Supporting Information

Multifunction Films with Highly Oriented "Nano-brick Walls" Structure by Regulating Modified TiO_2 @ Graphene oxide / Poly (vinyl alcohol) Nanocomposites

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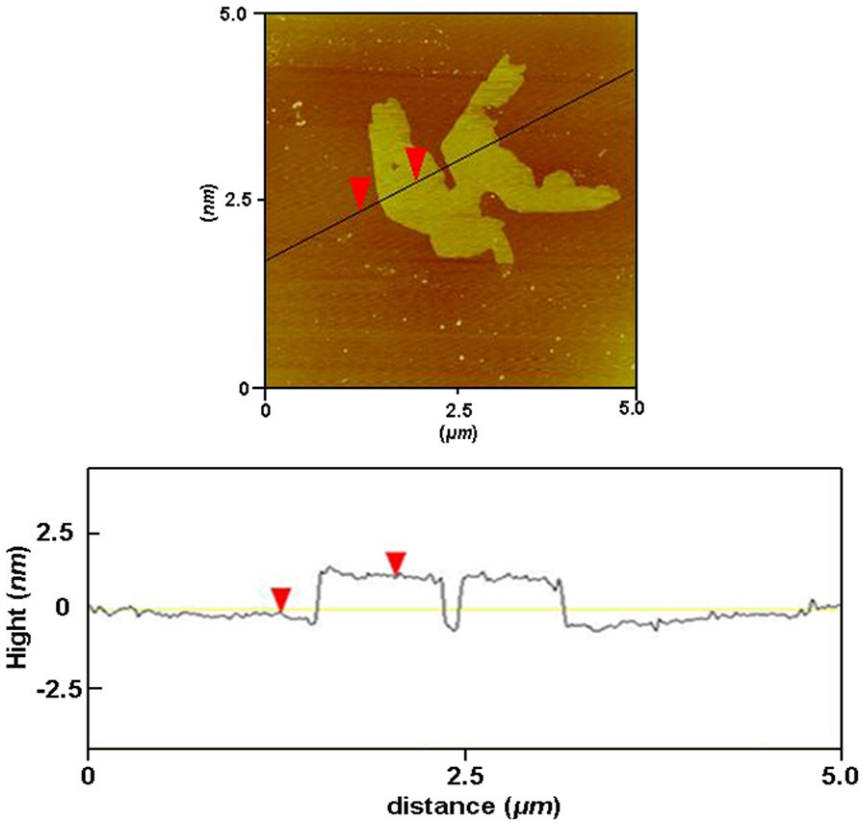

Figure S1. AFM image of the GO nanosheets.

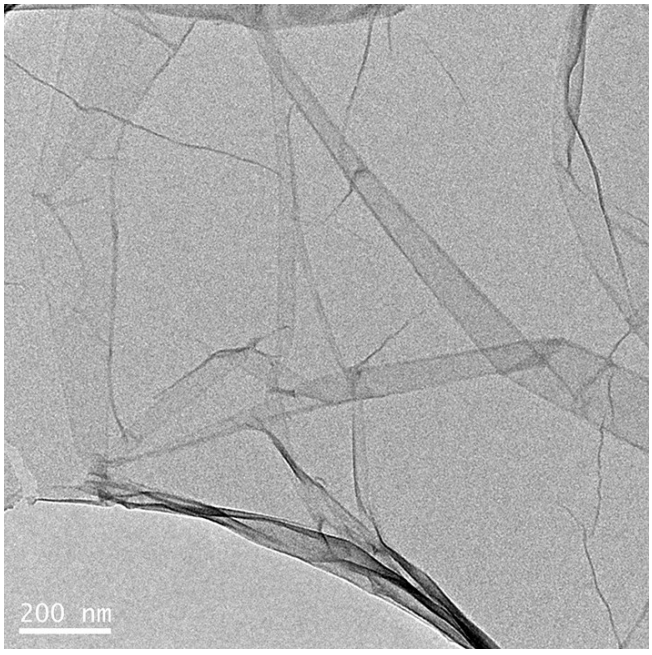

Figure S2. TEM image of the GO nanosheets.

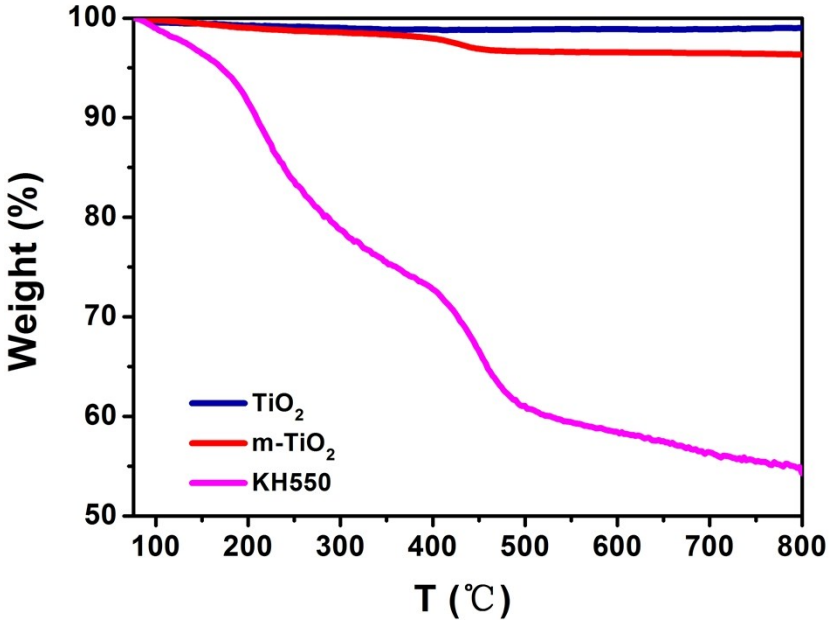

Figure S3. TG curves of the TiO_2, m-TiO_2 and KH550.

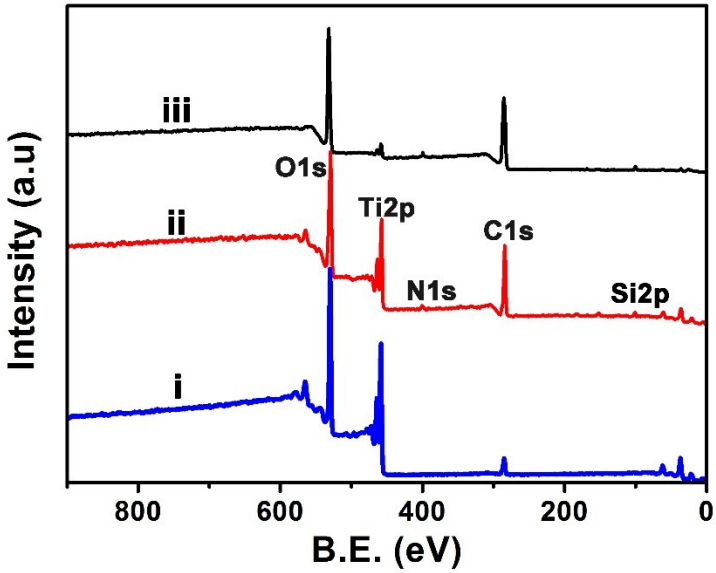

Figure S4. XPS survey spectra of different nanocomposite films.

((i) TiO_2, (ii) m-TiO_2 and (iii) m-TiO_2@GO).

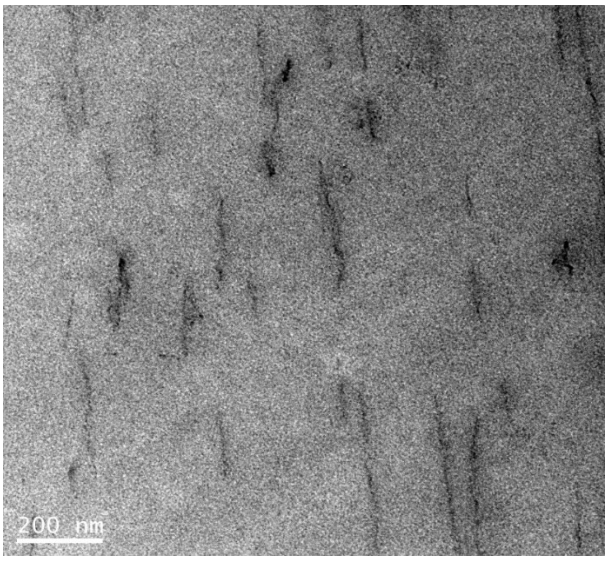

Figure S5. TEM image of the cross-section of 1.0 wt%-GO/PVA film.

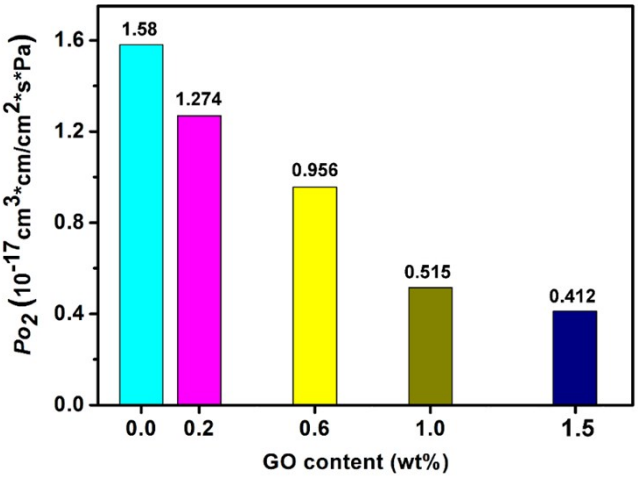

Figure S6. The Po_2 for the GO/PVA films with different loading of GO.

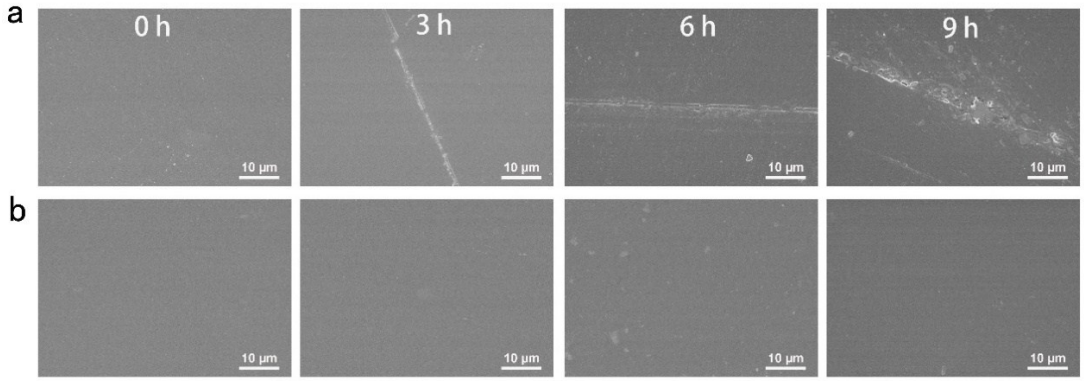

Figure S7. SEM images of (a) PVA and (b) m-TiO_2@GO/PVA films after UV accelerated aging for 0, 3, 6 and 9 h.

Table S1. Mechanical properties of the composite films with different content of GO.

Samples	σ(MPa)	ε_{max} (%)	E(GPa)
PVA	47.7 ± 2.0	134.7 ± 3.2	1.1 ± 0.3
0.2wt%-GO/PVA	48.5 ± 2.1	130.9 ± 2.5	1.3 ± 0.4
0.6wt%- GO/PVA	53.9 ± 2.5	128.0 ± 2.7	1.4 ± 0.3
1.0wt%- GO/PVA	63.5 ± 2.3	124.8 ± 3.0	1.7 ± 0.3
1.5wt%- GO/PVA	65.1 ± 2.1	109.2 ± 3.1	1.7 ± 0.4

Table S2. Mechanical properties of the UTP-1.2% film.

Sample	σ(MPa)	ε_{max} (%)	E(GPa)
UTP-1.2%	64.6 ± 2.3	90.2 ± 3.4	1.7 ± 0.4

Table S3. Mechanical properties of the PVA film and composite films with different content of m-TiO_2 after UV irradiation for 3h and 6h.

Samples	After 3h of UV irradiation			After 6h of UV irradiation		
	σ(MPa)	ε_{max} (%)	E(GPa)	σ(MPa)	ε_{max} (%)	E(GPa)
PVA	42.9 ± 2.0	88.6 ± 2.7	1.5 ± 0.3	41.4 ± 2.0	87.7 ± 2.6	1.3 ± 0.2
GO/PVA	59.6 ± 2.3	88.9 ± 3.3	2.0 ± 0.3	57.7 ± 2.1	78.1 ± 3.2	1.7 ± 0.3
TP-1.0%	71.0 ± 2.0	91.1 ± 2.7	1.9 ± 0.3	70.5 ± 2.0	76.1 ± 3.0	1.8 ± 0.2
TP-1.2%	74.7 ± 2.2	79.9 ± 2.7	2.1 ± 0.2	73.6 ± 2.1	73.5 ± 2.8	2.1 ± 0.3
TP-1.5%	70.9 ± 2.0	65.7 ± 3.2	2.2 ± 0.2	73.7 ± 2.0	63.9 ± 3.1	2.1 ± 0.3

Table S4. The Po_2 and mechanical properties of the TP-1.2% film after soaking.

Sample	After soaking for 72h			
	Po_2 10^{-17} m³ • cm/(cm² • s • Pa)	σ (MPa)	ε_{max} (%)	E (GPa)
TP-1.2%	0.253	62.5 ± 2.4	37.2 ± 2.8	1.6 ± 0.5