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| **Title:** | Highly sensitive and flexible strain-pressure sensor with cracked paddy shaped MoS2/graphene foam/Ecoflex hybrid nanostructures. | | |
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| **Abstract:** |  |
| Three-dimensional graphene porous networks (GPNs) have received considerable attention as a nanomaterial for wearable touch sensor applications because of their outstanding electrical conductivity and mechanical stability. Herein, we demonstrate a strain–pressure sensor with high sensitivity and durability by combining molybdenum disulfide (MoS2) and Ecoflex with a GPN. The planar sheets of MoS2 bonded to the GPN were conformally arranged with a cracked paddy shape, and the MoS2 nanoflakes were formed on the planar sheet. The size and density of the MoS2 nanoflakes were gradually increased by raising the concentration of (NH4)2MoS4. We found that this conformal nanostructure of MoS2 on the GPN surface can produce improved resistance variation against external strain and pressure. Consequently, our MoS2/GPN/Ecoflex sensors exhibited noticeably improved sensitivity compared to previously reported GPN/polydimethylsiloxane sensors in a pressure test because of the existence of the conformal planar sheet of MoS2. In particular, the MoS2/GPN/Ecoflex sensor showed a high sensitivity of 6.06 kPa–1 at a (NH4)2MoS4 content of 1.25 wt %. At the same time, it displayed excellent durability even under repeated loading–unloading pressure and bending over 4000 cycles. When the sensor was attached on a human temple and neck, it worked correctly as a drowsiness detector in response to motion signals such as neck bending and eye blinking. Finally, a 3 × 3 tactile sensor array showed precise touch sensing capability with complete isolation of electrodes from each other for application to touch electronic applications. | |