Highly Flexible Graphene Oxide Nanosuspension Microfluidic Tactile Sensor

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Abstract

We present a graphene-based liquid-state microfluidic tactile sensor where the sensing platform comprises a graphene oxide (GO) nanosuspension. This nanosuspension fluid serves as the active detection element and is enclosed within an Ecoflex-PDMS microfluidic assembly (Fig.1a). The use of the highly resistive and non-corrosive GO renders the fabricated physical sensor highly sensitive and versatile. The resistive sensor exhibits unique features, such as superior thinness, high flexibility, large area conformability, and small physical size (Fig. 1b). In addition, it displays excellent mechanical deformability and is able to maintain the integrity of the liquid confinement within the microchannel after being subjected to various mechanical deformation. This wearable tactile sensor is also capable of distinguishing a multitude of user-applied mechanical forces, including pressing, stretching, and bending. Additionally, it is possible to identify hand muscle-induced motions, such as finger flexing and fist clenching, using this tactile sensor (Fig. 1c). Our work illustrates the potential of the graphene-based flexible liquid-state sensing platform as a wearable diagnostic and prognostic device for real-time health monitoring.

Reference

[1] Kenry, J.C. Yeo, M. Shang, J. Yu, K.P. Loh, C.T. Lim, "Highly Flexible Graphene Oxide Nanosuspension Liquid-based Microfluidic Tactile Sensor." Small (2016).
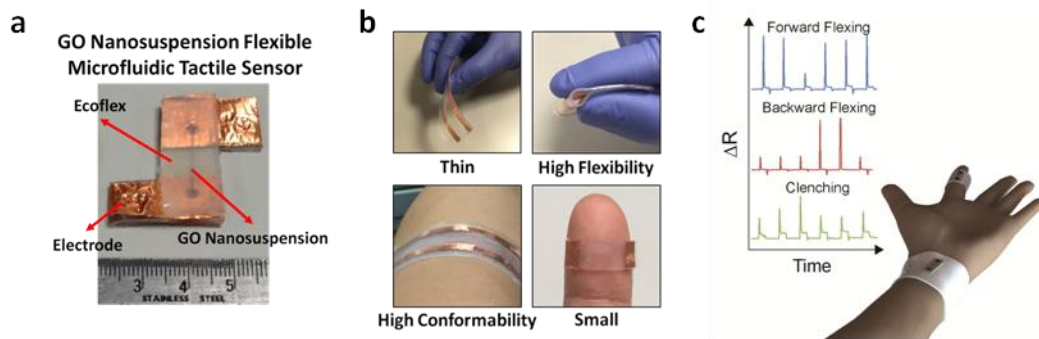
Figure

Figure 1 | Highly flexible graphene oxide nanosuspension microfluidic tactile sensor. (a) Actual fabricated GO nanosuspension-based tactile sensor. (b) Distinctive features of the sensor: thin, highly flexible, highly conformable, and small. (c) Wearable device for mechanical force sensing and differentiation.