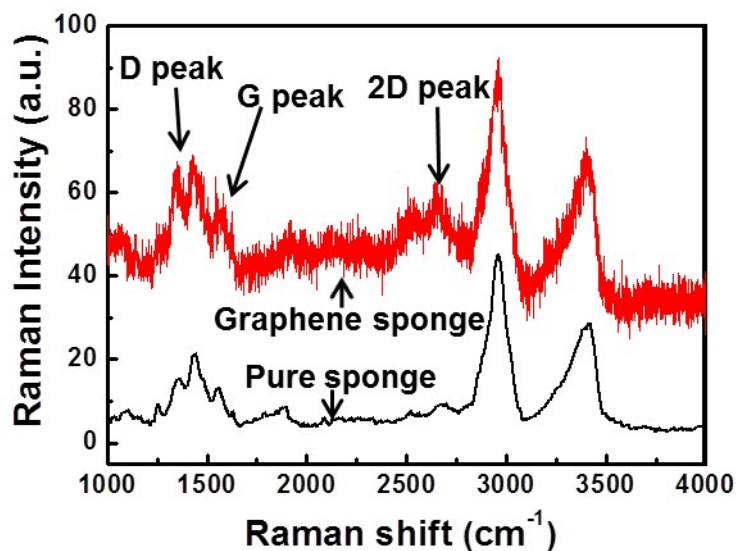


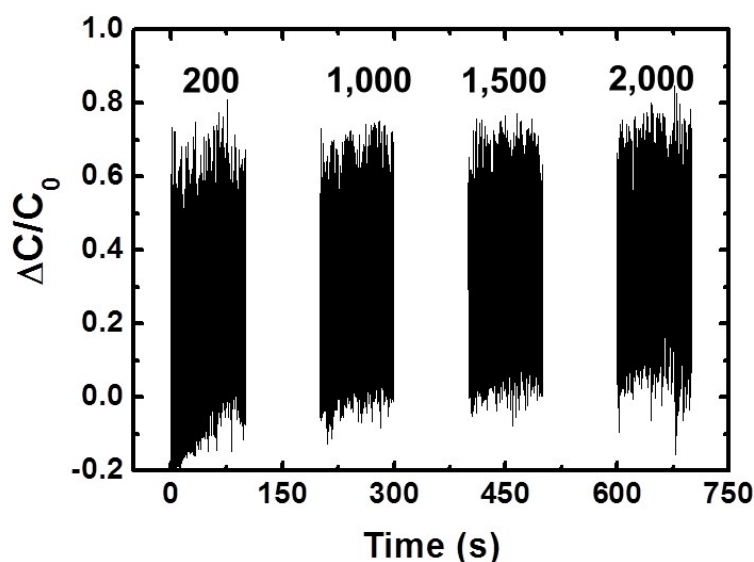
## Supplemental information

### S1. Raman spectrum



**Figure S1.** Raman spectroscopy of pure and graphene-coated polyurethane sponge. The graphene-coated sponge represents noticeable G band (1587 cm<sup>-1</sup>) and 2D band (2682 cm<sup>-1</sup>) intensities, whereas the pure sponge doesn't have such bands intensities. Also, The Raman resonance observations of the graphene-coated sponge indicate layered graphene with a reasonable ratio (> 1) of intensities of the G band to the 2D band.

### S2. Reproducible operation of GSC-based force sensor



**Figure S2.** The reproducible operation up to 2,000 loading-unloading cycles with a pulse width of 2 Hz and a vertical pressure of 2 kPa.

### S3. Pressure-sensitivity and saturation pressure dependent to the thickness of GSC.

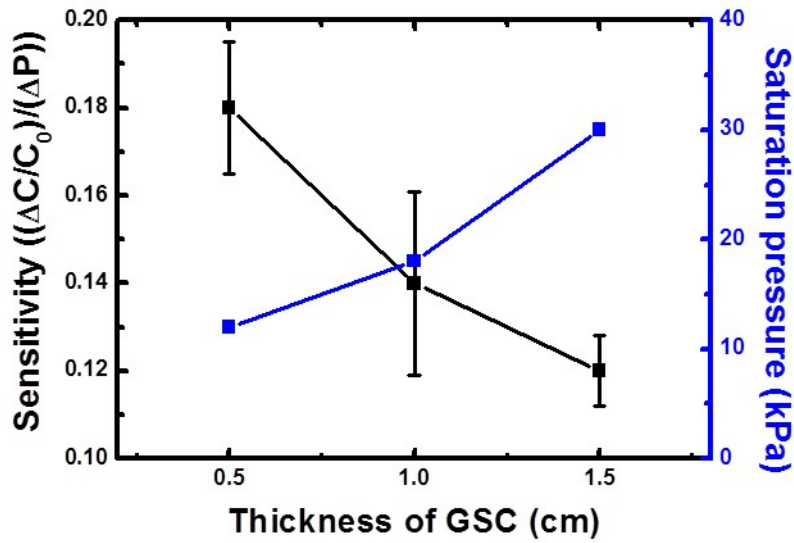


Figure S3. Thickness dependence of sensitivity and saturation pressure for various thickness of GSCs. The sensitivity is defined from linear tendency of conductance variation for vertical pressure. Saturation pressure indicates the pressure ending the linear behavior. Over the saturation pressure, the GSC shows a rapid saturation in conductance change by losing linear behavior.

### S4. Responses for high vertical pressure

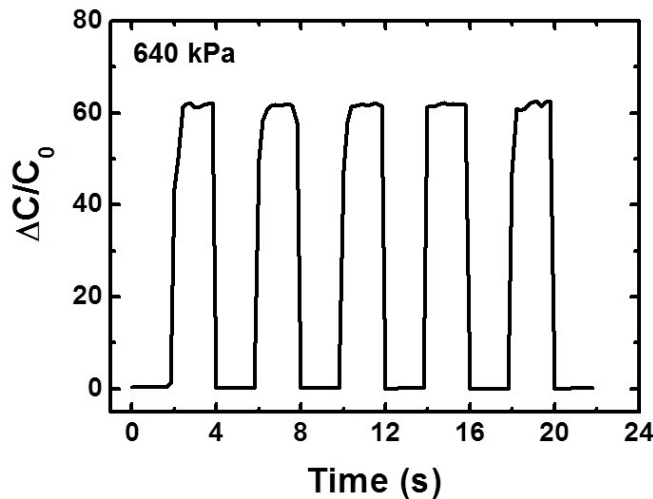


Figure S4. Conductance change ratio (relative conductance change ratio of ~60) with the application of a vertical pressure of 640 kPa.