

화학과 대학원 세미나

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Energy scavenging from the mechanical resource, and energy storage to high performing battery

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In the era of the internet of things, the billions of connected devices will require not only high battery cost but also an enormous scale of maintenance expenses, so that we need an alternative for powering the devices beyond plugging all of the intelligent devices into the grid. The power supply for future technology requires independent, sustainable, continuous operation, and maintenance-free. The possible solution for easily powering those devices includes harvesting the tiny energy when available, from environmentally friendly sources like the sun, thermal, and mechanical energy. Our recent research interest has been dedicated to the developing the main components of self-powered nanoelectronics, which includes the energy harvesting and storage devices. In this talk, I will address a simple strategy for energy harvesting from mechanical energy based on the smart piezoelectric nanomaterials, such as ZnO nanorods/graphene/ZnO nanorods heterostructure [1] and aligned M13 bacteriophage [2,3], as well as triboelectric nanomaterials [4-6]. Further I will present the future energy storage technology based on a single-ion conducting electrolyte [7,8] to improve the power density, safety concerns as well as high capacity retention at rapid discharging.

Dong-Myeong Shin is currently Assistant Professor of Mechanical Engineering at the University of Hong Kong (HKU). He was inspired to work in nanoscience as an undergraduate researcher with Prof. Yoon-Hwae Hwang and Prof. Hyung Kook Kim at Pusan National University (BS, 2009), where his work focused on the bioprotection effect of sugar glass on living cell. He obtained his M.S (2011) and Ph.D. (2016) degrees in nanomaterials at PNU, continuously working with his two mentors. At PNU, Dong-Myeong's research focused on the glassy dynamics of sugar in nanoconfinement, capacitive biosensor, piezoelectric and triboelectric nanogenerators. In 2016, he joined the Research Center for Energy Convergence Technology (RCECT) at PNU, where his research centered on the bioinspired sensor, to work with Prof. Kyujung Kim as a postdoctoral researcher. Following his Ph.D. and Postdoctoral research at PNU, in 2017, he moved to the University of California, Berkeley as a postdoctoral scholar with Prof. Jeffrey R. Long. His research is dedicated to developing the single ion conducting network polymer for battery applications. Upon completion of his postdoctoral studies in the summer of 2019, Dong-Myeong traveled back to Asia to assume his current position of Assistant Professor of Mechanical Engineering at HKU, where his group has devoted to developing the self-powered nanoelectronics, with an emphasis on important components such as energy harvesting/storage devices and bioinspired



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