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Graphene-based Triboelectric Nanogenerator for Self-powered Stretchable Wearable Touch Sensor

Recently, electronic devices have greatly headed to human-friendly through the wearable electronics. For this purpose, the electronic systems tend to have flexible characteristic by fabricating on flexible substrate. However, human skin has not only flexibility but also stretchabililty, such as palm and forearm. For this reason, wearable electronics which have just flexible characteristic are not easy to attach on skin and make uncomfortable to user. Therefore, stretchability is highly required for wearable electronics. Recently, stretchable electronics has been demonstrated by various methods.[1] Additionally, wearable electronics are the lack of compatible power system, which should offer sustainable electrical power without recharging process and be integrated with the human body without any hazards. Therefore, novel power system for wearable electronics is highly recommended for wearable and portable electronics. Recently, energy harvester addressed triboelectric nanogenerator(TENG) has been studied to be usable energy source for powering electronics and self-powered system.[2]

In this study, we demonstrate the self-powered stretchable touch sensor, made possible by the use of graphene and auxetic matrix design. We approach well contact on curved human skin by thin device design and also well stretch on palm by auxetic design which can stretch up to 11%. Additionally we enhance output voltage up to 5.1V in touch area(0.1cm2) via the plasma treatment which increases roughness surface. Finally, self-powered 8x8 touch sensor is successfully demonstrated by stretchable TENG on skin which is well attached on curved and stretched skin. Through the this stretchable TENG touch sensor, it can be human-machine interface device that is suitable to work on human skin.

References

[1] Rogers, J. A., Someya, T. & Huang, Y. G. Materials and mechanics for stretchable electronics. Science 327, 1603–1607 (2010)
[2] X. Wang, H. Zhang, L. Dong, X. Han, W. Du, J. Zhai, C. Pan, Z.L. Wang. Adv. Mater., 28 (2016), pp. 2896–2903

Figures

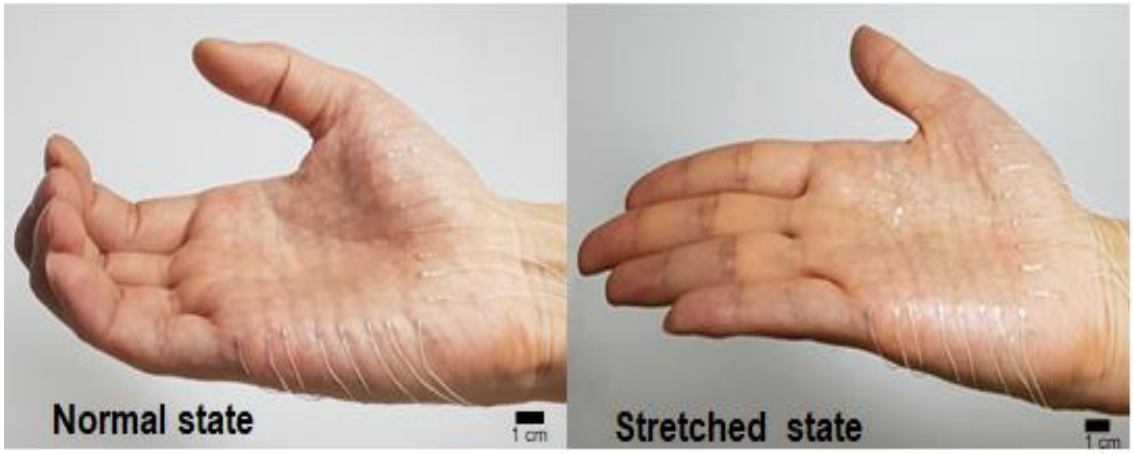

Figure 1: Photograph of the stretchable TENG touch sensor on hand which move from normal state to stretched state