

Smart Sensor Technologies for Healthcare and Medical Application

Inkyu Park^{1*}

¹ Department of Mechanical Engineering,
Korea Advanced Institute of Science and Technology (KAIST),
291 Daehak-ro, Yoo-sung-gu, Daejeon, South Korea

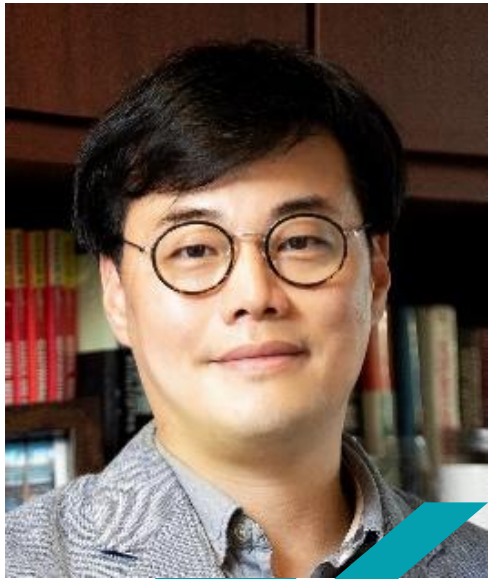
***Corresponding author:** inkyu@kaist.ac.kr

Abstract

Smart healthcare technology and wearable sensors revolutionize patient care by providing continuous, real-time health monitoring, enabling early detection of potential health issues. They empower individuals with actionable insights into their own health, fostering preventative care and personalized healthcare strategies. By integrating smart materials and sensors, these technologies enhance the responsiveness and efficacy of healthcare interventions. Furthermore, wearable devices facilitate a seamless connection between patients and healthcare providers, improving healthcare delivery and outcomes through data-driven decisions. In this talk, we discuss the micro/nanostructure-based wearable sensors for smart healthcare applications including self-powered, mechanical metamaterial-based highly stretchable strain sensors for exercise monitoring; porous elastomer – carbon nanotube (CNT) composite based, large dynamic range pressure sensors for wrist pulse, motion and posture monitoring; micro/nano-hierarchical structure-based pressure sensors for smart wristband to prevent carpal tunnel syndrome (CTS) ; and near field communication (NFC) based wireless, battery-free pressure/temperature/humidity sensors for the patient monitoring to prevent pressure injury, which were recently developed at our research group.

Keywords: Wearable sensors, Smart healthcare, Real-time monitoring, Micro/nanostructure sensors

CURRICULUM VITAE



Name:	Inkyu Park
Academic positions:	Full Professor / KAIST Endowed Chair Professor
Workplace:	Department of Mechanical Engineering, KAIST
Address:	#7102, Building N7-4, KAIST, 291 Daehak-ro, Yoonsung-Gu, Daejeon, Republic of Korea
Email:	inkyu@kaist.ac.kr
Expertise:	Smart sensors for healthcare, robotics, metaverse, and environmental monitoring, Micro/nano- fabrication, AI-based smart sensor design and signal processing



Education History

[Doctorate]	2003-2007	Department of Mechanical Engineering, University of California at Berkeley
[Master]	2001-2003	Department of Mechanical Engineering, University of Illinois at Urbana-Champaign
[Bachelor]	1994-1998	Department of Mechanical Engineering, KAIST



Professional Background

2021-2024	Vice Head, Department of Mechanical Engineering, KAIST
2009-Present	Professor, Department of Mechanical Engineering, KAIST
2017-Present	KAIST Endowed Chair Professor, KAIST
2008-2009	Co-founder & CTO, nPrintSolutions, inc., San Jose, CA, USA



Selected Awards and Honors

1.	2024	Academic Excellence Award, Micro and Nano Systems Society, Korea
2.	2023	Top 10 Nanotechnology Award, Mistry of Science and ICT, Korea
3.	2023	NanoKorea 2023 Innovation Award (Minister Award), Ministry of Science and ICT, Korea
4.	2022	Gold Prize, KSME-LG Future Hometech Challenge, KSME, Korea
5.	2021	Academic Excellence Award, KAIST



Selected Publications

1.	H. Jang, I. Park*, et al., “Flexible All-Inorganic Thermoelectric Yarns”, <i>Advanced Materials</i> , in press
2.	J. Ahn, I. Park*, et al., “Micro/Nano Hierarchical Structures Physically Engineered on Surface: Analysis and Perspectives”, <i>Advanced Materials</i> , 2300871 (2023)
3.	I. Cho, I. Park*, et al., “Deep-learning-based gas identification by time-variant illumination of a single micro-LED-embedded gas sensor”, <i>Light: Science & Applications</i> 12, 95 (2023)
4.	J. Ahn, I. Park*, et al., “Nanoscale Three-Dimensional Fabrication Based on Mechanically Guided Assembly”, <i>Nature Communications</i> 14, 833 (2023)
5.	J. Choi, I. Park*, et al., “Customizable, Conformal, and Stretchable 3D Electronics via Pre-distorted Pattern Generation and Thermoforming”, <i>Science Advances</i> 7, eabj0694 (2021)