



Department of Biomedical Engineering

香港城市大學  
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Hosted by Prof. Xinge YU

# Smart Environmental Monitoring by Low-Power / Self-Powered Gas Sensors and Artificial Intelligence

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Date: 27 August 2025

Time: 4:30 pm

Venue: YEUNG-B5210

Yeung Kin Man Academic Building

### Abstract

With the advent of the 4th industrial revolution, there has been a significant rise in the use of Internet of Things (IoT) and advanced sensors in several sectors, including but not limited to smart factories, healthcare, environment, and entertainment. However, the deployment of an increasing number of sensors in IoT systems has made it crucially important but challenging to reduce their form factors and power consumption. Consequently, there is a growing need for sensors that are miniaturized, low-power, or self-powered. In particular, when it comes to environmental IoT, it is essential to decrease power consumption in gas sensors while simultaneously enhancing sensing performance factors, such as sensitivity, selectivity, and response speed. In this talk, we present some recent advancements in the development of environmental sensors that are miniaturized, low-power or self-powered. These sensors utilize functional nanomaterials, microfabricated sensor structures, and photo-activated sensing mechanisms, which were developed by our research group at KAIST. Additionally, we describe the implementation of deep learning-based signal processing techniques for ultra-low power environmental sensors. The following topics are covered in depth: (a) Low-power semiconductor metal oxide (SMO) based chemoresistive gas sensor array using localized hydrothermal synthesis, (b) Ultra-low-power SMO gas sensors monolithically integrated on a micro LED platform, (c) Self-powered gas sensors using chemo-optically modulating sensing films and photovoltaic cells, (d) Machine learning of gas sensor array for high performance electronic nose (e-nose) systems.

### Biography

Prof. Inkyu Park received his B.S., M.S., and Ph.D. from KAIST (1998), UIUC (2003) and UC Berkeley (2007), respectively, all in mechanical engineering. He has been with the department of mechanical engineering at KAIST since 2009 as a faculty member and is currently a full professor and KAIST Endowed Chair Professor. His research interests are micro/nano-fabrication, smart sensors for healthcare, robotics, metaverse, and environmental and biomedical monitoring, and nanomaterial-based sensors and flexible & wearable electronics. He has published more than 208 international journal articles (SCI indexed) and holds more than 40 registered domestic and international patents in the area of MEMS/NANO engineering. He is a recipient of HP Open Innovation Research Award (2009-2012), KAIST Prize for Academic Excellence (2021), KAIST Grand Prize for Technology Innovation Award (2019), KAIST Endowed Chair Professorship (2017), Nanotechnologies Top 10 of Korea (2023), and NanoKorea 2023 Research Innovation Award – MIST Minister Award (2023). He is currently an editor for Sensors and Actuators B: Chemical, one of the top SCI journals in the sensor technology field.