



Development of highly stretchable conductive fiber and fiber-based electronic sensors for textile electronics

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Abstract

Recent studies on electronic textile (E-textile) where various electronic elements are fabricated into fabrics have attracted considerable attention for the advanced wearable and flexible devices. Especially, textile-based pressure sensor have been widely explored for a lot of applications such as detecting vital signals of patients, diagnostic and motion detection by embedding them in clothes. For the realization of the highly sensitive textile-based pressure sensors, various types of pressure sensors such as capacitive, piezoelectric, piezoresistive and optical types have been investigated. Among these various types of sensors, capacitive pressure sensors have advantages in terms of simple design and analysis of the devices, high sensitivity, excellent stability and low power consumption. However, since fabrication of the sensors with high performances is difficult due to limitations of techniques and materials, it is very challenging to apply these capacitive fabric pressure sensors to advanced wearable devices. Here, we describe high-performance fiber-based pressure sensor, strain sensor, and multimodal sensor. For the development of the fiber-based sensors, a highly stretchable conductive fiber, which effectively overcomes the limitations of previous stretchable conductive fibers, was fabricated by combining metal nanoparticles and bio-inspired elastomeric fibers. The conductive fiber exhibits an excellent conductivity of 20.940 S/cm, superb stretchability of 450%, and high stability over 10,000 cycles. By using the conductive fiber, various fiber-based mechanical sensors such as a pressure sensor, strain sensor, and multimodal sensors were successfully fabricated. The fiber-based sensors have an unprecedented performance and can be easily integrated into fabrics, gloves, and clothes using a simple sewing method.

Biography

Taeyoon Lee has his expertise in developing conductive fiber with high performances and fiber-based electronic devices for various applications such as wearable, stretchable electronics and smart textiles. He joined the School of Electronic and Electrical Engineering in Yonsei University as an Assistant Professor in 2007 and now he is an Associate Professor. He received his BS and MS from Yonsei University and his PhD from UIUC in 2004 in Materials Science. Before joining Yonsei University as an Assistant Professor, he had worked as a Senior Process Engineer at Intel for 2005-2007.

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