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Fabrication of flexible, transparent, and skin-attachable field-effect transistor (FET) sensors based on graphene-silver nanowires

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Flexible and transparent conductive materials have been vigorously investigated as the next-generation electrodes to cover the disadvantages of conventional indium tin oxide (ITO) such as poor mechanical robustness on flexible substrates. A variety of materials such as carbon nanotubes (CNTs), graphene, metal nanowires and conducting polymers have been appliedto flexible electrodes in transparent electronics. Especially, graphene-silver nanowires (AgNWs) hybrid structures have been considerably researched due to their high transparency and conductivity.Also, graphene and AgNWs hybrid filmscouldprevent the oxidation of AgNWs and complement relatively high sheet resistance of graphene. In this talk, we present the fabricationof flexible and transparent electronic devices, including field effect transistor (FET) sensors, using graphene-AgNW hybrid films as electrodes. These transistors show relatively high mobility (~3000 cm2V-1s-1) because of the low graphene-AgNW contact resistance (~0.3 kΩ·μm). In addition, the devices could be directly integratedon very thin andflexible substrates as well as human skin, exhibiting their versatility and bio-compatibility. Furthermore, we demonstrate the real-time wireless nanosensors for monitoring the materials operating at radio frequency (~-30 dB at the center frequency of 4.4 GHz) without power consumption. This device can be used as ultrasensitive mannan-binding lectin (MBL, Concanavalin A) sensors. Fabrication of flexible, transparent transistors using the hybrid electrodes demonstrates the substantial promise of future electronics.

Biography

Jang-Ung Park achieved his Ph.D from University of Illinois at Urbana-Champaign (UIUC) in 2009. After that, he went on to work as Postdoctoral Fellow at Harvard University. He is now an Associate Professor in the School of Materials Science and Engineering at UNIST (Ulsan National Institute of Science and Technology). His current research is focused on wearable electronics.

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