

Supporting Information

Miniaturized Flexible Piezoresistive Pressure

Sensors:

Poly(3,4-ethylenedioxythiophene):Poly(styrenesulfonate) Copolymers Blended with Graphene Oxide for Biomedical Applications

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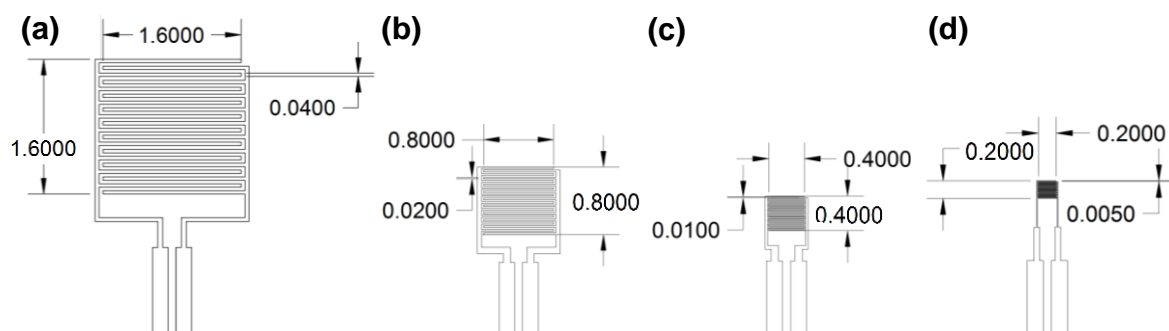


Figure S1 Layouts of piezoresistive pressure sensors for the device size of (a) 1.6, (b) 0.8, (c) 0.4, and (d) 0.2 cm. The width of the inter-digitated electrode is scaled from 0.04 to 0.005 cm.

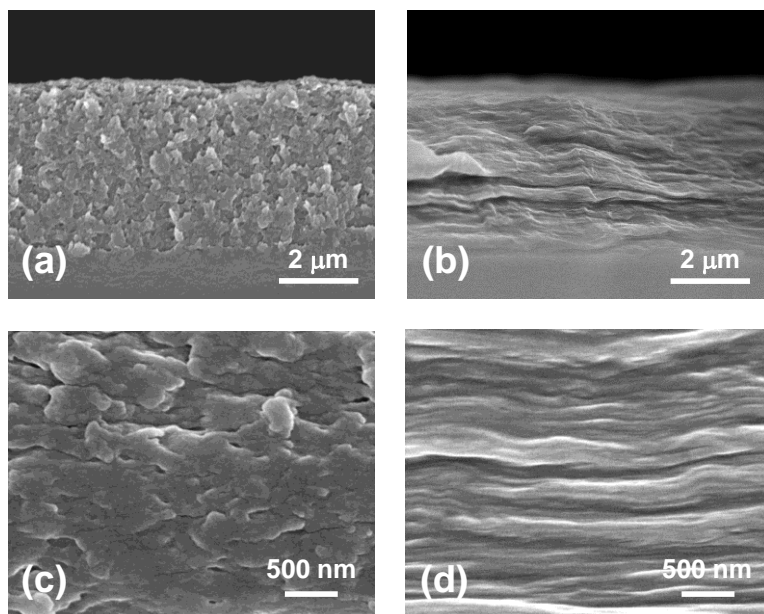


Figure S2 Cross-sectional FESEM images of (a) the pure PEDOT:PSS film and (b) the PEDOT:PSS/GO composite film with a concentration of GO in 50% (v/v), and the magnified images of (c) the pure PEDOT:PSS film and (d) the PEDOT:PSS/GO composite film with a concentration of GO in 50% (v/v).

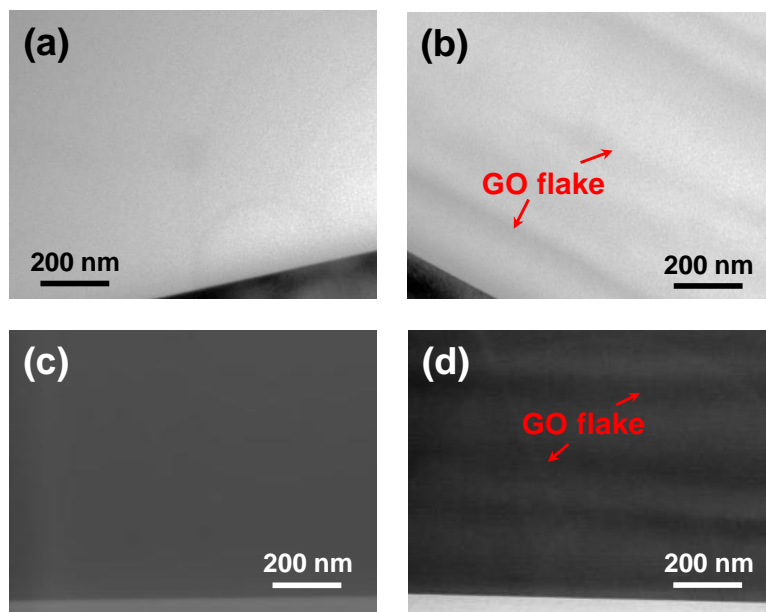


Figure S3 Cross-sectional TEM images of (a) the pure PEDOT:PSS film and (b) the PEDOT:PSS/GO composite film with a concentration of GO in 50% (v/v), and the STEM-HAADF images of (c) the pure PEDOT:PSS film and (d) the PEDOT:PSS/GO composite film with a concentration of GO in 50% (v/v).

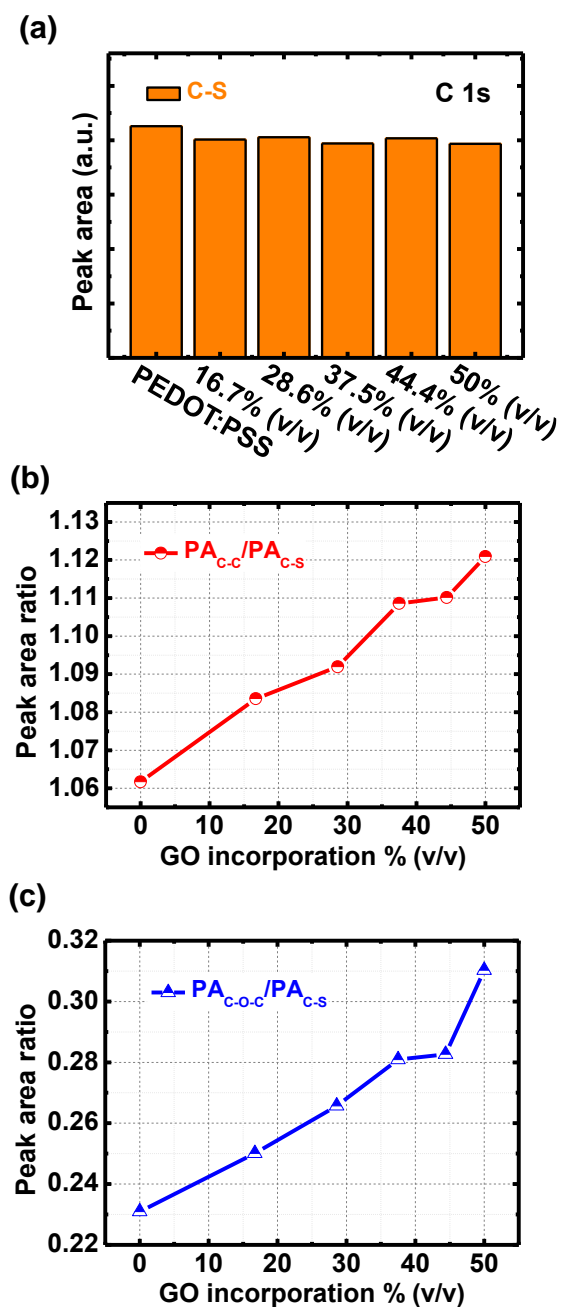


Figure S4 (a) C-S peak area in C 1s XPS spectra for the PEDOT:PSS/GO composite films with different volume percentages of GO. PARs for (b) C-C and (c) C-O-C peaks with respect to the C-S peak of the PEDOT:PSS/GO composite films with different volume percentages of GO.

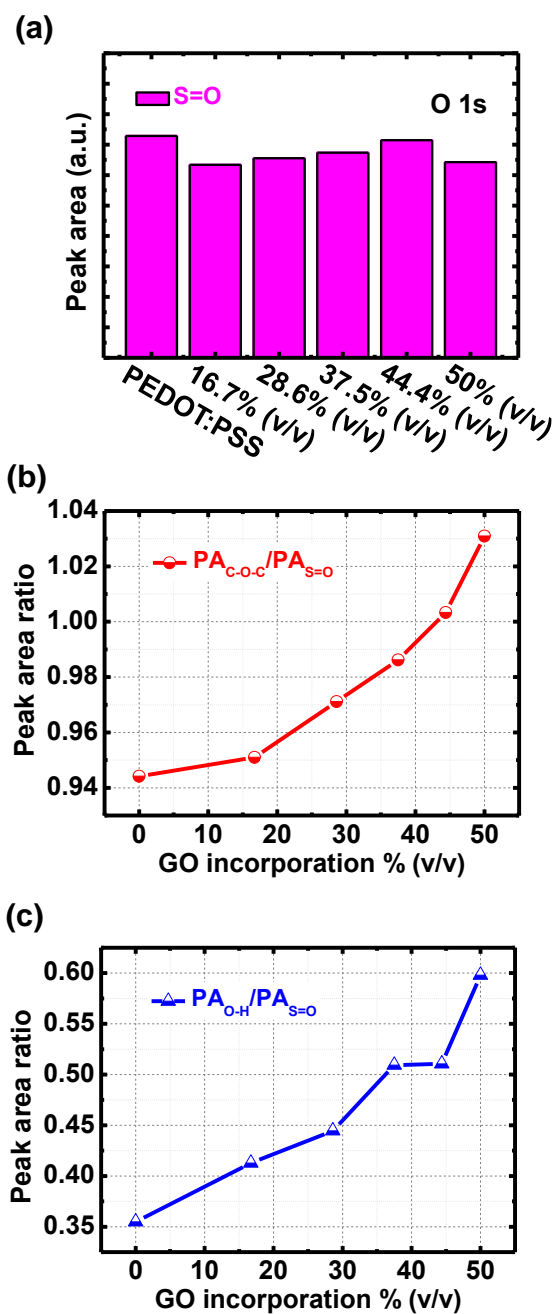


Figure S5 (a) S=O peak area in O 1s XPS spectra for the PEDOT:PSS/GO composite films with different volume percentages of GO. PARs for (b) C-O-C and (c) O-H peaks with respect to the S=O peak of the PEDOT:PSS/GO composite films with different volume percentages of GO.

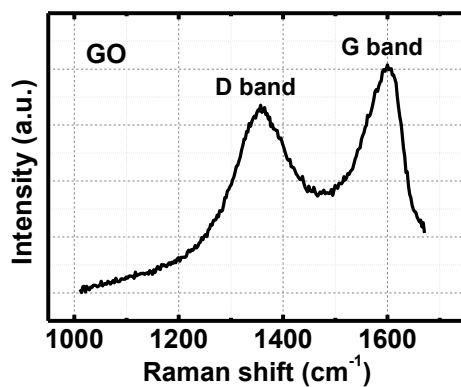


Figure S6 Raman spectra of GO to be blended into the PEDOT:PSS films. Two peaks at around 1355 and 1600 cm⁻¹, corresponding to the D and G band respectively, are observed. The D band represents some structural defects and partially disordered lattice of the film but the G band is ascribed to the E_{2g} vibration mode of the sp² carbon. The film with the relative intensity ratio of the D and G band (I_D/I_G) for 0.9 can be identified to be GO.

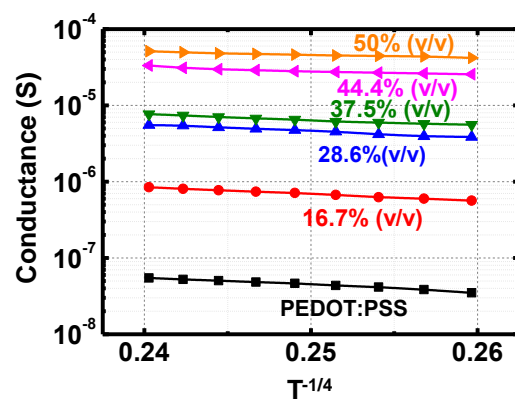


Figure S7 Linear fitting of $G-T^{-1/4}$ curves for the PEDOT:PSS/GO composite films with different volume percentages of GO.

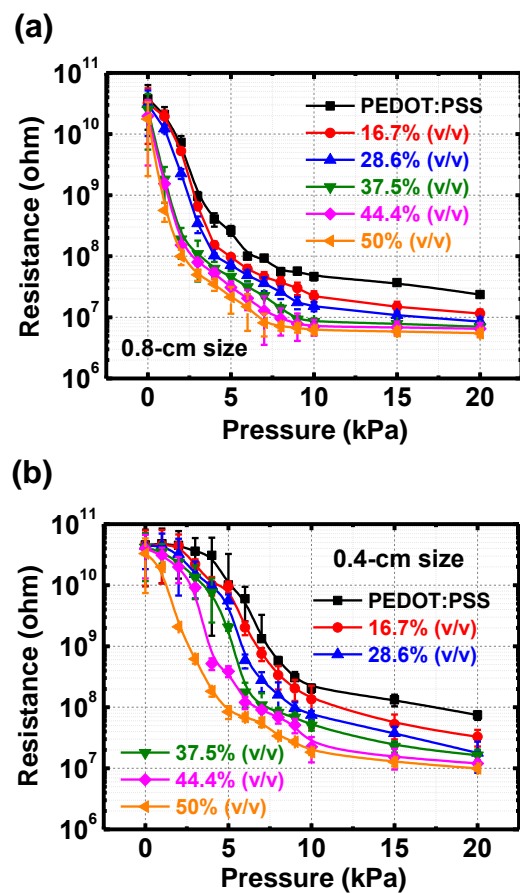


Figure S8 R – P curves of PEDOT:PSS/GO piezoresistive pressure sensors with different volume percentages of GO for the device sizes of (a) 0.8 and (b) 0.4 cm.

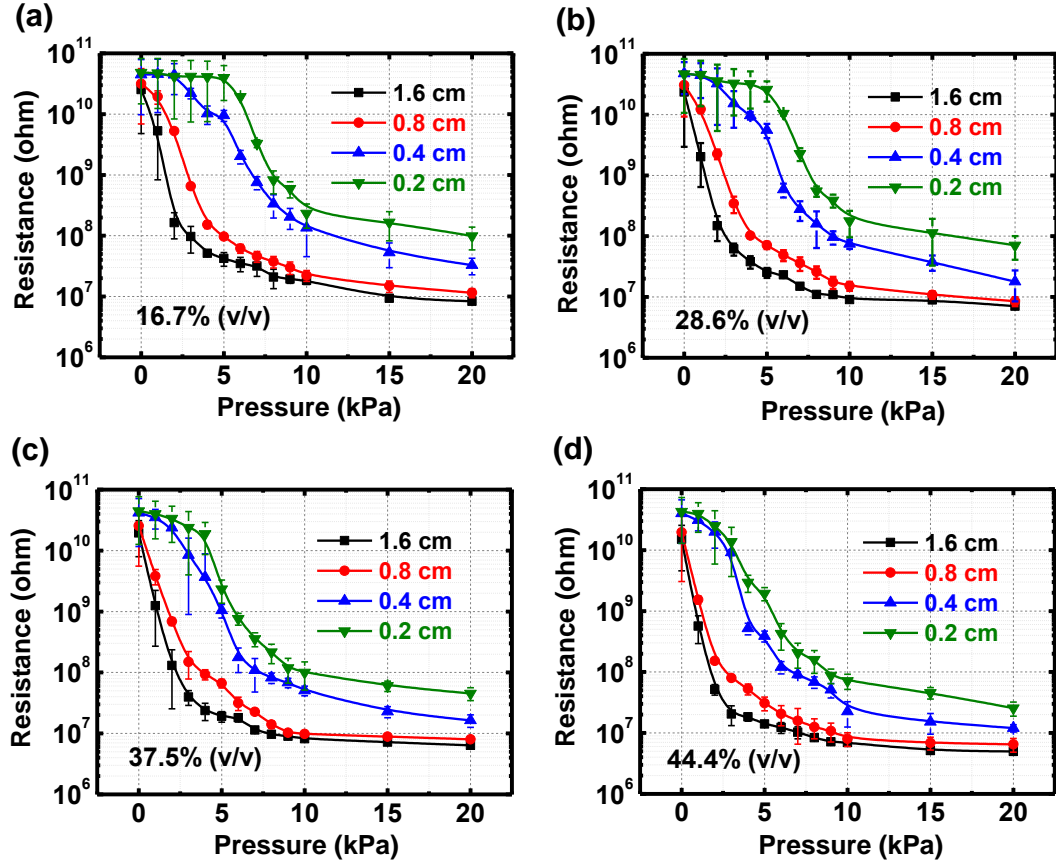


Figure S9 R – P curves of PEDOT:PSS/GO piezoresistive pressure sensors with different device sizes for the volume percentages of GO in (a) 16.7, (b) 28.6, (c) 37.5, and (d) 44.4% (v/v).

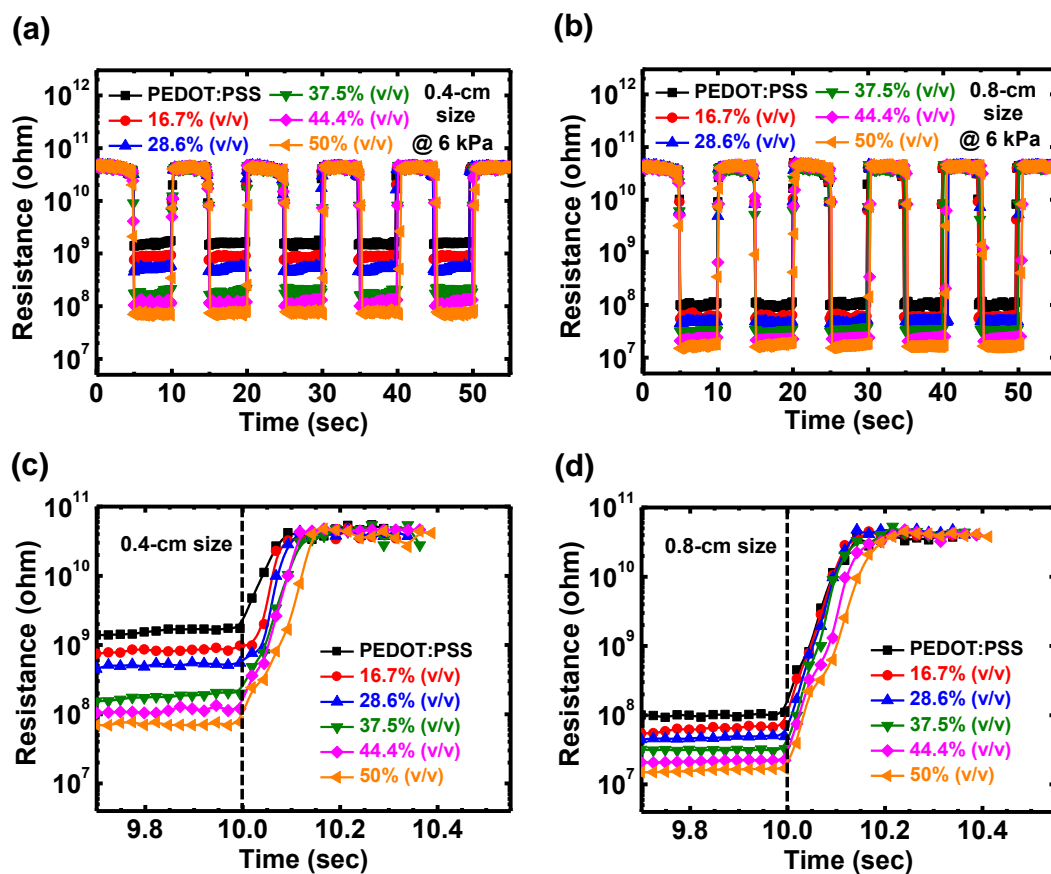


Figure S10 Reversible testing characteristics of press/release cycles for (a) 0.4- and (b) 0.8-cm piezoresistive pressure sensors with PEDOT:PSS/GO composite films. $R-t$ curves of PEDOT:PSS/GO piezoresistive pressure sensors with different volume percentages of GO for the device sizes of (c) 0.4 and (d) 0.8 cm.

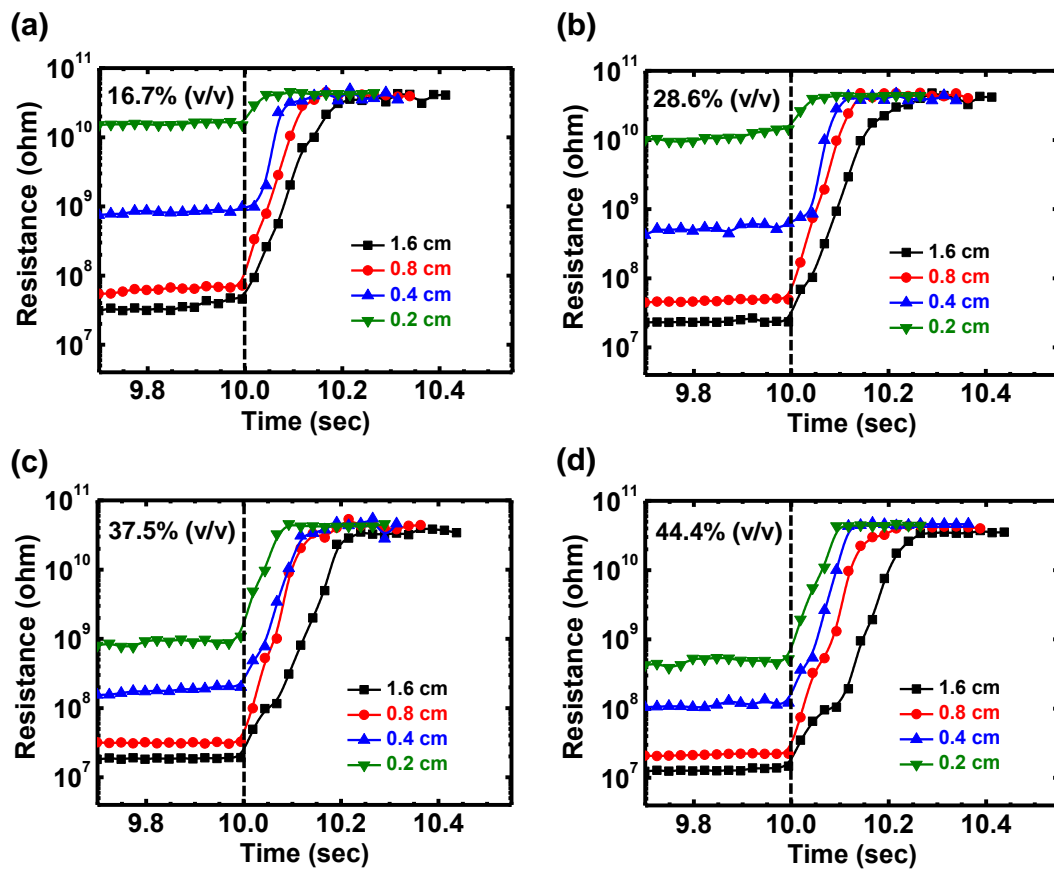


Figure S11 R - t curves of PEDOT:PSS/GO piezoresistive pressure sensors with different device sizes for the volume percentages of GO in (a) 16.7, (b) 28.6, (c) 37.5, and (d) 44.4% (v/v).

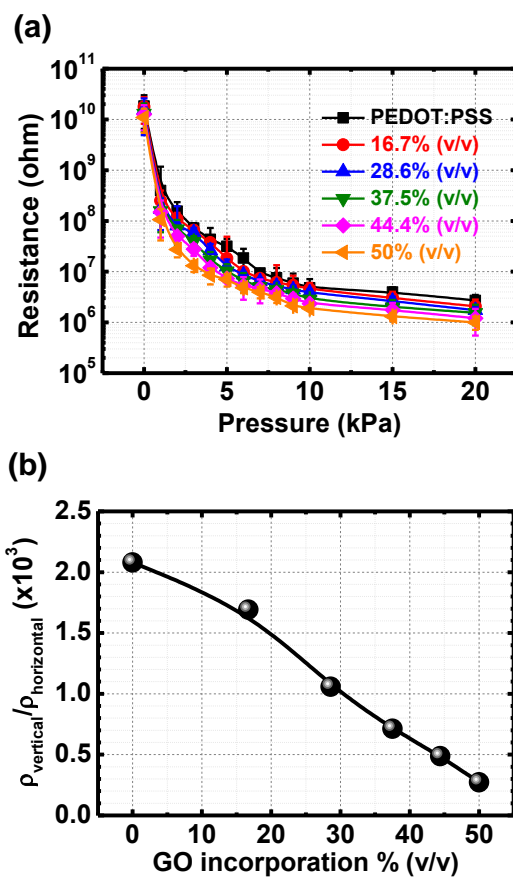


Figure S12 (a) R – P curves of PEDOT:PSS/GO piezoresistive pressure sensors with different volume percentages of GO for the CPE structure. (b) Vertical to horizontal resistivity ratio ($\rho_{\text{vertical}}/\rho_{\text{horizontal}}$) of the PEDOT:PSS/GO composite films with different volume percentages of GO.

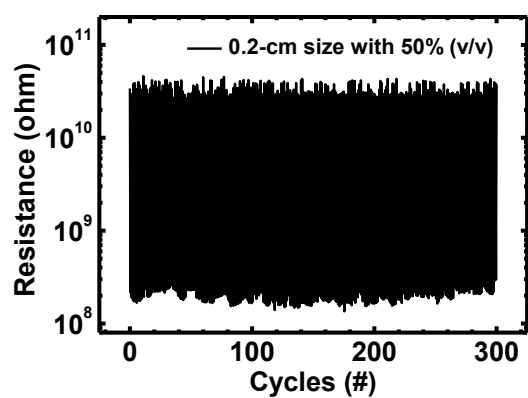


Figure S13 Repeatability behavior of the 0.2-cm piezoresistive pressure sensor with PEDOT:PSS/GO composite film with a concentration of GO in 50% (v/v). A pressure of 6 kPa was applied on the device and then released.