

Supplementary information

Controlling the spacing of the linked graphene oxide system with dithiol linkers under confinement

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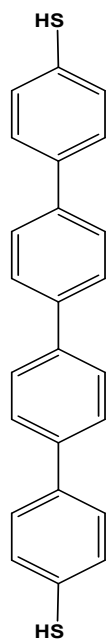
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[1,1':4',1'':4'',1''':4''']-
quaterphenyl]-4,4''-dithiol
(QPDT)

Figure S1. Structure of
QPDT.

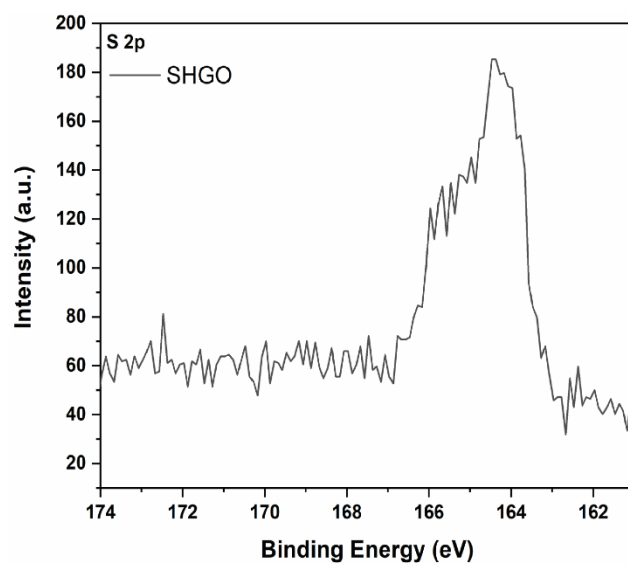


Figure S2. XPS S2p region spectra for SHGO sample.

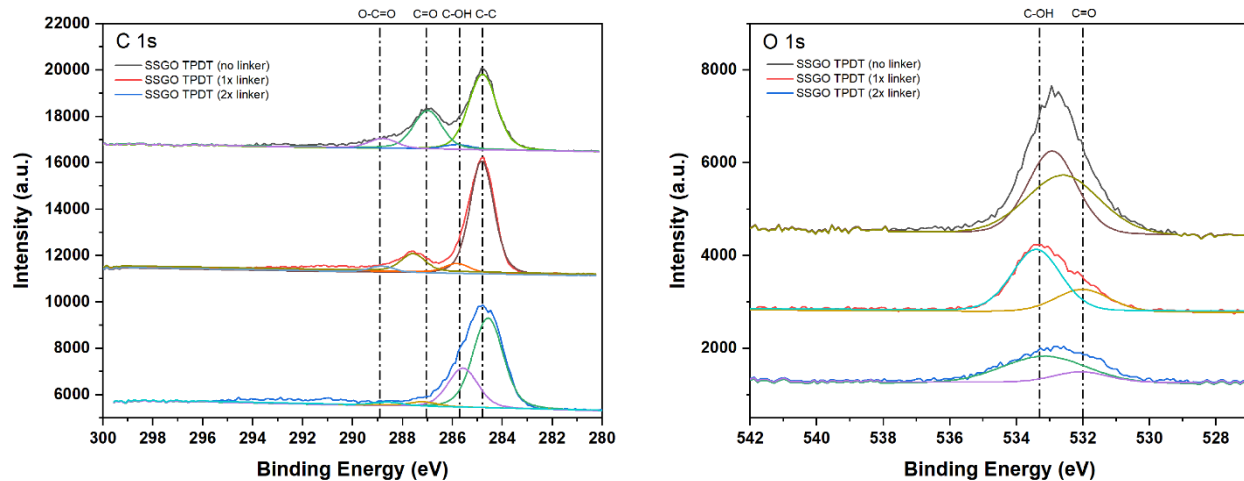


Figure S3. Deconvolution results of the XPS spectra for SSGO (no linker), SSGO TPDT (1x linker), and SSGO TPDT (2x linker). Carbon 1s region (**Left**). Oxygen 1s region (**Right**).

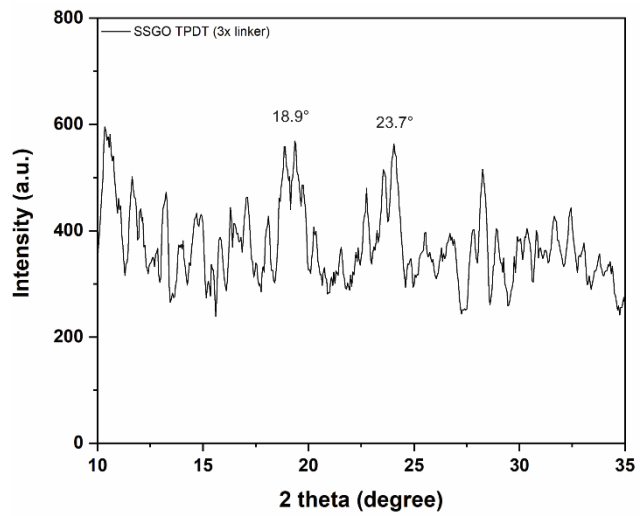


Figure S4. XRD Pattern of the SSGO TPDT 3x linker sample. The diffraction pattern of the SSGO TPDT (3x linker) were detected at 18.9° and 23.7°.

Table S1 – Atomic concentration of carbon, oxygen, and sulfur in 0.11, 0.33 and 0.55 ml of peroxide in 1x times QPDT samples.

Sample	C%	O%	S%
SSGO-QPDT (0.11 ml)	75%	23%	2%
SSGO-QPDT (0.33 ml)	78%	20%	2%
SSGO-QPDT (0.55 ml)	79%	18%	3%

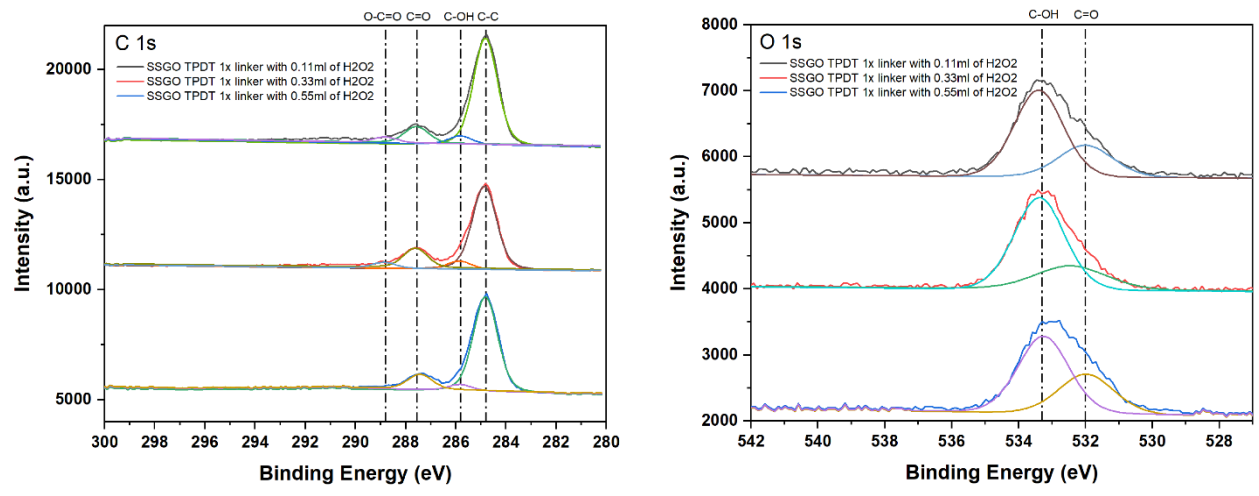


Figure S5. Deconvolution results of the XPS spectra for SSGO TPDT 1x linker with 0.11, 0.33, and 0.55 ml of H₂O₂. Carbon 1s region (**Left**). Oxygen 1s region (**Right**).

Raman spectroscopy was performed on a HORIBA LabRAM HR Evolution Raman microscope with a 532 nm laser.

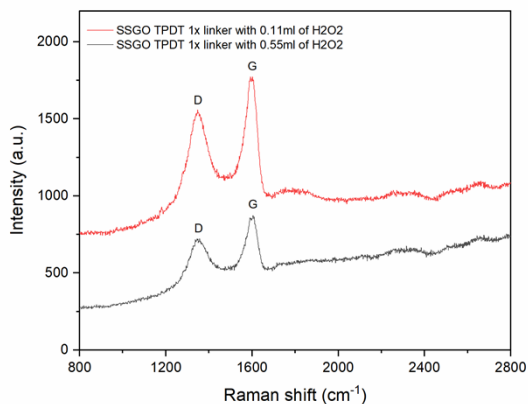


Figure S6. Raman spectra for SSGO TPDT 1x linker with 0.11 and 0.55 ml of H₂O₂.

Figure S6 shows the Raman spectrum of SSGO TPDT with 0.11 ml and 0.55 ml of H₂O₂. The Raman spectra displays D and G peaks located at 1344 and 1592cm⁻¹, respectively. The intensity ratios of I_D/I_G of SSGO TPDT with 0.11 ml and 0.55 ml of H₂O₂ are 0.84 and 0.83, respectively.

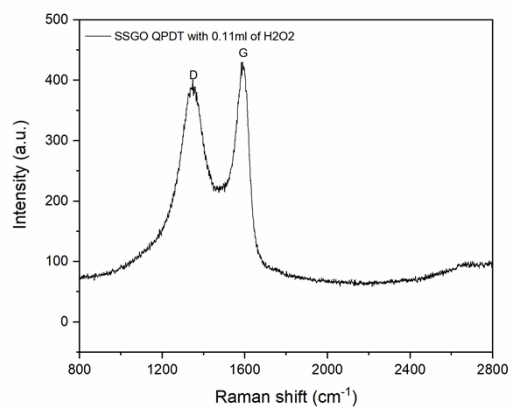


Figure S7. Raman spectra for SSGO QPDT with 0.11 ml of H₂O₂.

Figure S7 shows the Raman spectra of SSGO QPDT with 0.11 ml of H₂O₂. The Raman spectra indicates D and G peaks found at 1346 and 1593cm⁻¹, respectively. The intensity ratio of I_D/I_G of SSGO QPDT with 0.11 ml of H₂O₂ is 0.91.

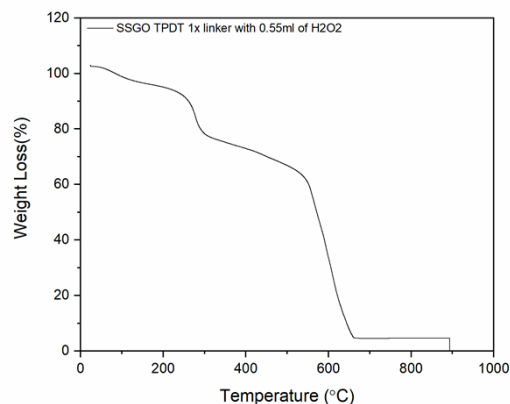


Figure S8. TGA weight loss curve for SSGO TPDT with 0.55 ml of H₂O₂.

The investigations of the thermal stability of the SSGO TPDT 1x linker with 0.55 ml of H₂O₂ were performed using TGA. TGA was recorded on a TGA Q50 V20.13 system at the heating rate of 20K/min from 25-900 °C under air. The thermogravimetric curve showed two major weight drops. The first effect observed between the temperatures of 100 and 300 °C is associated with the thermal removal of oxygen functionalities (the decomposition of carboxylic) chemically bonded with graphene layers and the release of CO₂ gas. The second significant loss of sample weight begins at the temperature of around 550 °C. This effect corresponds to the decomposition of graphene-like sheets.

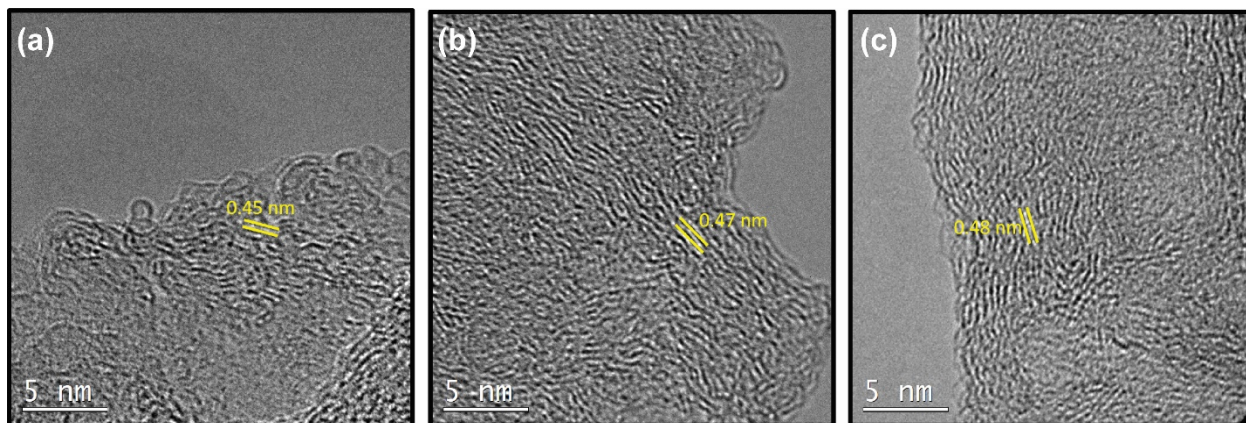


Figure S9. TEM images of a) SSGO QPDT (1x linker) with 0.11 ml of H_2O_2 b) SSGO QPDT (1x linker) with 0.33 ml of H_2O_2 c) SSGO QPDT (1x linker) with 0.55 ml of H_2O_2

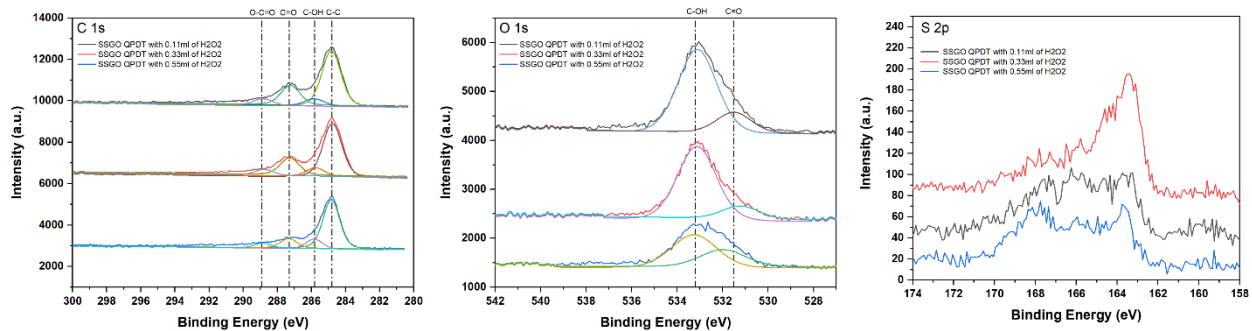


Figure S10. Deconvolution results of the XPS spectra for SSGO QPDT samples with 0.11, 0.33, and 0.55 ml of H₂O₂. Carbon 1s region (**Left**). Oxygen 1s region (**Middle**). Sulfur 2p region (**Right**).