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Graphene-Based Wearable Self-Powered Touch Sensor

Wearable electronic devices have become familiar to people and have been expanded to various functions via development in the field of the flexible and stretchable electronic devices [1]. These wearable devices, such as displays, motion sensors, electromyography sensors, and electrocardiogram sensors, require input and power systems to command information and supply energy, respectively. The triboelectric nanogenerator (TENG) has attracted attention as an eco-friendly device that provides sustainable power without recharging to replace the previously bulky battery with limited energy storage [2,3]. Here, we report a self-powered stretchable TENG (S-TENG) touch sensor suitable for a wearable device that adapts to the skin's motion because of its stretchability. The S-TENG with a single-electrode structure was fabricated using atomically thin graphene (<1 nm), polyethylene terephthalate (~5 μm), and polydimethylsiloxane (~5 μm) as the electrode, substrate, and electrification layer, respectively. The stretchability was realized through an auxetic mesh design, which helps to obtain stable mechanical and electrical properties while stretching. The S-TENG touch sensor not only senses the touch point but can also perform improved extended functions such as detection of touch sliding velocity and information input through the trajectory mode. The developed S-TENG touch sensor showed good potential for future wearable input applications and is capable of long-term performance without an energy supply.

References

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Figures

Figure 1: The optical image of stretchable/wearable self-powered touch sensor on the palm (left). The touch result at x7, y5 touch point of stretchable triboelectric touch sensor.