

Stretchable Nanomesh Electronics for Wearables and in Vitro Characterizations

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Abstract

Stretchable electronics are expected to open up a new class of applications ranging from wearable electronics for health-monitoring and human-machine interfaces, implantable electronics, and in vitro characterization. Wearable technology can enable continuous, long-term monitoring and lead to the personalization of medical care that can help people stay healthy and prevent more serious health problems from happening in the first place. In order to expand emerging applications of wearable technologies, soft biomedical sensors have attracted much attention recently. In order to minimize the discomfort of wearing sensors, it is highly desirable to use soft electronic materials particularly for devices that come directly into contact with the skin and/or biological tissues. Thanks to recent progress of soft electronics, intimate and conformal integration of electronics with the human skin can be created to continuously monitor health conditions. It can monitor small changes that occur very gradually over long periods and, therefore, have tremendous potential to drastically change the nature of the examination and treatment of medical conditions.



Figure 5: Nanomesh electrodes that are directly attached on the skin.

In this talk, recent progress and outlook of wearables using stretchable devices will be reviewed. In particular, I report a newly developed hypoallergenic electronic sensor that can be worn on the skin continuously for a week without discomfort. It is so light and thin that users forget they even have it on. The elastic electrode constructed of breathable nanoscale meshes holds promise for the development of noninvasive on-skin devices that can monitor a person's health continuously over a long period. Then, similar nanomesh sensors is applied to in vitro characterization. These can monitor the field potential of cardiomyocytes on gel, while enabling them to move dynamically without interference.

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