Electronic Supplementary Material (ESI) for Nanoscale.

Enhanced performance in capacitive force sensors using carbon nanotube/polydimethylsiloxane nanocomposites with high dielectric properties

Hyeyoung Jang[a,b,†], Hyungsuk Yoon[c,d,†], Youngpyo Ko[a], Jaeyoo Choi[a], Sang-Soo Lee[a,b], Insu Jeon[d], Jong-Ho Kim[c] and Heesuk Kim[a**]*

[a] Photo-electronic Hybrids Research Center, Korea Institute of Science and Technology (KIST), Seoul 02792, Korea.

[b] KU-KIST Graduate School of Converging Science and Technology, Korea University, Seoul 02841, Korea.

[c] Korea Research Institute of Standards and Science (KRISS), Daejeon 34113, Korea.

[d] School of Mechanical Systems Engineering, Chonnam National University, Gwangju, 61186, Korea.

Hyeyoung Jang and Hyungsuk Yoon contributed equally to this work.

*Corresponding authors. E-mail: jhk@kriss.re.kr and heesukkim@kist.re.kr

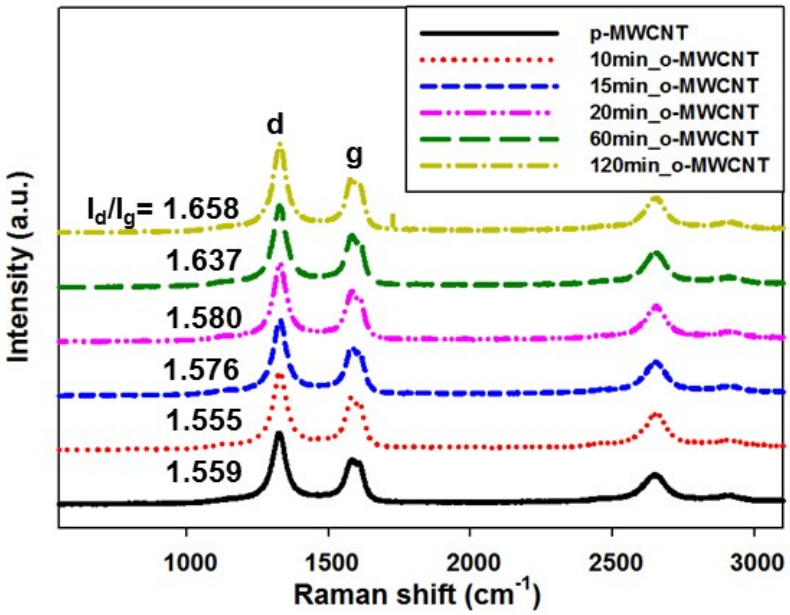

Fig. S1 Raman spectra of p-MWCNTs and o-MWCNTs treated with acid for various amount of time (10, 15, 20, 60, and 120 min).

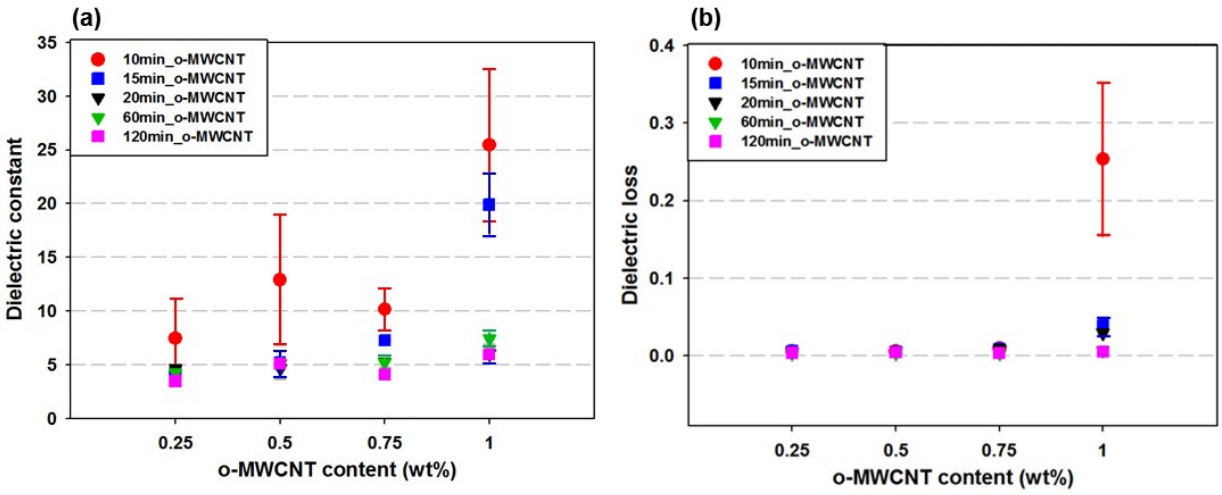

Fig. S2 (a) Dielectric constant at 100 kHz and (b) dielectric loss at 100 kHz of o-MWCNT/PDMS composites as a function of CNT contents. MWCNTs were oxidized with acid for various amount of time (10, 15, 20, 60, and 120 min).

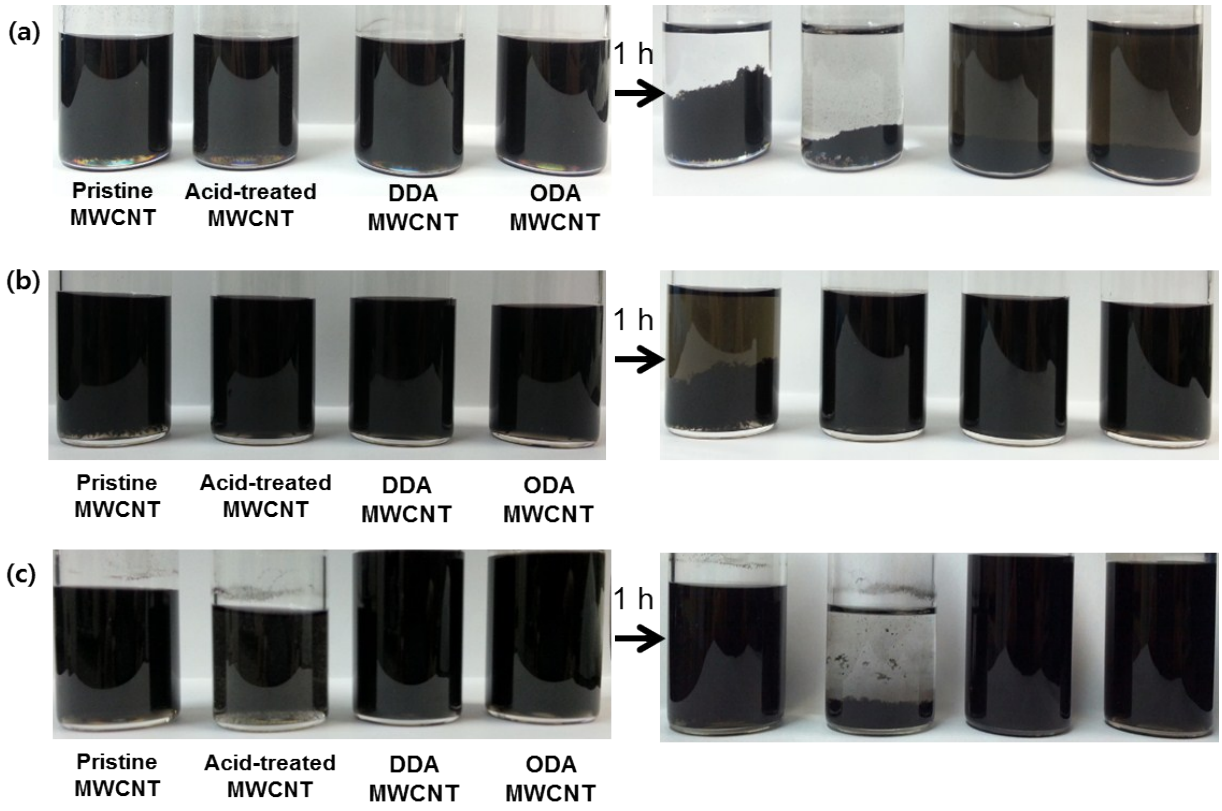

Fig. S3 Photographs of MWCNTs in (a) toluene, (b) tetrahydrofuran, and (c) chloroform after 1 h.

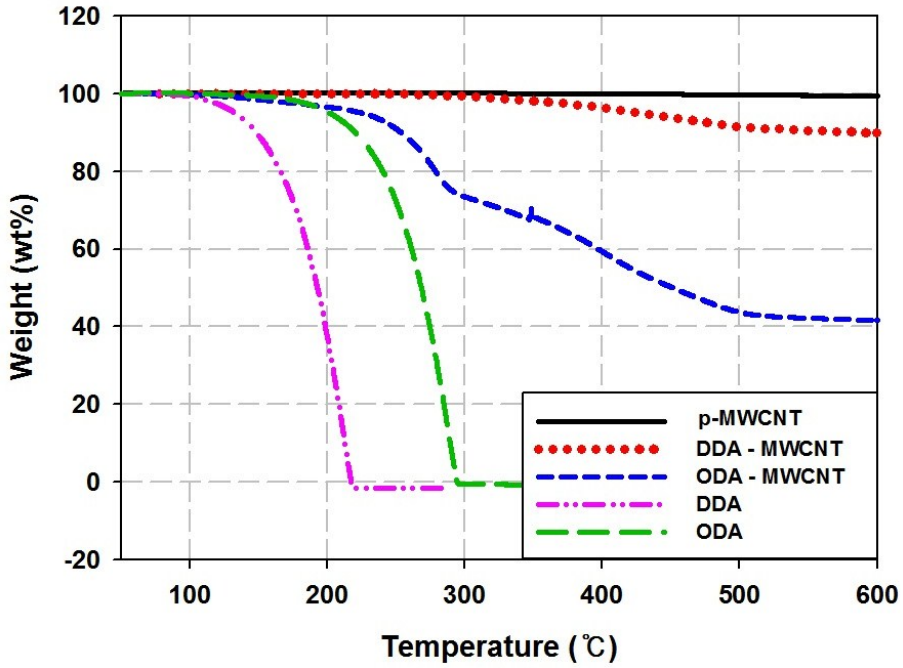

Fig. S4 TGA curves of p-MWCNT, DDA-MWCNT, ODA-MWCNT, DDA, and ODA illustrating the weight loss in the range of 50-700 °C.

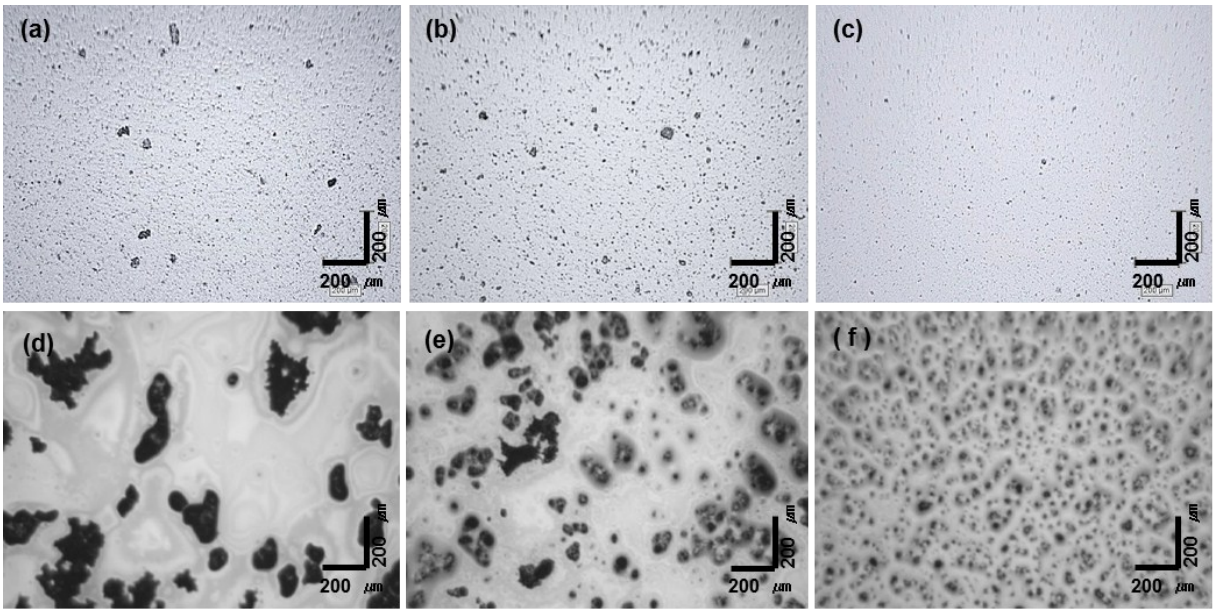

Fig. S5 Optical microscopy (OM) images of p-MWCNT, o-MWCNTs, and DDA-MWCNTs in chloroform (a, b, c) and in PDMS/chloroform mixture (d, e, f), respectively.

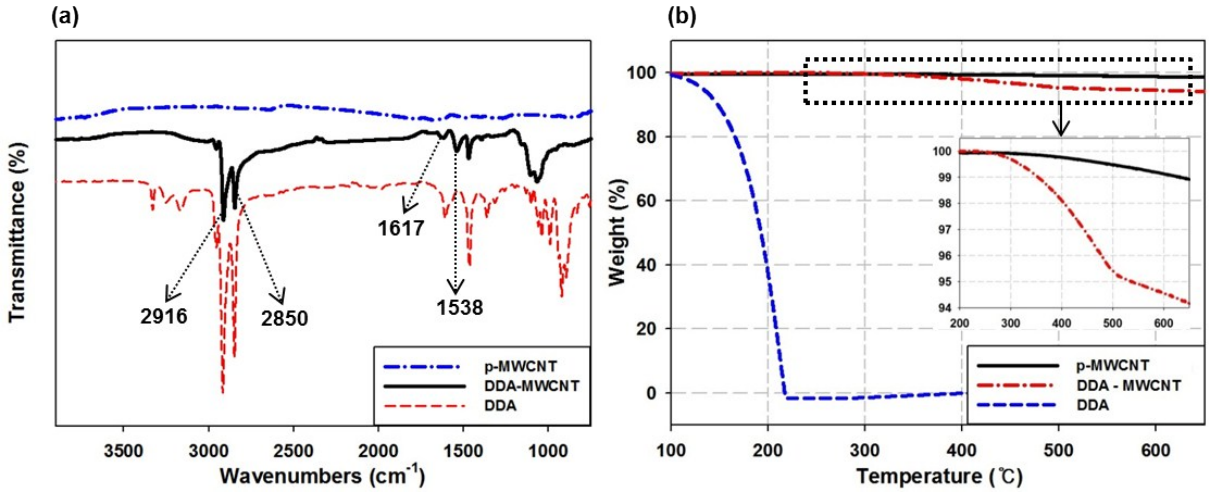

Fig. S6 (a) FT-IR spectra and (b) TGA curves of p-MWCNT, DDA-MWCNT, and DDA. DDA-MWCNTs were prepared by the reaction of o-MWCNT (treated with acid for 15 min) with DDA.

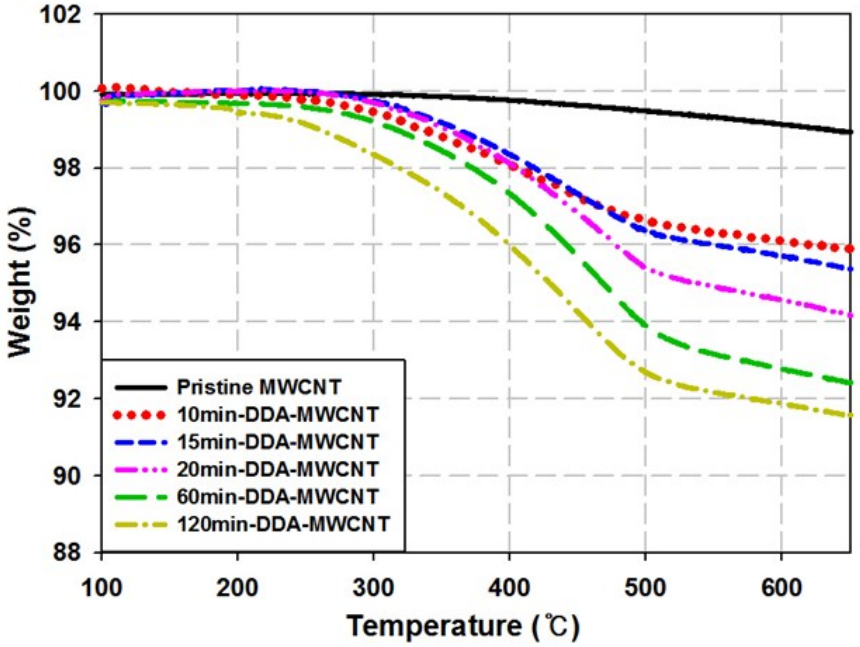

Fig. S7 TGA curves of p-MWCNT and DDA-MWCNTs. DDA-MWCNTs were prepared by the reaction of o-MWCNT (treated with acid for 10, 15, 20, 60, and 120 min) with DDA.

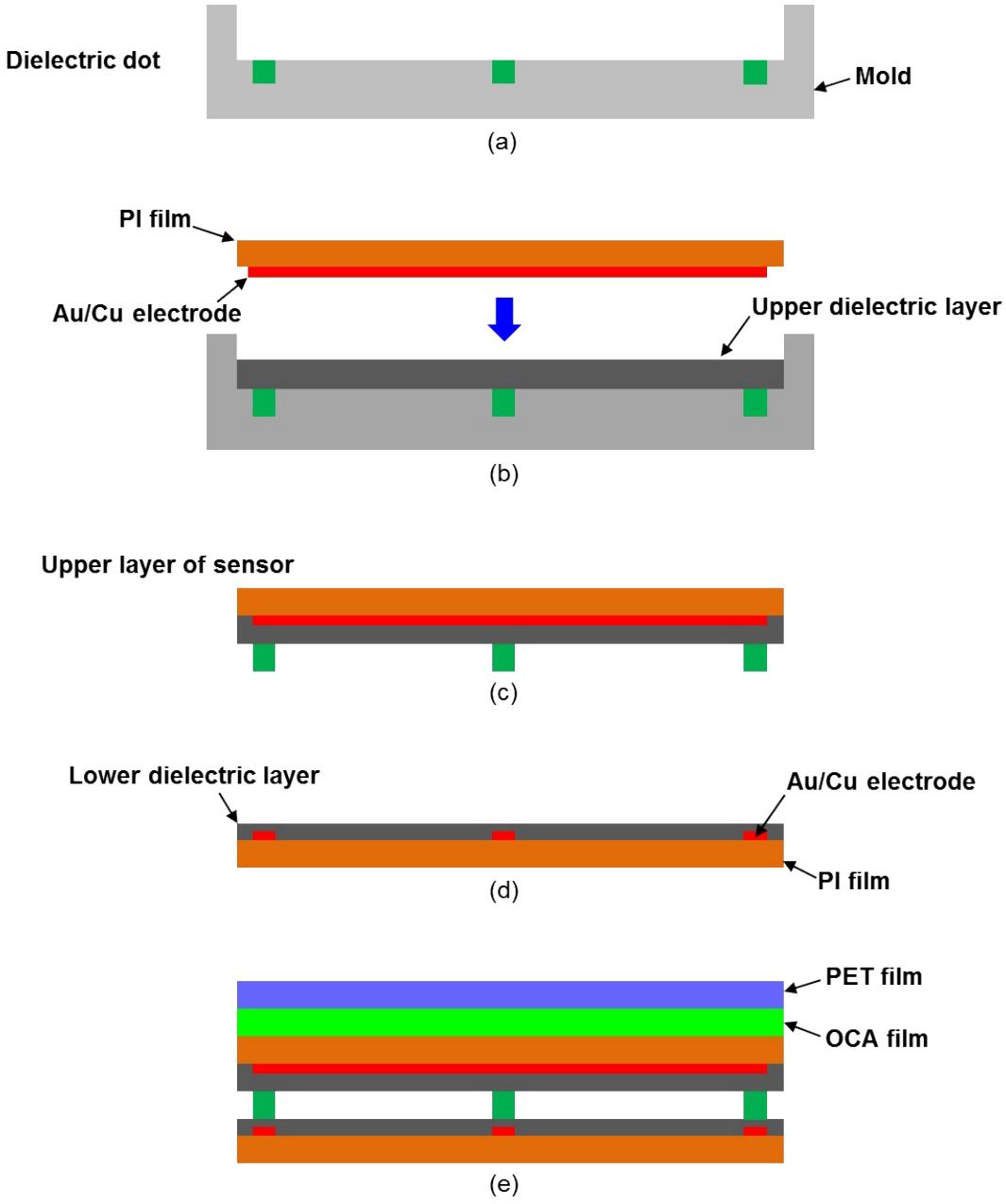

Fig. S8 Schematic illustration of sensor array fabrication. (a) Formation of dielectric dots, (b) bonding of dielectric dots with upper dielectric layer, (c) fabricated upper layer of the sensor, (d) lower layer with dielectric layer, and (e) alignment of upper layer with lower layer.

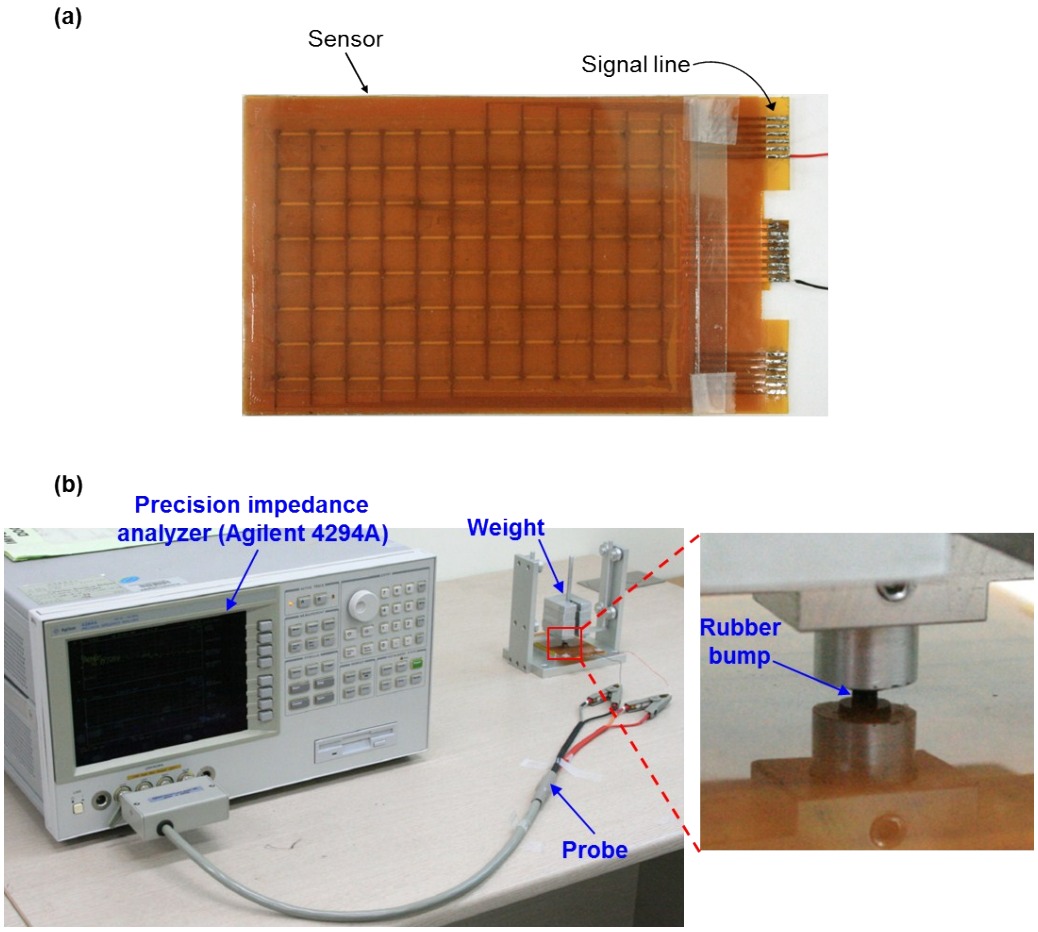

Fig. S9 (a) Bonding of signal processing board with sensor array and (b) measurement setup for loading test as a function of weight.

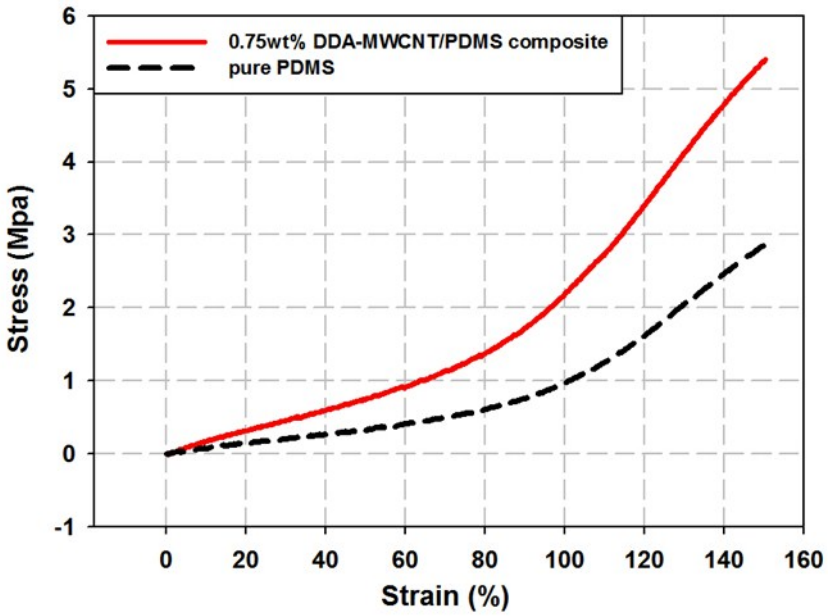

Fig. S10 Stress-strain curves of pure PDMS and PDMS composite with 0.75 wt% DDA-MWCNTs.