Next generation wearable electronics: Skin-attachable electronics

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Abstract
An ultimate goal of biological information measurement is to monitor 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 necessary to reduce heat capacity or thermal conductance of sensors in order to suppress the effect of heat transfer from the object to the sensor. Furthermore, a mechanical compliance of the electronics is extremely important for the biological objects. Because the skin is soft and has a three-dimensional structure, it is preferable to use flexible and/or stretchable sensors to reduce the effects from modulus differences between the skin and the sensors, and to achieve the stable contact to the curved surface.

In this talk, recent developments in flexible and stretchable electronics will be introduced which can be directly attached to the skin while allowing a stable and conformable contact. Ultraflexible electronics having overall thickness of only a few micrometers and their superior mechanical stability will be discussed. Next, nanomesh electronics developed for improving biocompatibility will be introduced.

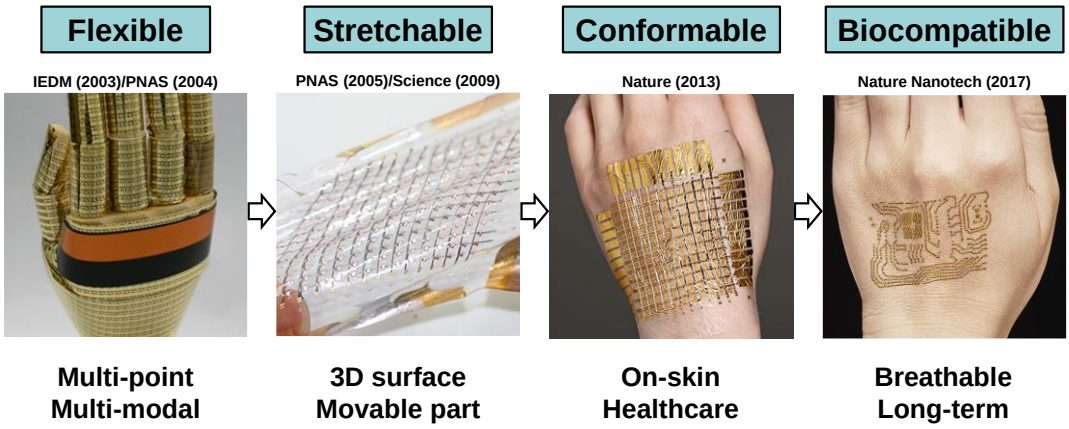

Figure 1. Path to skin electronics

Sunghoon Lee received his BS degree from the Department of Applied Physics, the University of Tokyo, Tokyo, Japan, in 2009, and his MS and PhD 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.