Supplementary Information

Preparation and comparison of reduced graphene oxide and carbon nanotubes as fillers in conductive natural rubber for flexible electronics

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Figure S1: TEM of the MWCNT utilized for the preparation of the NR conductive composites.
**Table S1.** Assignment and relative percentage of the functionalities arising from the deconvolution of the C 1s XPS spectra: graphene oxide (GO1), thermally reduced at 150°C × 1 h under vacuum (GO2), thermally reduced GO at 1000°C × 5 s (GO3), chemically reduced GO using NaBH₄ + Ammonia (GO4), and chemically reduced GO using NaBH₄ + NaOH (GO5) samples determined by XPS.

| Sample | Peak BE (eV) | %   | Functionalities       |
|--------|-------------|-----|-----------------------|
| GO1    | 284.5       | 48.7| C–C and C=C           |
|        | 285.8       | 6.62| C–OH                  |
|        | 286.7       | 37.33| C–O–C                |
|        | 287.7       | 7.35| C=O                   |
| GO2    | 284.6       | 16.45| C–C and C=C          |
|        | 286.9       | 58.45| C–O–C                |
|        | 288.4       | 17.9 | C=O                  |
|        | 290.4       | 7.2  | N.D.                 |
| GO3    | 284.6       | 59.65| C–C and C=C          |
|        | 285.4       | 16.45| C–OH                 |
|        | 286.3       | 13.7 | C–O–C                |
|        | 288.1       | 10.2 | C=O                  |
| GO4    | 284.6       | 61.1 | C–C and C=C         |
|        | 285.5       | 17.7 | C–OH                 |
|        | 286.5       | 11.45| C–O–C                |
|        | 287.9       | 9.75 | C=O                  |
| GO5    | 284.6       | 58.19| C–C (sp2)            |
|        | 285.6       | 22.09| C–C (sp3)            |
|        | 287.0       | 12.80| C=O                  |
|        | 288.9       | 6.91 | C=O                  |
**Figure S2**: SEM cryogenic surface fracture of the rGO-THF composite (left) and rGO-Toluene (right). Contained within the yellow circles are marked the sulphur crystals remained after vulcanization of the samples.

**Figure S3**: stabilizing effect observed for the rGO dispersion after the addition of 0.1 vol% of NR and 3 months in Chloroform, xylene, THF and toluene, 1-4 respectively.
Figure S4: tensile test cycles for NR composite (toluene-based) with 4.4 wt% of the rGO.

Figure S5: tensile test cycles for the neat NR.

Conflicts of interest

No conflict of interest to declare