Supporting Information

Structural Engineering for High Sensitivity, Ultra-Thin Pressure Sensors Based on Wrinkled Graphene and Anodic Aluminum Oxide Membrane

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Supporting Information Content

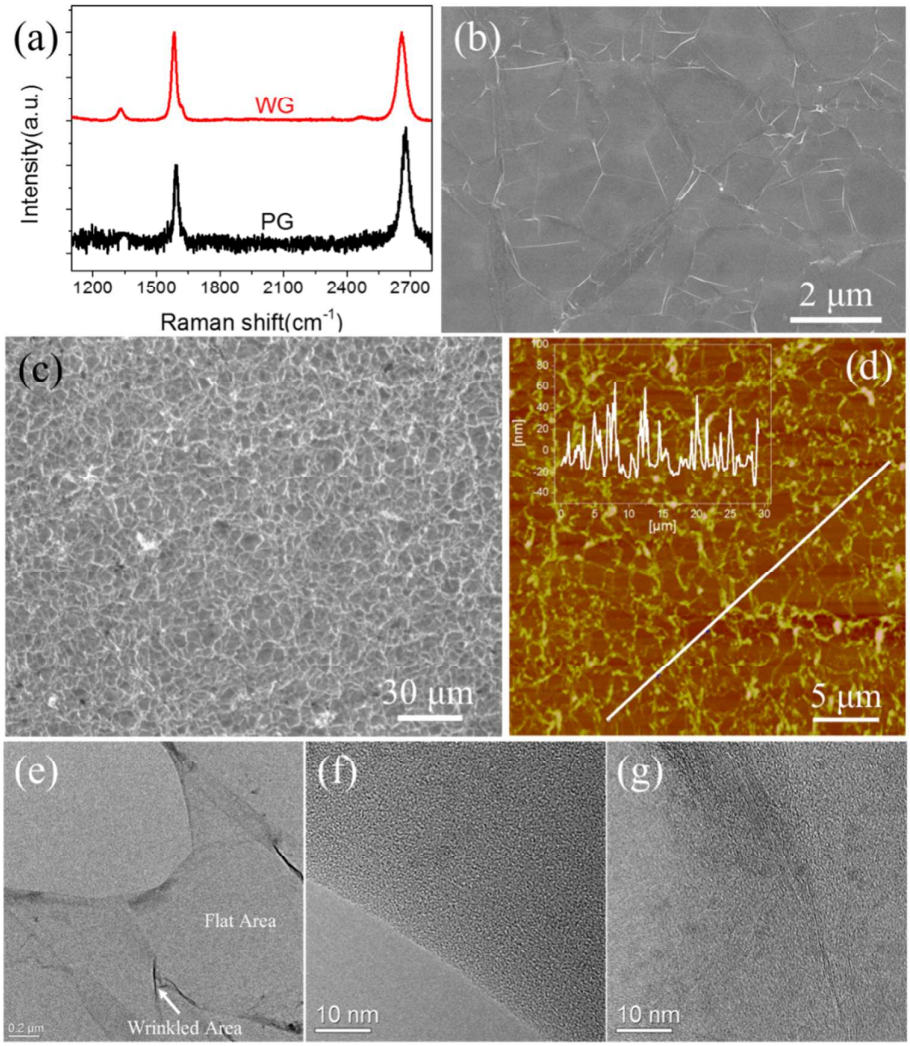

Figure S1. Characterization of PG and WG. (a) Raman spectra of PG and WG. (b) SEM image of PG. (c) Optical microscopy image of WG. (d) AFM image of WG, inset is the height distribution of the selected section. (e) Low-magnification TEM images of WG. High-magnification TEM images of (f) flat and (g) wrinkled area of WG.

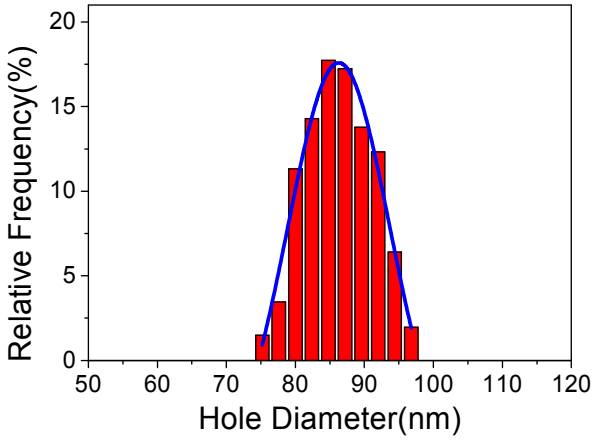

Figure S2. Hole diameter distribution of AAO and its Gauss fit (blue curve).

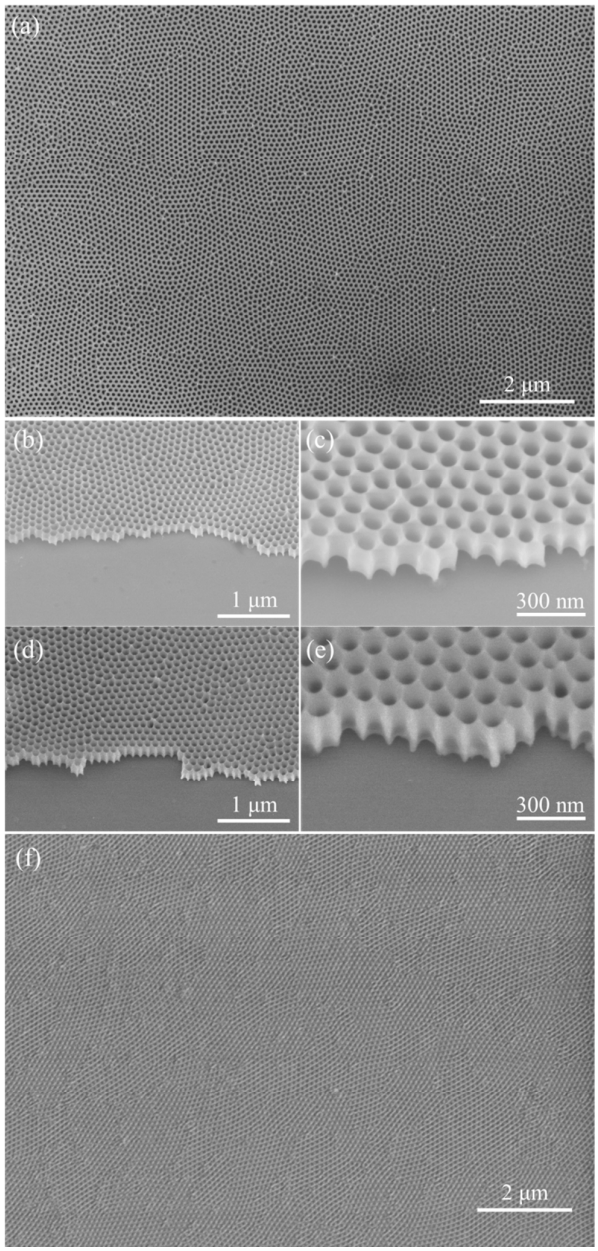

Figure S3. SEM images of AAO membranes. (a) SEM image of large-area AAO membrane. (b) Low-magnification and (c) High-magnification SEM image of AAO membrane with the thickness of 250 nm. (d) Low-magnification and (e) High-magnification SEM image of AAO membrane with the thickness of 300 nm. (f) SEM image of AAO membrane in the sensor after 10,000 cycle test.

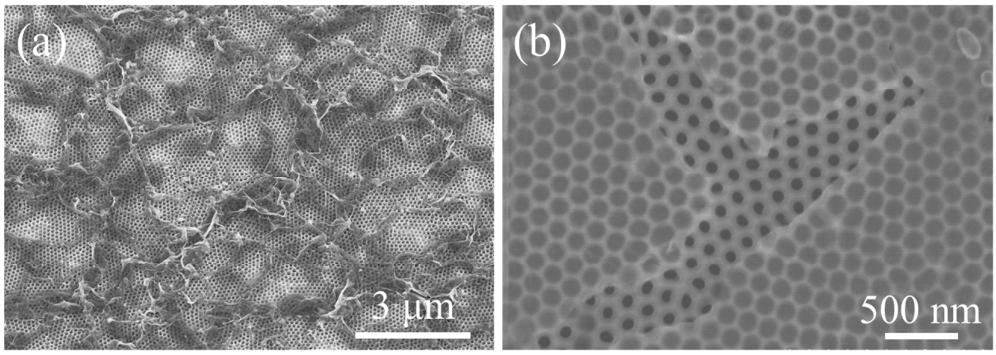

Figure S4. SEM image of (a) WG and (b) PG on AAO membrane.

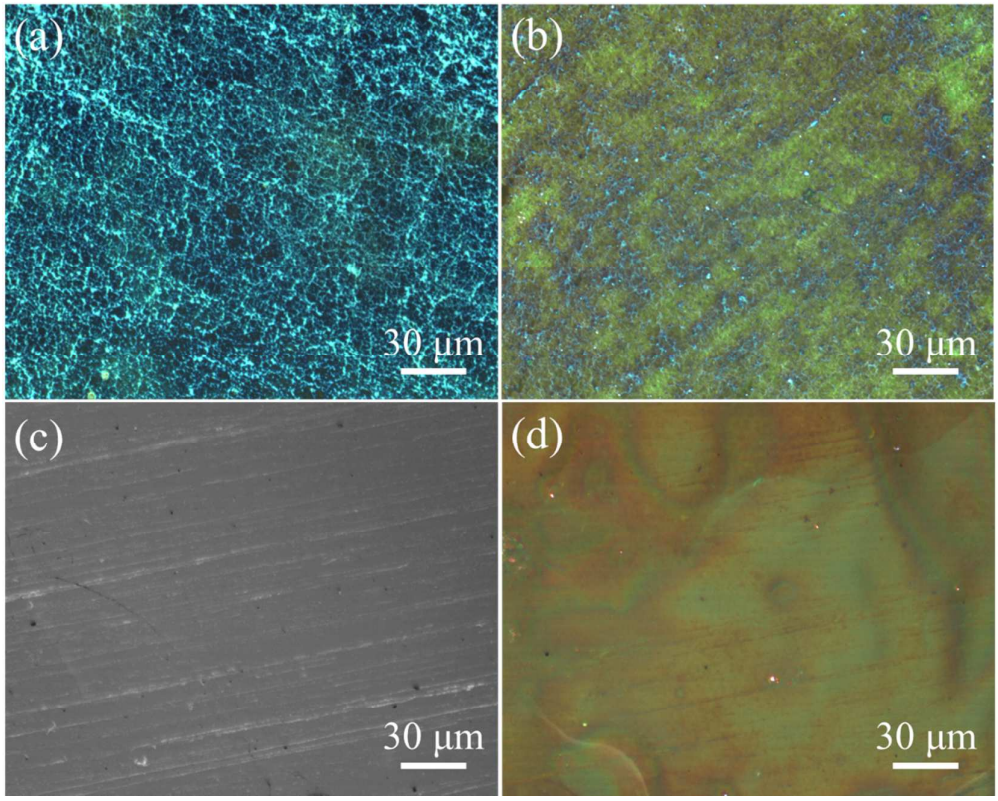

Figure S5. Optical microscopy image of (a) 250-nm-thick AAO on WG, (b) 300-nm-thick AAO on WG, (c) PG and (d) 250-nm-thick AAO on PG.

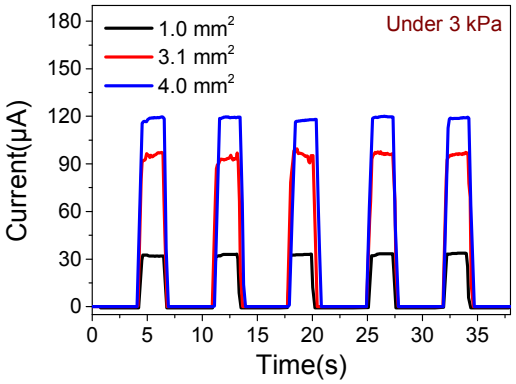

Figure S6. Cyclic current responses *via* different contact area of pressure sensors based on 200-nm-thick AAO membrane and WG under 3 kPa.

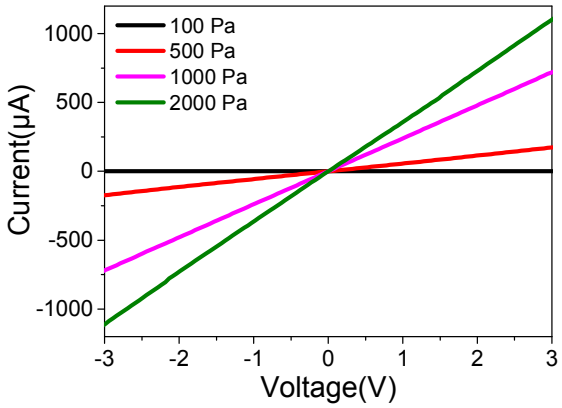

Figure S7. I-V curves of the sensor based on WG/200-nm-thick AAO under the pressure of 100, 500, 1000 and 2000 Pa respectively.

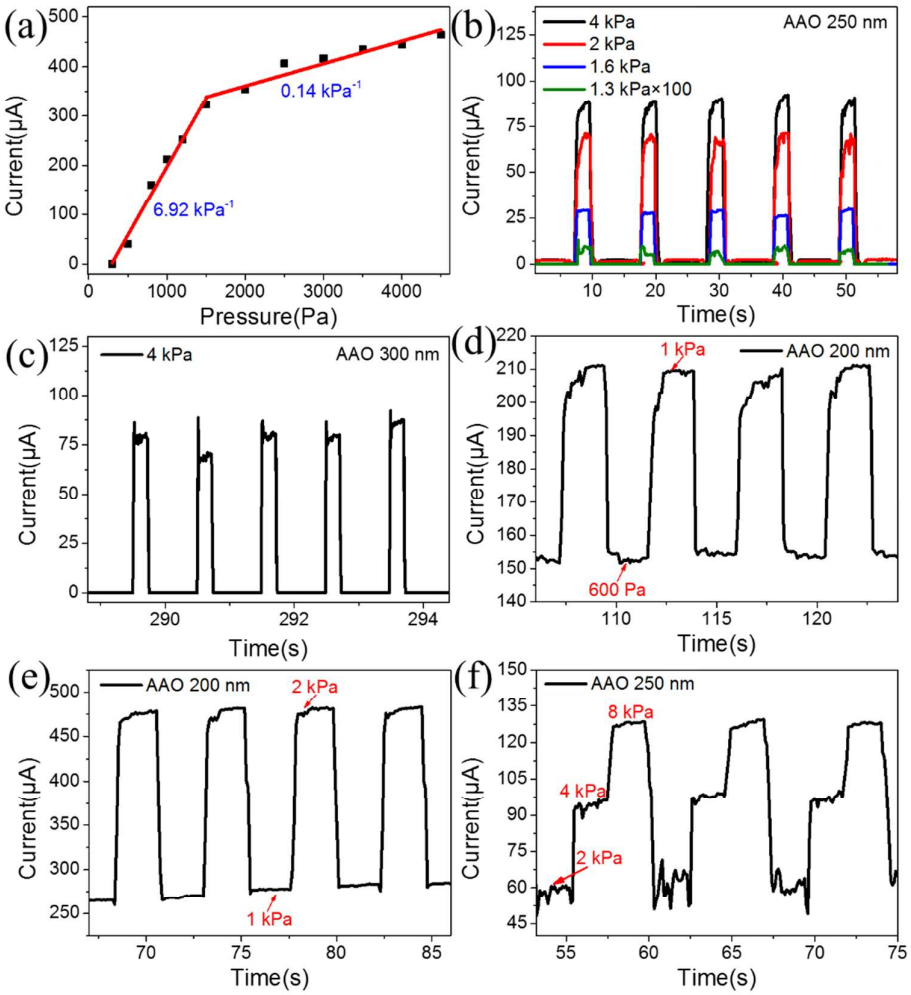

Figure S8. (a) Linear fit of current response of pressure sensor based on 200-nm-thick AAO membrane and WG. The current response for sensitivity calculation under 500, 800, 1000, 1500, 1200, 2000, 2500, 3000, 3500, 4000 and 4500 Pa is 40, 160, 212, 252, 323, 355, 407, 417, 435, 445 and 464 μA, respectively. (b) Cyclic current responses of pressure sensors based on 250-nm-thick AAO membrane and WG under various pressures. (c) Cyclic current responses of pressure sensors based on 300-nm-thick AAO membrane and WG under 4 kPa. (d) Cyclic current responses of pressure sensors based on 200-nm-thick AAO membrane and WG under 600 Pa to 1 kPa. (e) Cyclic current responses of pressure sensors based on

200-nm-thick AAO membrane and WG under 1 to 2 kPa. (f) Cyclic current responses of pressure sensors based on 250-nm-thick AAO membrane and WG under 2 to 4 to 8 kPa.

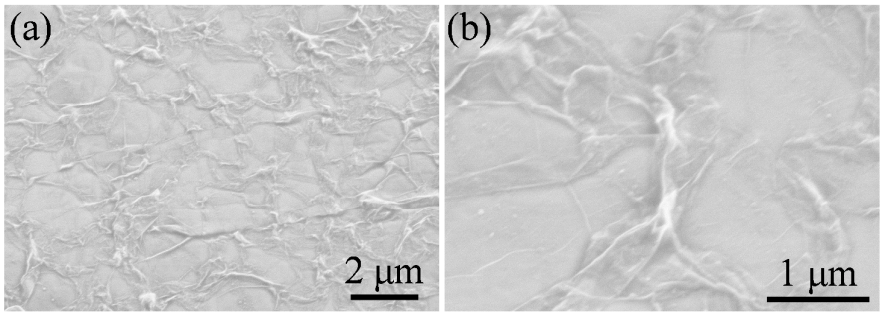

Figure S9. (a) Low-magnification and (b) high-magnification SEM images of WG on PDMS after 10,000 cycles test.

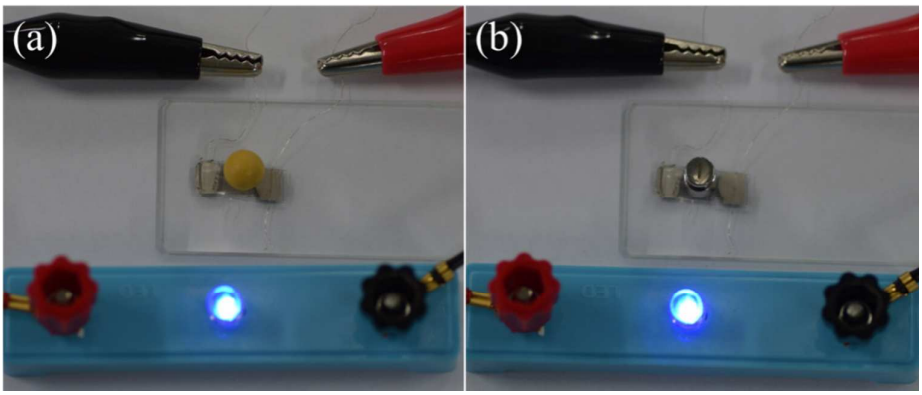

Figure S10. The blue LED is on with a (a) soybean and (b) weight applied on the pressure sensor based on 200-nm-thick AAO membrane and WG.

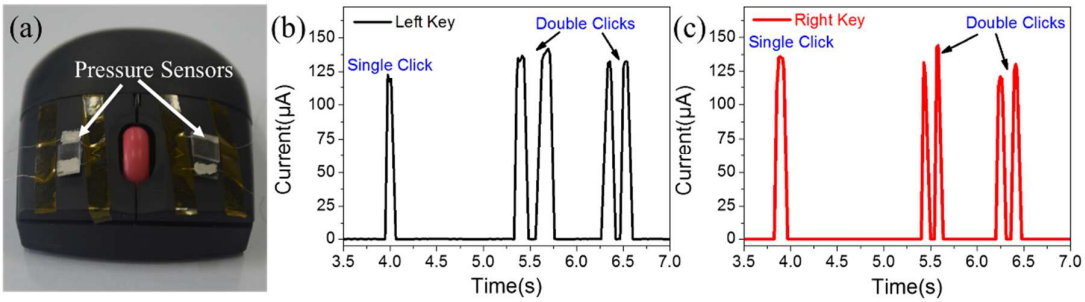

Figure S11. Application demonstration of the pressure sensor for mouse keys.