

Next generation wearable electronics: Skin-attachable electronics

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Abstract

An ultimate goal of biological measurement is to monitor the states of a living body in a non-invasive, continuous, and accurate manner without disturbing the natural functions or activities of the living body. Because sensors in direct contact with biological tissues are inevitably exposed to physical disturbances caused by physical contact, considerable efforts have been made to minimize the effects of sensors. In temperature measurement, for example, it is preferable to reduce the heat capacity or thermal conductance of a sensor in order to suppress the effect of heat transfer from the object to the sensor. Furthermore, mechanical compliance with electronics is extremely important for biological objects. The skin is soft and has a three-dimensional structure. Flexible and/or stretchable sensors have been proposed to reduce the effects of modulus differences between the skin and the electronics.

In this talk, I will introduce skin-attachable nanomesh electronics to further improve biocompatibility by introducing an extremely soft, thin, and porous structure. They electrically functionalize the skin while allowing its inherent functionalities. The nanomesh electrode having sufficiently high gas-permeability can be attached to the skin without additional adhesives (Fig. 1). It results in a continuous attachment to the skin for a week without any skin inflammation issues. Furthermore, the nanomesh pressure sensor enables the monitoring of finger manipulation without interfering with the inherent skin sensation, although the sensor is directly applied to the highly sensitive fingertip (Fig. 2).



Fig. 1. Nanomesh electrodes on hand

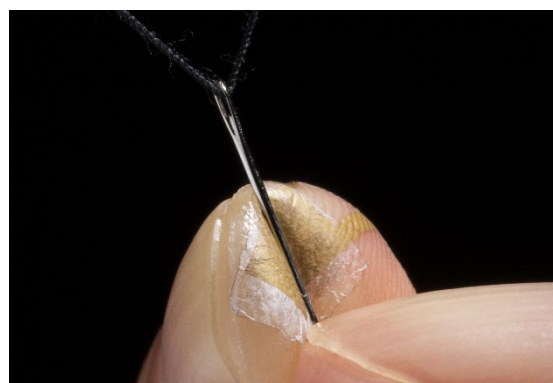


Fig.2 Nanomesh pressensor on finger

Biography

Sunghoon Lee received his B.S. degree from the Department of Applied Physics, the University of Tokyo, Tokyo, Japan, in 2009, and his M.S. and Ph.D. degrees from the Department of Electrical and Electronic Engineering, the University of Tokyo, in 2011 and 2017, respectively. Since 2019, he has been a project assistant professor and a lecturer at the University of Tokyo. His current research interests include organic electronics, soft electronics, and flexible electronics.