Supporting Information

Synthesis of Multiwalled Carbon Nanotube-Reinforced Polyborosiloxane Nanocomposites with Mechanically Adaptive and Self-Healing Capabilities for Flexible Conductors

Tongfei Wu and Biqiong Chen*

Department of Materials Science and Engineering, University of Sheffield, Mappin Street, Sheffield S1 3JD, U.K.

E-mail: biqiong.chen@sheffield.ac.uk

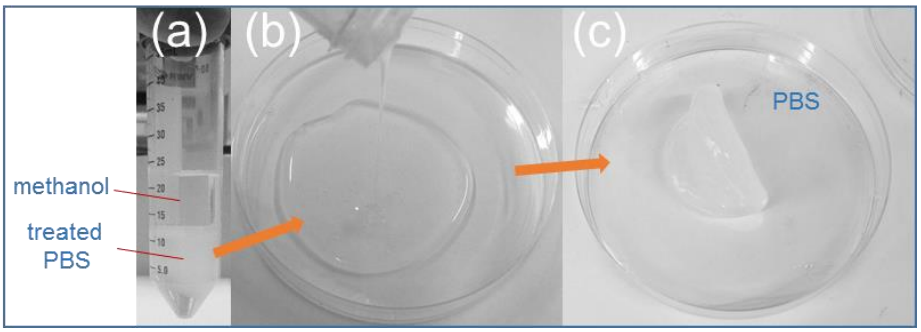

Figure S1. Preparation of polyborosiloxane (PBS) from hydroxyl terminated poly(dimethylsiloxane) (PDMS) and boric acid. Digital images of (a) the mixture after centrifugation showing two separated liquid phases, (b) refresh modified PDMS (i.e. PBS) sample, containing some residual methanol and so remaining the capability to flow and (c) non-tacky PBS after methanol evaporation.

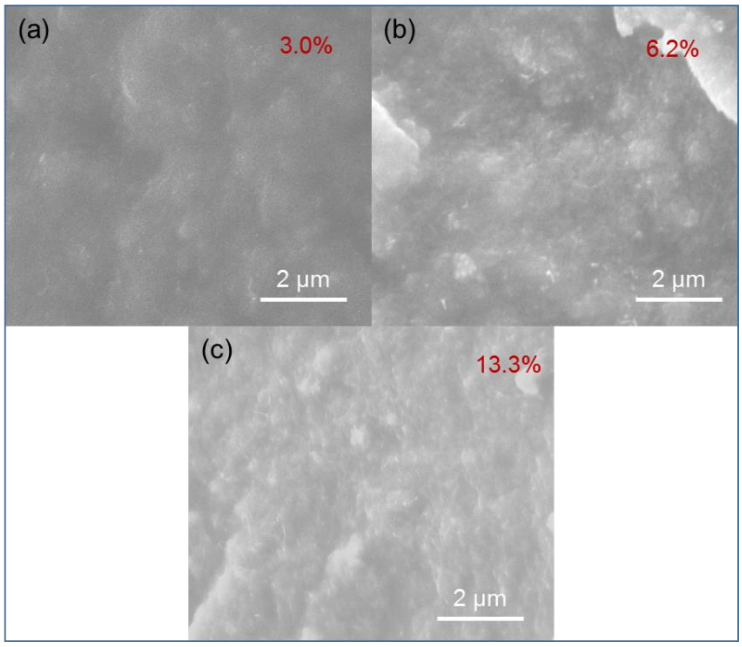

Figure S2. Cross-section scanning electron microscopic images of multiwalled carbon nanotube (MWCNT)/PBS nanocomposites with different contents of MWCNTs: (a) 3.0 wt %, (b) 6.2 wt % and (c) 13.3 wt %.

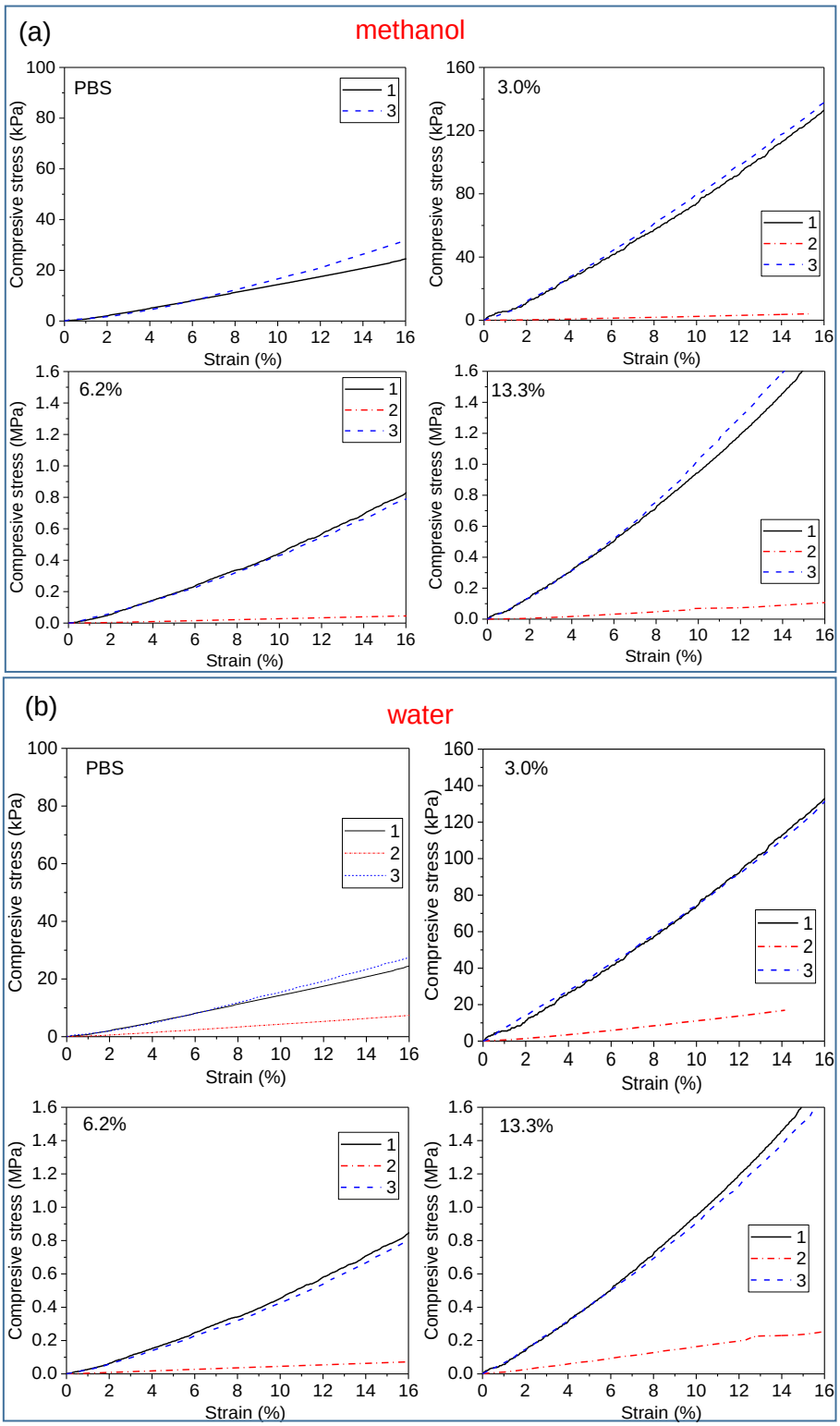

Figure S3. Typical compressive stress-strain curves of MWCNT/PBS nanocomposites with different contents of MWCNTs using (a) methanol and (b) water vapor as the stimulus: 1. original, 2. after kept in the saturated vapor at 20 °C for 24 h, and 3. recovered after kept in ambient conditions for 8 h.

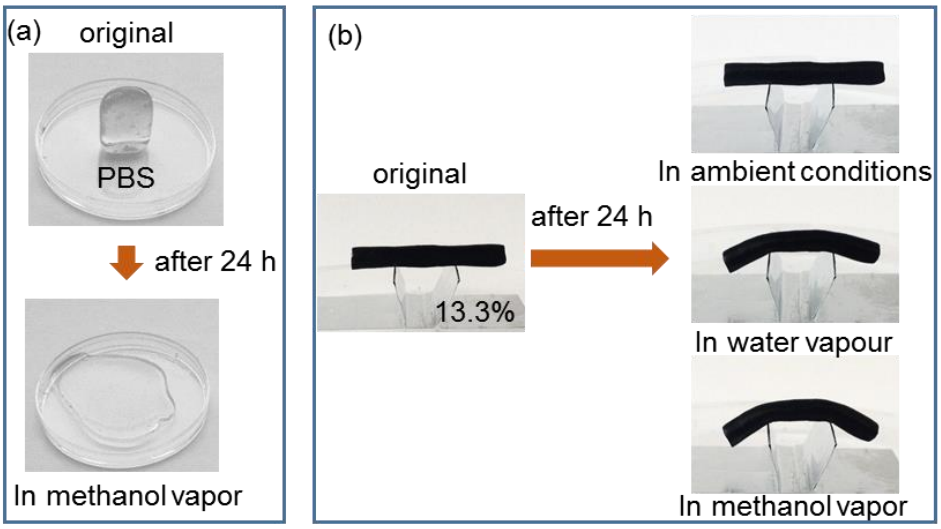

Figure S4. a) Digital images of PBS before and after kept in saturated methanol vapor at 20 ºC for 24 h. b) Digital images of the 13.3% MWCNT/PBS nanocomposite before and after kept in ambient environments, saturated water vapor or saturated methanol vapor for 24 h. The sample was softened by water or methanol and bent under the gravity force.

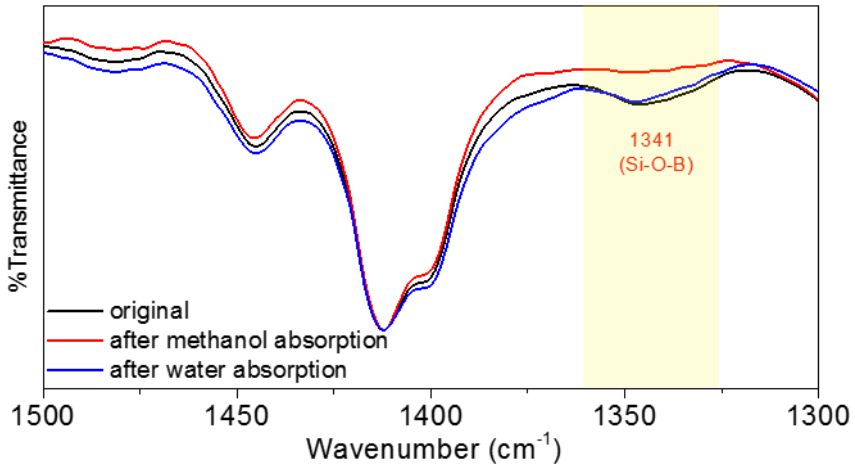

Figure S5. Fourier transform infrared spectra of PBS samples.

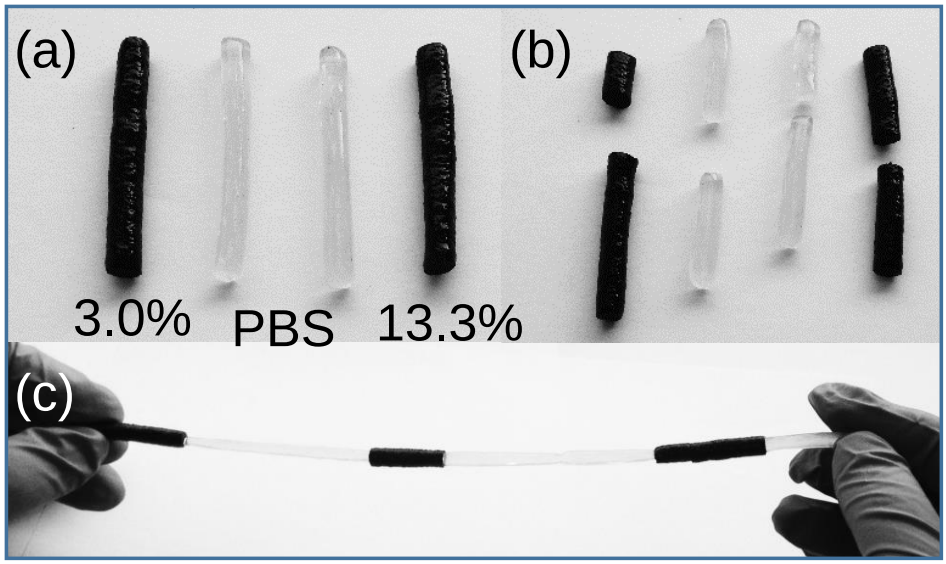

Figure S6. Demonstration of the self-healing properties of PBS and MWCNT/PBS nanocomposites: (a) undamaged samples, (b) completely severed samples, and (c) mechanically self-healed sample.

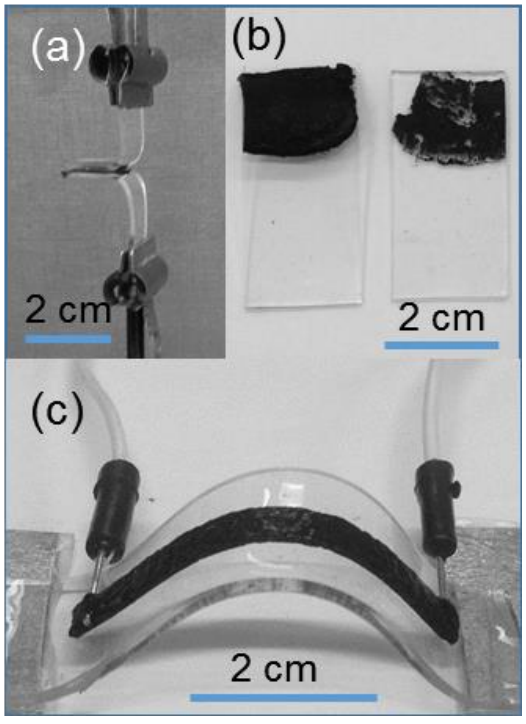

Figure S7. Digital images of (a) a sample for T-peel testing and (b) the fractured surfaces of the sample after peel testing. c) The flexible device based on a MWCNT/PBS nanocomposite coated on a poly(dimethylsiloxane) elastomer substrate for measuring the resistance as a function of flexion angle.