Pilgyu Kang, PhD

Assistant Professor, Department of Mechanical Engineering
Quantum Science and Engineering Center

Education

PhD, Mechanical Engineering, Cornell University

Key Interests

Nanomaterials | Atomically-thin 2D Materials | Micro/Nano Mechanics | Micro/Nano Manufacturing | Nano-photonics | Opto-Fluidics | Optoelectronics | Plasmonics

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SELECT PUBLICATIONS

- P. Kang *et al.*, Mechanically reconfigurable architectured graphene for tunable plasmonic resonances. *Light: Science & Application* 7 (2018).
- P. Kang *et al.*, Crumpled graphene photodetector with enhanced, strain-tunable and wavelength-selective photoresponsivity. *Advanced Materials* 28, 4639-4645 (2016).
- P. Kang *et al.*, Bioelectronics with two-dimensional materials. *Microelectronic Engineering* 161, 18-35 (2016).
- M. Kim *et al.*, Stretchable crumpled graphene photodetector with plasmonically-enhanced photoresponsivity. *Nanoscale* 9, 4058-4065 (2017).
- P. Kang *et al.*, Nanophotonic detection of freely interacting molecules on a single influenza virus. *Scientific Reports* 5, 12087 (2015).

Research Focus

My research focuses on fundamental studies of mechanics and photonics with nanomaterials at the micro and nano scale. I aim to create high-performance materials with new functionalities in mechanical, optical, and electrical properties. The main approach for creating the functionalities is nanostructuring of nanomaterials by using micro-/nanomanufacturing and micro-/nanofabrication techniques. Nanomaterials explored include atomically-thin 2D materials such as graphene and transition metal dichalcogenide (TMD) monolayers (e.g. MoS2) as well as photonic materials such as silicon, silicon nitride, and dielectrics. Based on the approach, I explore various fields including nanophotonics, optofluidic, optoelectronics, and plasmonics to achieve high performance materials and devices for broad applications of Nano Bio Sensors.

Current Projects

- 3D porous graphene embedded with palladium nanoparticles for ultrasensitive electrochemical sensing: This project aims to investigate electrochemistry of homogeneous hybrid nanostructures based on porous graphene.
- Atomically-thin photodetectors by crumple-nanostructuring of graphene-MoS2 heterostructures: The objective of this project is to investigate optoelectronic properties of heterogeneous layered structures of 2D materials.
- Laser nanomanufacturing of porous nanostructured graphene and hybrid nanostructures: This project aims to develop advanced nanomanufacturing technology to synthesize novel architectured nanomaterials using a laser.
- Photoelectrochemistry of crumpled nanostructured 2D materials: This project aims to investigate electrochemical properties of 2D material nanostructures under light illumination for applications in sensing, energy storage and conversion, supercapacitors, solar cells, and fuel cells and batteries.