013.
- **I. T. Kim** and K.D. Kihm, Hidden cavity formations by nanocrystalline self-assembly on various substrates with different hydrophobicities, *Langmuir* (IF: 4.187) **28**, 9195, 2012.
- K. Kihm, S. S. Cheon, J. S. Park, J. S. Lee, **I. Kim**, and H. J. Yi, Surface Plasmon resonance (SPR) reflectance imaging: Far-field recognition of near-field phenomena, *Optics and Laser in Engineering* (IF: 1.916) **50**, 64-73, 2012.
- **I. Kim**, S. Bander, J. Hranisavljevic, L. Huang, G. Wiederrecht, D. Tiede, Metal nanoparticle Plasmon enhanced light-harvesting in Photosystem I thin film, *Nano Letters* (IF: 13.198) **11**, 3091-3098, 2011.
- **I. Kim** and K. D. Kihm, Measuring near-field nanoparticle concentration fields by correlating SPR reflectance with nanofluidic effective refractive index (ERI), *Optics Letters* (IF: 3.318) **35**, 393-395, 2010.
- **I. Kim** and K. D. Kihm, Unveiling hidden complex cavities formed by evaporative nanofluidic (Al<sub>2</sub>O<sub>3</sub>) self-assembly, *Journal of Heat Transfer* (IF: 0.959) **131**, 080907-1, 2009.
- B. A. Green, R. Steward, **I. Kim**, C. K. Choi, P. K. Liaw, K. D. Kihm, and Y. Yokoyama, In situ

- observation of pitting corrosion of the Zr<sub>50</sub>Cu<sub>40</sub>Al<sub>10</sub> bulk metallic glass, *Intermetallics* (IF: 2.231) **17**, 568-571, 2009.
- **I. Kim** and K. D. Kim, Unveiling hidden complex cavities formed during nanocrystalline self assembly, *Langmuir* (IF: 3.898) **25**, 1881-1884, 2009, *selected as a cover page in issue 4*.
  - **I. T. Kim** and K. D. Kihm, Label-Free and Near-Field Mapping of Molecular Diffusion (Saline Solution/Water) Using Surface Plasmon Resonance (SPR) Refractive Index Field Imaging, *Journal of Heat Transfer* (IF: 1.421) **130**, 080906-1, 2008.
  - **I. T. Kim** and K.D. Kihm, Full-field and real-time SPR imaging thermometry, *Optics Letters* (IF: 3.711) **32**, 3456~3458, 2007.
  - **I. T. Kim** and K.D. Kihm, Real-time and full-field detection of near-wall salinity using Surface Plasmon Resonance (SPR) reflectance, *Analytical Chemistry* **79**, 5418~5423, 2007.
  - **I. T. Kim** and K. D. Kihm, Surface plasmon resonance (SPR) reflectance imaging: A label-free/real-time mapping of microscale mixture concentration fields (Water+Ethanol), *Journal of Heat Transfer* (IF: 1.202) **129**, 930, 2007.
  - **I. T. Kim** and K.D. Kihm, Label-free visualization of microfluidic mixture concentration fields using a surface plasmon resonance (spr) reflectance imaging, *Experiments in Fluids* (IF: 1.112) **41**, 905~916, 2006.
  - J. G. Kim, K. Y. Huh, and **I. T. Kim**, Three-dimensional analysis of the walking beam type slab reheating furnace in hot strip mills, *Numerical Heat Transfer, Part A* (IF: 0.354) **38**, 589~609, 2000.

### Conference Papers/Presentation and Book Chapters

- I. Kim and K. D. Kihm, Nano sensing and energy conversion using surface plasmon resonance, Top 5 Contributions in Material Science 4th edition, Avid Science, Mar. 25, 2019.
- I. Kim, Surface plasmonic imaging and quantitative plasmonic applications, Nano-SMAT, USA, South Padre Island, Oct. 30, 2018.
- I. Kim, Full-field measurement of ultra-thin liquid film thickness using surface plasmon resonance, ASME IMECE 2018, Pittsburg, Nov. 15, 2018.
- I. Kim, S. Paik, Y. B. Jeon, J. S. Park, H. Kim and H. Kim, Full-field measurement of ultra-thin liquid film thickness using surface plasmon resonance, Nano Korea 2018, Ilsan, Korea, July 12, 2018.
- J. S. Park, H. Kim, H. Kim, and I. Kim, Characterization of micro droplet patterns on differently coated glass surfaces using Total Internal Reflection (TIR) measurement, Nano Korea 2018, Ilsan, Korea, July 13, 2018.
- J. Park, R. Cabosky, Z. Ye, and I. Kim, Thickness Dependence of Refractive Index of Compressed Polydimethylsiloxane (PDMS) Film, UKC 2017, Washington DC, Aug. 10, ISBN 978-0-9967493-7-4, pp. 201, 2017.
- I. Kim and M. Olson, Optical property detection of thermochromics molecules depending on temperature change, The 17th International Symposium on Flow Visualization (participating as a co-organizer), Gatlinburg, TN, June 19-22, 2016.
- I. Kim and K. D. Kihm, In-situ visualization of evaporation induced self-assembly phenomena of nanofluids, Proceedings of the ASME-JSME-KSME Joint Fluids Engineering Conference 2015, AJK2015-FED, Seoul, Korea, July 26-31, AJK (ASME-JSME-KSME) FLUIDS-20804, 2015.
- I. Kim, Nano-bio-chemical sensing and energy conversion, 13th International Nanotech Symposium & Nano-Convergence Expo, NANO KOREA 2015, Seoul, July 1-3, 2015 (invited speaker in Nanomaterials session).
- I. Kim, Evaporation induced property change and hidden cavity formation, TechConnect World Innovation Conference Proceedings, Washington DC, June 14-17, ISBN 978-1-4987-4727-1, pp. 494-497, 2015.
- I. Kim, Campione, S.W. Howell, G. S. Subramania, R. Grubbs, I. Brenner, H. Chen, S. Fan, and , M. Sinclair, T. S. Luk, Dispersion control of near-infrared surface Plasmon polariton using hyperbolic metamaterials, CLEO, San Jose, June 9-14, 11107-11114, 2013.

- I. Kim, S. Bender, J. Hranisavljevic, L. M. Utschig, L. Huang, G. P. wiederrecht, D. M. Tiede, Metal nanoparticle-enhanced light harvesting in a Photosystem I thin film, ACS 241<sup>st</sup> spring Meeting, Anaheim, CA, Mar. 27-31, 2011.
- I. T. Kim, K. D. Kihm, Label-free detection of full-field microfluidic concentration and temperature Fields by surface plasmon resonance (SPR) reflectance imaging technique, 18th International Symposium on Transport Phenomena (ISTP-18), Daejon, Korea, Aug. 27-30, pp.244-258, 2007.
- I. T. Kim, S. H. Kim, Y. W. Lee, S. H. Lee, and N. K. Lee, The establishment of optimal standard of reheating furnaces in wire rod mills for energy saving by experiment and three dimensional thermal fluid analysis of reheating furnaces, the 14th workshop of energy saving technology, The Korea Institute of Energy Technology, Daejeon , Korea, Oct. 5, 1999.
- J. G. Kim, K. Y. Huh and I. T. Kim, Three-dimensional analysis of the walking beam type slab reheating furnace in hot strip mills, Spring meeting, The Korean Institute of Computational Fluid Engineering, Daejon, Korea, May 28, 1999.
- I. T. Kim, K. Y. Huh and C. H. Chun, A study on the plume flow of attitude control thruster in satellite, The Korean Institute of Aeronautics and Space, The national air force school, Cheongju, Korea, April 17, pp. 201-204, 1993.

### **Journal Papers in Preparation**

- J. S. Park and I. Kim, The determination of microdroplet profile by reflection interference fringe (*Journal of Physics, D*).
- I. Kim, Jin Xiao, Y. Lie, Z. Ye, Opto-mechanical stress determination of PDMS thin film using surface plasmon resonance (SPR) (*Optics Express*).
- I. Kim and Yang Lie, and Jae Sung Park, Aperture total internal reflection for droplet characterization (*Journal of Optics*).

### **Invited Presentations**

- I. Kim, Surface plasmonic imaging and quantitative plasmonic applications, NIST Boulder, Aug. 13, 2018.
- I. Kim, Ultrasensitive sensing applications using surface plasmon resonance (SPR), total internal reflection and interference, Busan National University, Busan Korea, July 19, 2018.
- I. Kim, Ultrasensitive sensing applications using surface plasmon resonance (SPR), total internal reflection and interference, POSTECH, Pohang Korea, July 18, 2018.
- I. Kim, Research activities of Nano Sensing & Energy Lab at TAMU-CC, KAERI, Korea, June 26, 2017.
- I. Kim, How to detect humidity and negative ions, UNIX Electronics, Korea, June 23, 2017.
- I. Kim, Research Recent progress research at NSEL, TAMU-CC, POSTECH, Korea, June 19, 2017.
- I. Kim, Research activities of Nano Sensing & Energy Lab at TAMU-CC, KAERI, Korea, Aug. 4, 2016.
- I. Kim, Energy conversion and nano-bio-chemical sensing using nanaophotonics, POSTECH, Korea, July 11, 2016.
- I. Kim, Real-time, label-free, and full-field sensing using surface plasmon resonance, MTS Subsea Leak Detection Symposium, Houston, TX, Nov. 9, 2015.
- I. Kim, “Visualization of mixing dynamics in microchannel using surface plasmon resonance technique”, 3D Printing and Digital Rock Physics, Sandia National Laboratories, Santa Fe, NM, Aug. 3, 2015.
- I. Kim, “Thermal-fluids and energy conversion applications using synergy of nano-biophotonics and engineering”, University of Maryland, College Park, MD, Oct.14, 2014.
- I. Kim, “Thermal-fluids and energy conversion applications using surface plasmon resonance”, TAMU, College Station, TX, Oct.10, 2014.
- I. Kim, “Thermal-fluids applications using surface plasmon resonance imaging”, KAERI, Daejon,

Korea, May 20, 2014.

- I. Kim, “Thermal-fluids and energy applications using synergy of nanotechnology and engineering”, OCI, Seongnam, Korea, May 13, 2014.
- I. Kim, “Synergy of nanotechnology and engineering for energy / thermal-fluids applications”, University of Houston, Houston, TX, Mar. 24, 2014.
- I. Kim, “Applications of surface Plasmon resonance (SPR): Label-free imaging and energy conversion”, KLA-Tencor, June 28, 2013.
- I. Kim, “Applications of surface Plasmon resonance (SPR)”, Wichita State University, Apr. 12, 2013.
- I. Kim, “surface Plasmon resonance imaging to detect transport properties and solar energy conversion”, University of Central Florida, Feb. 28, 2012.
- I. Kim, A label-free mapping of transport properties and energy conversion using surface plasmon resonance, Dept. of Mechanical & Industrial Eng., University of Toronto, Dec. 14, 2011.
- I. Kim, A label-free mapping of transport properties and energy conversion in thin film devices using surface plasmon resonance, Marquette University, Oct. 27, 2011.
- I. Kim, Metal nanoparticle plasmon enhanced light harvesting in Photosystem I thin film device and a label-free imaging using surface plasmon resonance, Sandia National Lab, July, 2011.
- I. Kim, Label-free mapping of transport properties of thermo-fluidic phenomena and solar energy harvesting using surface plasmon resonance (SPR), Dept. of Mechanical Eng., IUPUI, Mar. 10, 2011.
- I. Kim, The recent trends in plasmonics and its application: Thermal-flow visualization, KSEA-MW chapter, Mt. Prospect, Feb. 18, 2011.
- I. Kim, Label-free Mapping of Near-field Transport Properties in Micro/nanoscale Phenomena Using Surface Plasmon Resonance (SPR) Reflectance Imaging, POSTECH, Aug. 4, 2009.
- I. Kim, Label-free Mapping of Near-field Transport Properties using Surface Plasmon Resonance (SPR) Imaging Technique, KNU, Aug. 3, 2009.
- I. Kim, Label-free Mapping of Near-field Transport Using Surface Plasmon Resonance (SPR) Reflectance Imaging Fluid control Applications, KAIST, July 30, 2009.
- I. Kim, Label-free Mapping of Near-field Transport and Optical Properties Using Surface Plasmon Resonance (SPR) Reflectance Imaging, Argonne National Lab, Chicago, IL, Oct. 2, 2008.
- I. Kim, Label-free Mapping of Near-field Transport Properties Using Surface Plasmon Resonance (SPR) Reflectance Imaging, NIST, Gaithersburg, MD, May 22, 2008.

### **Presentations**

- M. Jacobs, Z. Guo, A. Carrilo, M. Olson, and I. Kim, Detecting optical property variation of temperature-dependent color change of thermochromics molecules using surface plasmon resonance (SPR) imaging, 3<sup>rd</sup> Innovation Science by TAMU-CC Chemistry, Corpus Christi, TX, Apr. 28, 2015.
- I. Kim, Surface plasmon resonance imaging for near surface phenomena, Gordon Research Conference (GRC) on Micro/nano scale phase change heat transfer, Galveston, TX, Jan. 11-16, 2015.
- I. Kim, “Thermal-fluids and energy applications using synergy of nanotechnology and engineering”, TAMU, Corpus Christi, TX, Apr. 28, 2014.
- I. Kim, “Thin film perfect absorption and hyperbolic metamaterials for enhanced photoluminescence”, 7th Postdoctoral Technical Showcase, Sandia National Laboratories, Albuquerque, NM, Dec. 12, 2013.
- I. Kim and K. Kihm, In-situ label-free imaging technique to characterize nanofluids, Rio Grande Symposium, Albuquerque, NM, Oct. 7, 2013.
- I. Kim, Near-field energy transfer enhancement and label-free mapping of transport properties using surface plasmon resonance (SPR), 6th Postdoctoral Technical Showcase, Sandia National Laboratories, Dec. 11, 2012.
- I. Kim, T. Luk, S. Campione, S.W. Howell, G. S. Subramania, R. Grubbs, I. Brenner, H. Chen, S. Fan, and M. Sinclair, Direct observation of near-infrared surface Plasmon dispersion control for near-field photovoltaic application, ASME 2012 IMECE, Houston, TX, Nov. 9-15, 2012.

- I. Kim, T. Luk, S. Campione, S.W. Howell, G. S. Subramania, R. Grubbs, I. Brenner, H. Chen, S. Fan, and M. Sinclair, Near-infrared surface Plasmon polariton dispersion control with hyperbolic metamaterials, CINT User conference, Albuquerque, NM, Sep. 18-20, 2012.
- I. Kim and K. Kihm, The Hidden Complex Cavities Created by Nanofluidic Self-Assembly, MNHMT 2012, Atlanta, GA, March 6, 2012.
- I. Kim, G. Wiederrecht, D. Tiede, and K. Kihm, A label-free mapping of microfluidic transport properties and energy conversion in thin film device using surface Plasmon resonance (SPR), Gordon Research Conference (Microfluidics, Physics & Chemistry of ), Waterville Valley, NH, June 26-July 1, 2011.
- I. Kim, S. Bender, G. Wiederrecht, D. Tiede, Metal enhanced light harvesting complexes of Photosystem I thin film, Gordon Research Conference (Plasmonics), Waterville, ME, June 13-18, 2010.
- D. Tiede, L. X. Chen, O. G. Poluektov, Lisa M. Utschig, Gary Wiederrecht, K. Mulfort, S. Bender, I. Kim, J. Lockard, Mapping Structure with Function in Natural and Biomimetic Photosynthesis, 2009 Photosynthetic Systems Research Meeting, Annapolis, MD, Oct. 25-28, 2009.
- D. M. Tiede, K. L. Mulfort, J. V. Lockard, L. M. Utschig, O. Poluektov, L. X. Chen, L. Huang, S. Bender, I. Kim and G. Wiederrecht, Mapping Structure with Function in Biomimetic and Natural Photosynthetic Architectures, Proceedings of the Thirty-First DOE Solar Photochemistry Research Meeting, Annapolis, MD, June 8, 2009.
- I. Kim and K. D. Kihm, Unveiling Hidden Cavities Formed During Nanofluidic Self Assembly, Photogallery in the panel of visualization of heat transfer in 2008 IMECE, Boston, MA, Nov. 4, Session 10-21-1, 2008.
- I. Kim and K. D. Kihm, Label-free detection of near-field microfluidic properties using surface plasmon resonance (SPR) reflectance mapping, US-Korea Conference on Science, Technology, and Entrepreneurship, San Diego, CA, Aug. 14-17, YGPF-8, 2008.
- I. Kim and K. D. Kihm, Label-free and near-field mapping of dynamic mixing of saline (10%) + water using surface plasmon resonance (SPR) reflectance imaging, Photogallery in the panel on innovative imaging techniques in 2007 IMECE, Seattle, Washington, Nov. 13, Session 8-16-1, 2007.
- I. Kim and K. D. Kihm, Label-free and real-time imaging of microscale mixture (water+ethanol) concentration fields using surface plasmon resonance (SPR) reflectance, Photogallery in the committee of visualization of heat transfer in 2006 IMECE, Chicago, Illinois, Nov. 5, 2006.
- I. Kim and K. D. Kihm, Label-free and real-time imaging of microscale mixture concentration fields using Surface Plasmon Resonance (SPR) reflectance, APS 59th Annual Meeting of the APS Division of Fluid Dynamics, Tempa Bay, Florida, Nov. 21, LC00009, 2006.
- I. Kim, A stability analysis of the main pipe hangers and modification in power plant, The Energy Technical Conference POSCO, Pohang, Korea, June 20, 2003.
- I. Kim, A Study on the establishment of the optimal refurbishment method of the gas turbine in LNG power plant (111MW, ABB, GT11N2), The Energy Technical Conference, POSCO, Pohang, Korea, June 18, 2002.
- I. Kim, Y. J. Park, The establishment of the 4 MIX GAS(by-product gases and LNG) supply system to the furnaces of the rolling mills in Pohang through the fuel compatibility study, The Energy Technical Conference, POSCO, Pohang, Korea, June 12, 2001.
- I. Kim, The mechanical engineering of the replacement of the sealing equipment of the COREX Furnace GAS Holder, The Publication of The Engineer's Research, POSCO, Pohang, Korea, March, 2001.
- I. Kim, Y. W. Lee and B. O. Kim, The development of the RH-OB Burner system in steel making process in Pohang works by experiment and thermal-fluid analysis, The Energy Technical Conference , POSCO, Pohang, Korea, June 15, 2000.
- I. Kim, N. K. Lee and Y. W. Lee, The thermal fluid analysis of the reheating furnaces of wire rod mills using commercial package PHOENICS for the modification of the dam structure inside the furnace, The Energy Technical Conference, POSCO, Gwanyang, Korea, Mar. 3, 1999.

- I. Kim, Y. W. Lee, C. M. Kim, Y. J. Park, K. Y. Park, K. S. Sakong, and S. M. Cho, The development of the technology of the thermodynamic engineering of the 260T/H reheating furnace in Pohang works, The Celebration Conference of professor Chun's 60th birthday anniversary, POSTECH, Korea, Dec. 28, 1998.
- I. Kim, K. Y. Park, S. Y. Kim and C. W. Lee, The modification of the burner system in the pre-heater of the billet tundish in steel making process by numerical analysis and experiment, The POSCO Technology Conference, POSCO, Pohang, Korea, Aug. 1997.

### RESEARCH AND ENGINEERING PROJECTS (funded)

- 09/19-08/20 Research enhancement funding for "Nanoscale thickness measurement of liquid thin film in lubricant impregnated surface", **TAMU-CC RE** (PI, \$ 5K).
- 06/15-04/19 Three-dimensional surface plasmon resonance (SPR) imaging technique development, **CEKO** (PI, \$ 460K).
- 08/17-08/18 DoD HBCU Equipment Funding, Engineering Functional Surfaces And Flexible Smart Sensors By Scalable, \$ 583,000, **Department of Defense** (Co-PI: \$ 58.3K).
- 09/16-08/17 T Development of optical techniques to characterize micro fingerprint patterns, **TAMU-CC TCRF** (PI, \$ 30K)
- 03/15~12/15 UAV Lab-on-a-chip for chemical sensing, **TAMU-CC RE** (PI, \$ 5K).
- 07/13~01/14 Electrically injected UV-Visible nanowire laser, SNL, **DOE SNL LDRD** (Contributor).
- 01/12~01/14 Near-field thermal emission measurement for enhanced heat recovery, SNL, **DOE BES CMMS**, (Contributor).
- 01/09~12/11 Imaging Solar Energy Flow in Light-Harvesting Photosynthetic Assemblies, ANL, **DOE BES CSGB** (Contributor).
- 04/04~08/05 Micro-scale investigation of capillary pumped heat transport systems (CPHTS) with a binary mixture working fluid, **US Air Force Laboratory** (Contributor).
- 04/03~09/04 The study on the improvement of combustion instability of gas turbine (GT11N2), Pohang, **POSCO** (PI, \$ 300K).
- 01/02~12/02 The energy saving by heat efficiency increase and air leak decrease in GAH (gas air heater) in power plant (100MW), **POSCO** (PI, \$50K).
- 12/01~11/02 The establishment of the optimal refurbishment maintenance in the GAS Turbine of the LNG power plant, **POSCO** (PI, \$20K).
- 07/00~06/01 The development of a computer program for the pipe network analysis of by-product gases at Pohang works, **POSCO** (PI, \$20K).
- 03/98~12/99 The development of the RH-OB Burner in steel making process in Pohang works by experiment and numerical analysis, **POSCO** (PI, \$100K).
- 01/99~12/99 The development of the 3Gcal/H burner of the reheating furnace in the Plate Rolling Mills by numerical analysis and experiment, **POSCO** (PI, \$100K).
- 07/97~06/98 The development of the technology of the thermodynamic engineering of the 260T/H reheating furnace in Pohang works by experiment and numerical analysis, **POSCO** (Co-PI, \$50K).
- 01/98~12/98 The development of the analysis program for the prediction of the temperature of the outer casing of the teeming ladle by IHCP method, **POSCO** (Contributor, \$250K).
- 05/93~12/93 A study on the Interaction between satellite structure and thruster plume flow, **KARI** (Contributor, \$200K).
- 02/92~12/92 A study on the Interaction between satellite structure and thruster plume flow, **KARI** (Contributor, \$200K).



## RESEARCH PROPOSALS (unfunded)

- Ultrasensitive and multiplexing detection of explosive based on graphene-gold metasurface, **Department of Homeland Security (DHS)** Summer Research Team (PI, \$ 20k equivalent), 2019.
- High resolution thermal energy detection in photothermal therapy of cancers using 3-D surface plasmon resonance microscopy, **TAMU-CC TCRF** (PI, \$ 20,000), 2019.
- Nanoscale thickness measurement of liquid thin film in lubricant impregnated surface, **TAMU-CC RE** (PI, \$ 5,000), 2019.
- **MRI**: Acquisition of an optical tweezers and AFM combi-system and a stereo 3D3C micron-resolution particle image velocimetry system for micro/nanofluidic and biological research, **NSF CBET** (Co-PI, \$ 1 M), 2019.
- Engineering functional surfaces and flexible smart sensors/modular  $\mu$ Robot by scalable microfabrication – Phase II expansion of TAMUCC facility and capabilities to thin film polymeric meta-materials, **Department of Defense** (Co-PI, \$ 600K), 2018.
- Ultrasensitive cancer detection technique development using graphene-Au metasurface and pattern recognition, **TAMU-CC TCRF** (PI, \$ 20K), 2018.
- **MRI**: Development of ultrasensitive three-dimensional surface plasmon imaging system, **NSF CBET** (PI, \$ 935K), 2017.
- **Career**: Development of ultrasensitive and long-range three-dimensional surface plasmon imaging technique, **NSF CBET**, 2017.
- Enhanced spectral photodetector using hybrid graphene- multilayered hyperbolic metamaterials, **NSF EPMD** (PI, \$400K), 2016.
- Realtime oceanographic signature sampling and prediction for Gulf of Mexico, **Federal Restore** (Co-PI, \$ 1M), 2016.
- Multi-functional indoor phenotyping platform to characterize plant performance and dynamics, **USDA-NSF Eager** (Co-PI, LOI submitted), 2016.
- Acquisition of an Atomic Force Microscope (AFM) for Cross-Disciplinary Nanoscience Research and Education, **NSF MRI** (Co-PI, \$600K), 2016.
- In-situ visualization ion transport and dendrite formation in lithium metal electrode using surface plasmon resonance, **TAMU Area 41** (PI, LOI submitted), 2015.
- Does surface precipitation of nanoparticles dominate transport phenomena, **NSF CBET Multiphase** (PI in Collaborative Proposal, \$270K), 2014.
- Thermal rectification as a first step toward building a new class of thermal circuits, **Sandia LDRD** (Contributor), 2014.
- Development of a real-time and full-field SPR biosensor to quantitatively measure the enzymatic hydrolysis of cellulose, \$100K, **US DOA** (Co-PI, \$20K), 2008.
- Development of the Novel Bio/Chemical Sensor applying Liquid Core Optical Ring Resonator with micro-fluidic AC Electrokinetic Mixing, **US ARO** (Contributor), 2008.

## PATENTS

- Cooling nozzle tube for annealing material cooling (20-0197994-0000).
- Thermal diode design (pending).

## PROFESSIONAL SOCIETEEY MEMBERSHIPS

- American Society of Mechanical Engineers (ASME).
- American Physical Society (APS).
- Optical Society of America (OSA).



- American Chemical Society (ACS).
- Korean-American Scientists and Engineers Association (KSEA).