3D-Graphene Based Pressure and Strain Sensor

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Abstract

We demonstrate an ultrasensitive pressure and strain sensor using a conductive and flexible 3D graphene aerogel that enables detecting small pressures/strains and various biological signals from the movement of human skin. The active element of the sensor is composed of a 3D graphene nanoporous framework made of graphene sheets separated with air-filled pores. The 3D graphene aerogel is synthesized using a simple hydrothermal technique followed by freeze-drying and thermal annealing. The resulting graphene aerogel is elastic and exhibits a significant change of electrical resistance with stimuli. It is found that the resistance of the sample is highly sensitive to applied stimuli, enabling the detection of small changes of the sample size down to a few micrometers. The responsivity of the samples allows detecting fast events down to a few milliseconds. We show that the 3D graphene-based sensors can be used as a wearable electronic sensor for human heartbeat monitoring as well as for other kinds of biological motion detection.