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Electronic Supplementary Information for

Comparative assessment of the strain-sensing behaviors in polylactic acid nanocomposites: reduced graphene oxide or carbon nanotubes

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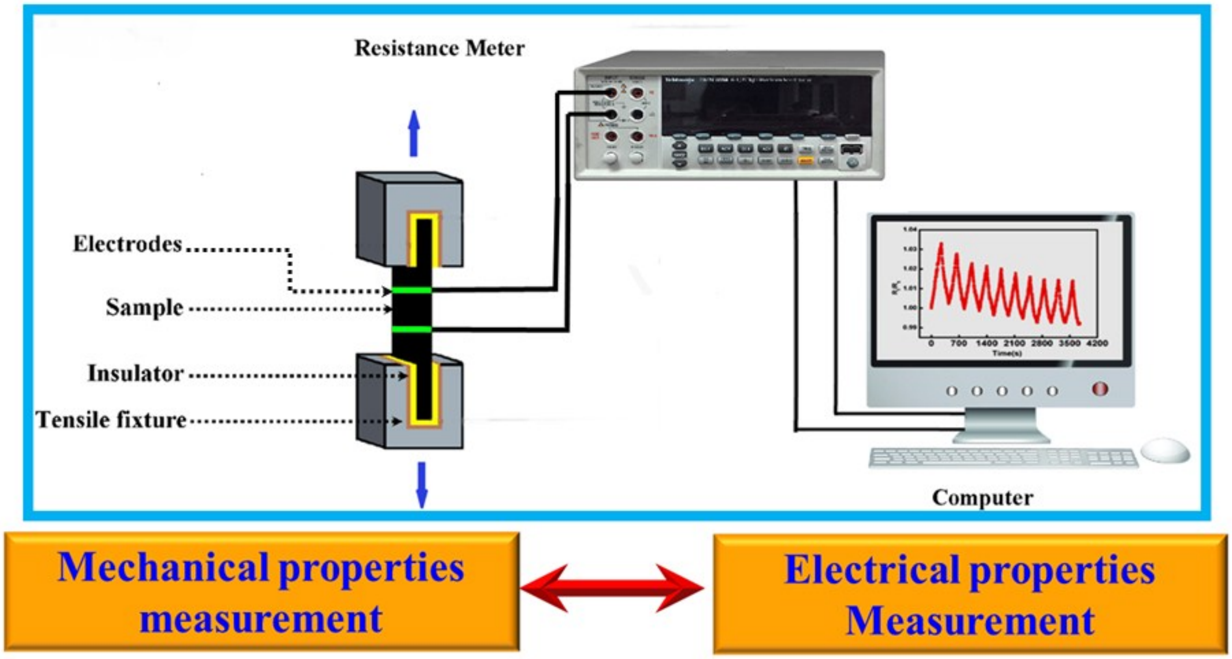

Fig. S1 The set-up for the strain sensing behaviors test (the blue arrows represent the tensile direction; the green lines represent the silver paste electrodes).

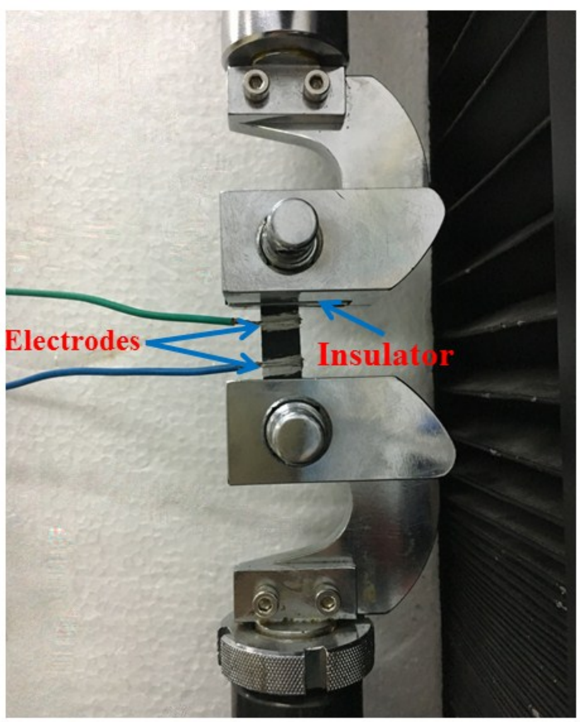

Fig. S2 Image of specimen setup for strain-sensing test used in the present paper (two layers of insulating gaskets were fixed on the surfaces of the tensile fixture).

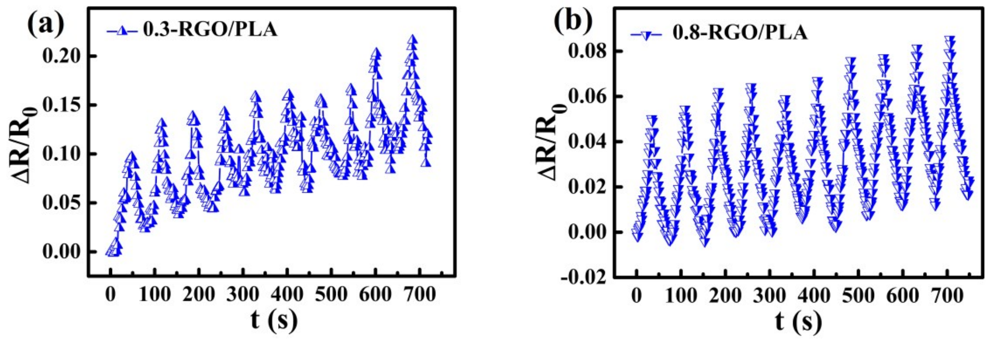

Fig. S3 Strain-sensing behavior measurement for RGO/PLA nanocomposites: (a) 0.3-RGO/PLA, (b) 0.8-RGO/PLA.

Samples with different RGO concentrations are tested in 10 extension-retention cycles to 3% strain. (The original resistances of 0.3-RGO/PLA and 0.8-RGO/PLA in this experiment were 5.31×10^{-5} S/m and 3.57×10^{-2} S/m, respectively). It can be seen from Fig. S3 that the values of max and min $\Delta R/R_0$ increased gradually with increasing the cycle number for both 0.3-RGO/PLA and 0.8-RGO/PLA nanocomposites. Low RGO concentrations (0.3-RGO/PLA), close to the percolation threshold leads to higher values of max and min $\Delta R/R_0$, as shown in Fig S3a; while high loading of RGO (0.8-RGO/PLA) gives slightly lower values of max and min $\Delta R/R_0$, the responsive curve tends to be more stable in comparison with 0.3-RGO/PLA nanocomposites, as shown in Fig. S3b.

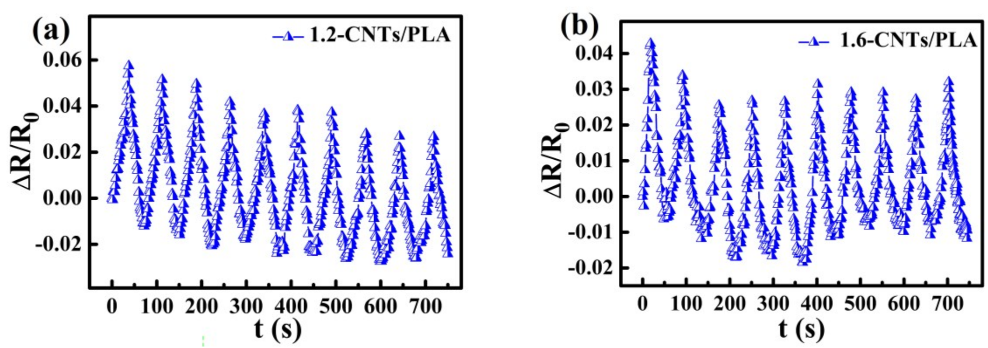

Fig. S4 Strain-sensing behavior measurement for CNTs/PLA nanocomposites: (a) 1.2-CNTs/PLA, (b) 1.6-CNTs/PLA.

Samples with different CNTs concentrations are tested in 10 extension-retention cycles to 3%

strain. (The original resistances of 1.2-CNTs/PLA and 1.6-CNTs/PLA in this experiment were 4.05×10^{-3} S/m and 6.31×10^{-2} S/m, respectively). It can be seen from Fig. S4 that values of max and min $\Delta R/R_0$ became more and more negative with increasing the cycle number for both 1.2-CNTs/PLA and 1.6-CNTs/PLA nanocomposites. However, it is worth noting that the strain sensing behavior of 1.6-CNTs/PLA exhibits a stable response compared with composites containing 1 wt% CNTs and 1.2 wt% CNTs, which is attributed to the formation of a stable conductive network.

Table S1.

The changes of max and min $\Delta R/R_0$ values of 0.5-RGO/PLA and 1.0-CNTs/PLA nanocomposites during 10 cycles.

Cycle number		1	2	4	6	8	10
RGO/PLA	Max $\Delta R/R_0$	0.049	0.046	0.059	0.068	0.069	0.074
	Min $\Delta R/R_0$	0.012	0.016	0.025	0.034	0.040	0.044
CNTs/PLA	Max $\Delta R/R_0$	0.063	0.038	0.029	0.024	0.024	0.014
	Min $\Delta R/R_0$	-0.019	-0.029	-0.029	-0.034	-0.038	-0.043

The max and min $\Delta R/R_0$ values of 0.5-RGO/PLA and 1.0-CNTs/PLA nanocomposites during 10 cycles are shown in table S1. For RGO/PLA nanocomposites, the max $\Delta R/R_0$ value in the tenth cycle increases to 0.074 from 0.049 in the first cycle, meanwhile the min $\Delta R/R_0$ value in the tenth cycle increases to 0.044 from 0.012 in the first cycle. Contrarily, for CNTs/PLA nanocomposites, the max $\Delta R/R_0$ value in the tenth cycle decreases to 0.014 from 0.063 in the first cycle, and the min $\Delta R/R_0$ value in the tenth cycle decreases to -0.043 from -0.019 in the first cycle.