Nanoscale

ARTICLE

Supporting Information

Unprecedented Sensitivity towards Pressure Enabled by Graphene Foam

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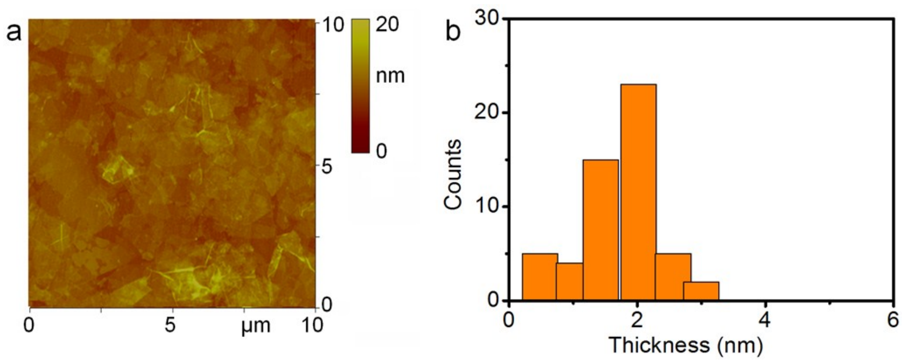

Fig. S1 AFM image of the GO nanofilms (a) and statistical information of the thickness of the GO sheets (b).

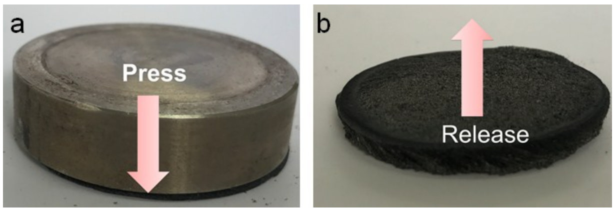

Fig. S2 The real-time images of the compression–recovery process. Diameters: 4.5 cm.

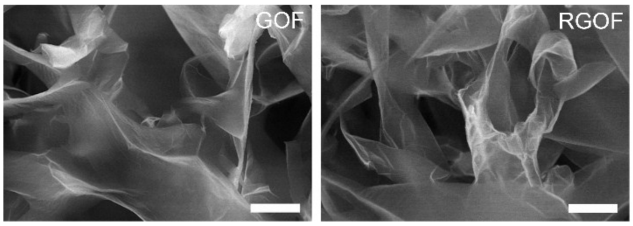

Fig. S3 SEM images of the GOF (a) and RGOF (b). They separately correspond to the EDX images in Figure 2c and d. The scale bars are 20 μm in panels (a) and (b).

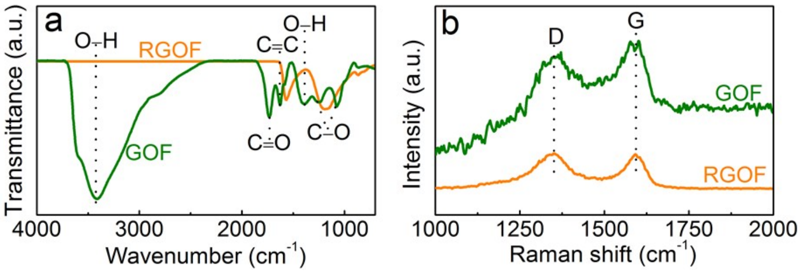

Fig. S4 a) FTIR spectra of the GOF and RGOF. In contrast to the GOF, the O–H bond in RGOF disappears, and the C–O and C=O bonds also decrease. b) Raman spectra of the GOF and RGOF. The intensity ratios of D and G peaks for the GOF and RGOF are simulated to be 0.94 and 1.02, respectively.

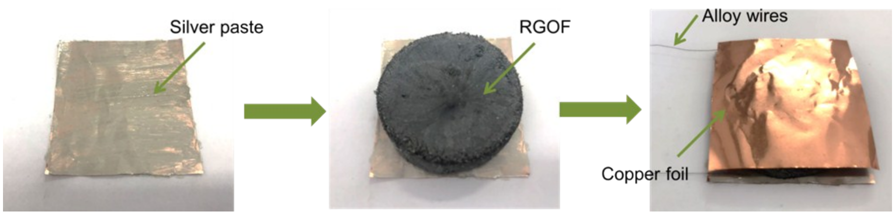

Fig. S5 Fabrication process of the RGOF-based sensor device.

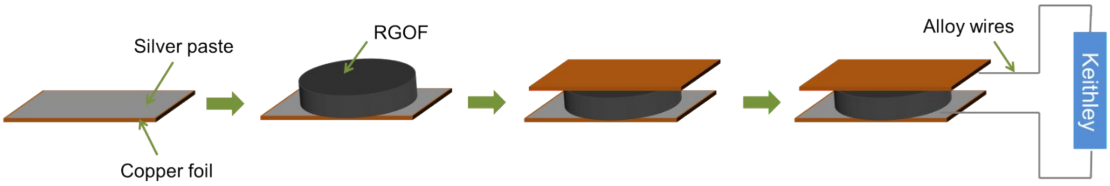

Fig. S6 Schematic of the fabrication process of the rGO foam-based sensor device.

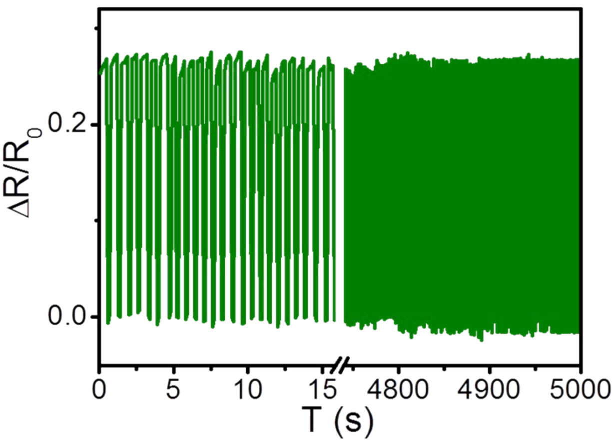

Fig. S7 The stability test of the RGOF sensor under a pressure of 13 Pa for more than 5000s cycles (in 5000 s).

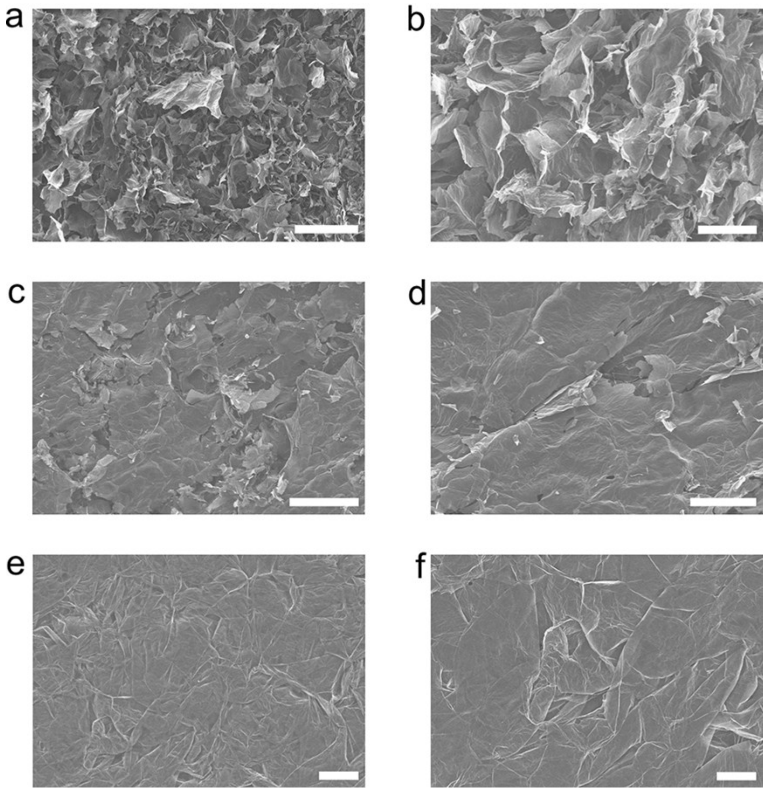

Fig. S8 a,b) SEM images of the initial RGOF without compression. c,d) SEM images of the compressed RGOF after the long-term cycling pressure test with large pressure (over 300 Pa). e,f) SEM images of the initial RGO sheet without compression. The scale bars in panels (a-f) are 200, 100, 200, 100, 50, and 25 µm.

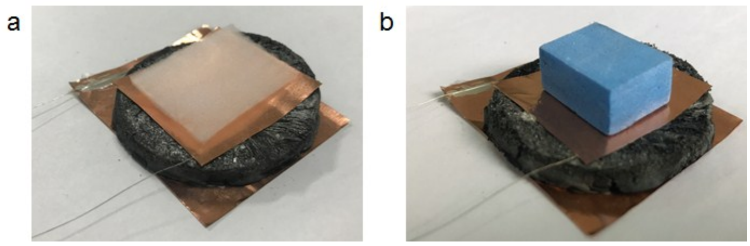

Fig. S9 The RGOF sensor under a pressure of ~ 0.1 Pa (a) and 13 Pa (b).

For the small pressure test, the commercialized plastic foams (polystyrene and polyurethane with different densities) were cut into cubes with different sizes to provide pressure. Due to the full contact of the cubes and RGOF sensing device in the horizontal plane, the pressure p is calculated as follows:

$p = mg/S$

where m represents the mass of the plastic foam, g is the acceleration of gravity, and S is the contact area. Thus the pressure could be regulated by the mass and bottom area of the plastic cubes. The plastic cube shown in Fig. S9a with the mass of 8 mg and the size of $31 \times 23 \times 1.5\ mm^3$ could provide a pressure of 0.11 Pa, which is calculated by the following equation: $p = (8 \times 10^{-6}\ kg * 10\ N/kg)/(23 \times 31 \times 10^{-6}\ m^2)$.

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