Supplementary Information

Antibacterial Property of Graphene Oxide: the Role of Phototransformation

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Manuscript prepared for publication in: Environmental Science: Nano

Pages: 13

Figures: S1-12

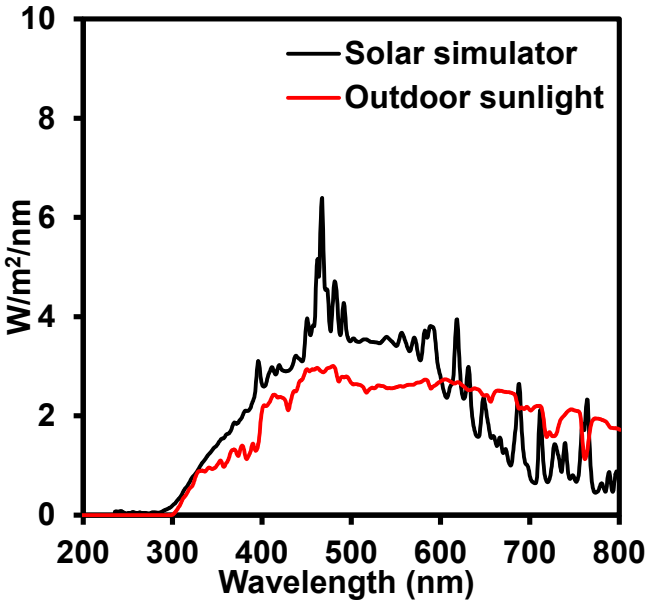


Figure S1. Spectra of solar simulator sunlight and outdoor summer noon sunlight in a clear day in Tainan, Taiwan (23°0'0.44" N, 120°13'18.1" E).

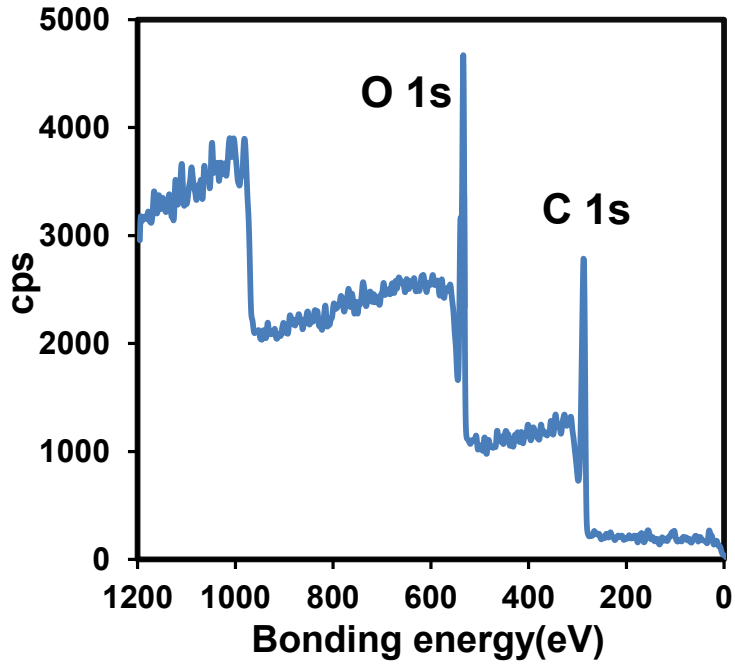


Figure S2. XPS survey spectrum of parent GO.

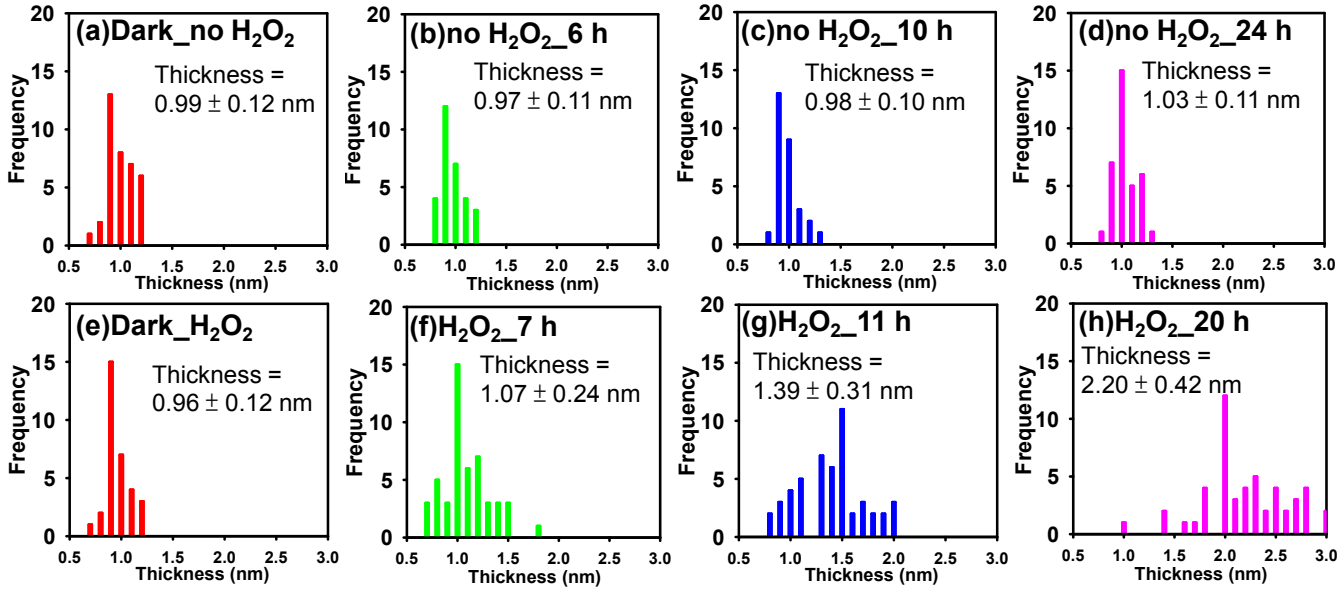
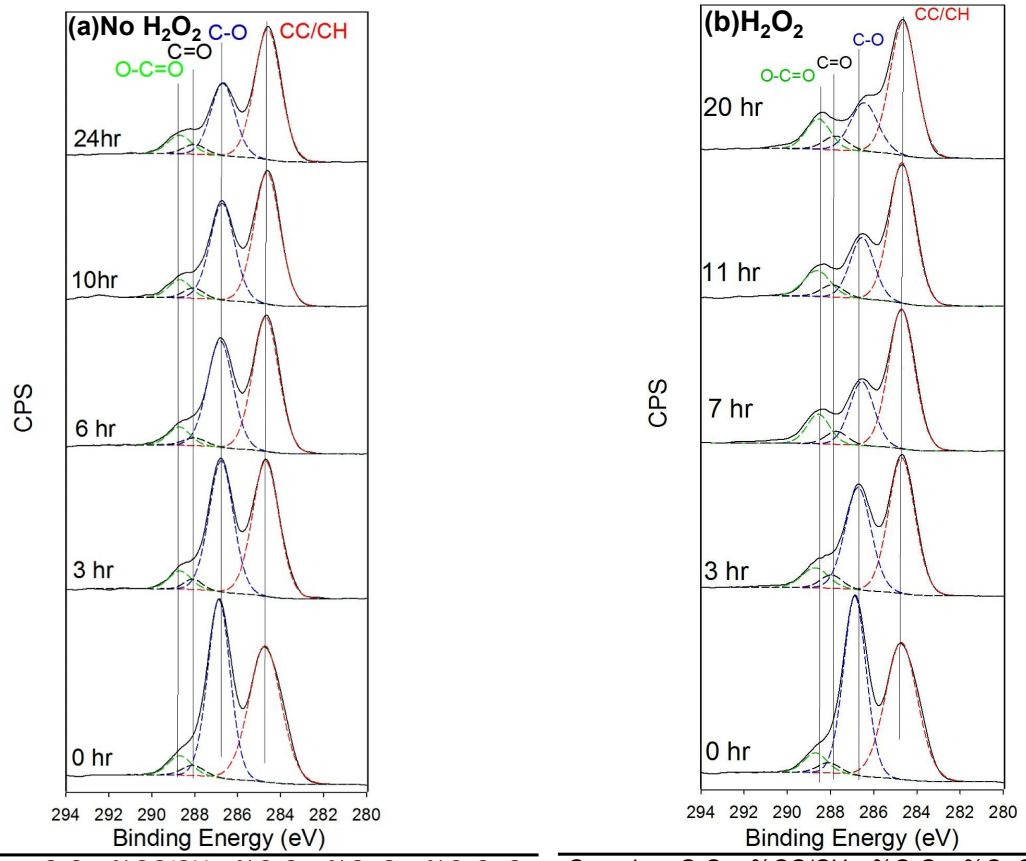


Figure S3. The change in the thickness of GO before and after phototransformation in the (a-d) absence and (e-h) presence of H_2O_2. The data are derived from the analysis of AFM images presented in Figure 1.



Sample	O:C	%CC/CH	%C-O	%C=O	%O-C=O
0 h	0.55	48.3	44.2	2.5	5.0
3 h	0.54	48.8	43.3	2.5	5.4
6 h	0.53	51.5	40.0	2.6	5.9
10 h	0.49	53.4	37.1	3.2	6.3
24 h	0.47	58.7	29.9	3.7	7.7

Sample	O:C	%CC/CH	%C-O	%C=O	%O-C=O
0 h	0.55	48.3	44.2	2.5	5.0
3 h	0.52	50.9	37.5	4.1	7.5
7 h	0.41	59.2	25.3	4.6	10.9
11 h	0.40	59.9	24.1	4.6	11.4
20 h	0.39	59.6	22.3	5.7	12.4

Figure S4. XPS spectra showing the functionality evolution of GO samples during phototransformation in the (a) absence of H_2O_2, and (b) presence of H_2O_2.

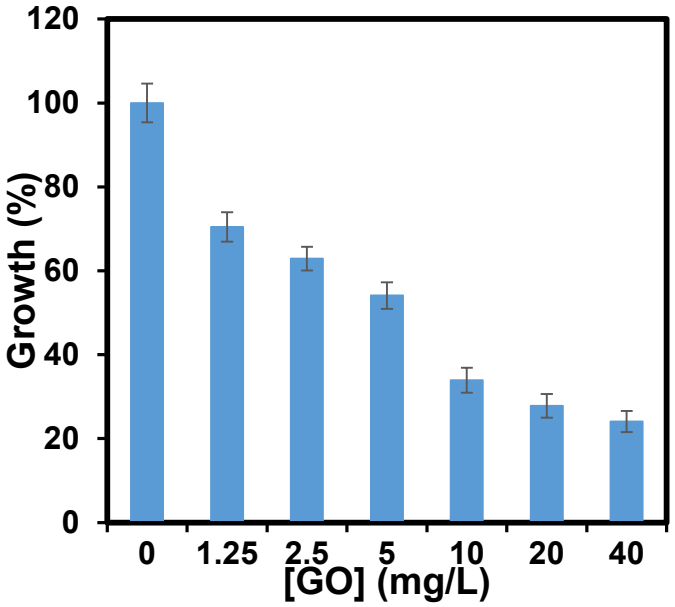


Figure S5. Dose dependency of GO on the growth of *E.coli* K12 after 24 h of incubation. The growth (%) indicates the cell densities (CFU/mL) of GO-treated samples normalized to those of control samples (no GO added). Errors indicate one standard deviation.

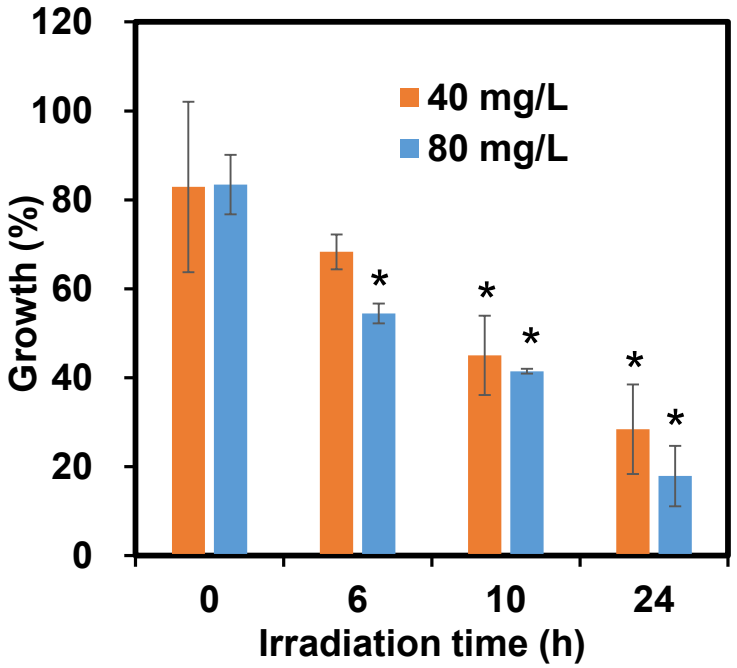


Figure S6. The effect of direct phototransformation of GO on the growth of *B. subtilis*. For GO exposure, irradiated samples were diluted to a nominal concentration of 40 or 80 mg/L based on the initial GO concentration. Errors indicate one standard deviation. *$p < 0.05$ versus parent (0 h) GO.

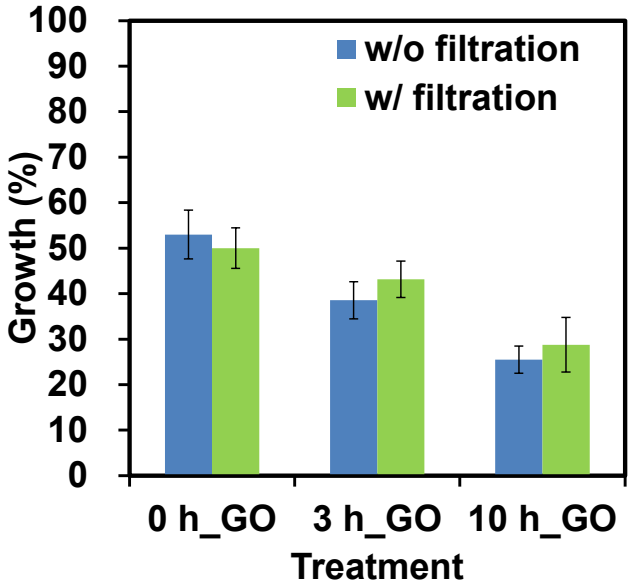


Figure S7. Growth of *E. coli* incubated with GO and directly photolyzed GO with and without filtration. The GO samples were filtered through ultrafiltration membranes (3 KDa, Amicon Ultra-4 centrifugal filter unit, Merck Millipore) and re-suspended in DI water. The filtration and re-suspension steps were repeated 3 times.

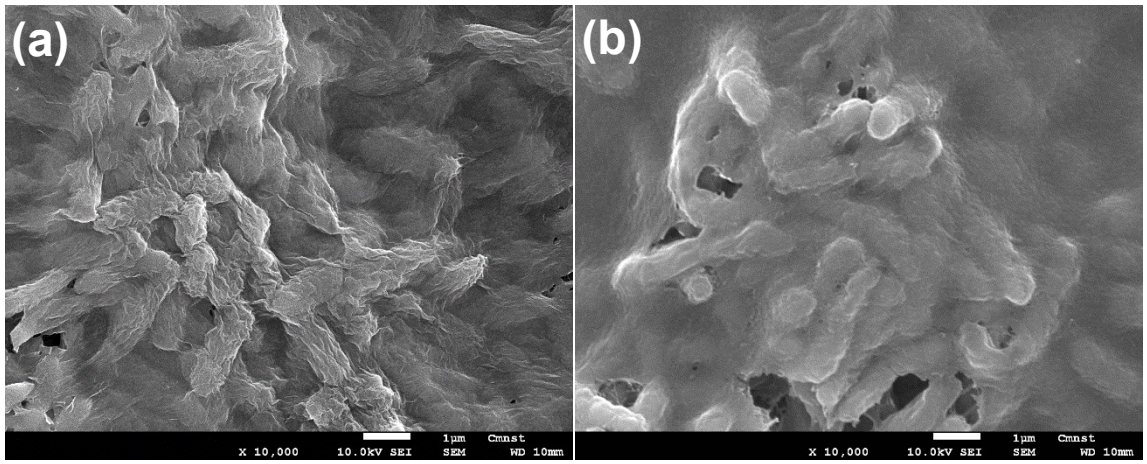


Figure S8. SEM image showing *E. coli* K12 incubated with (a) parent 0-h GO, and (b) 24-h directly photolyzed GO material.

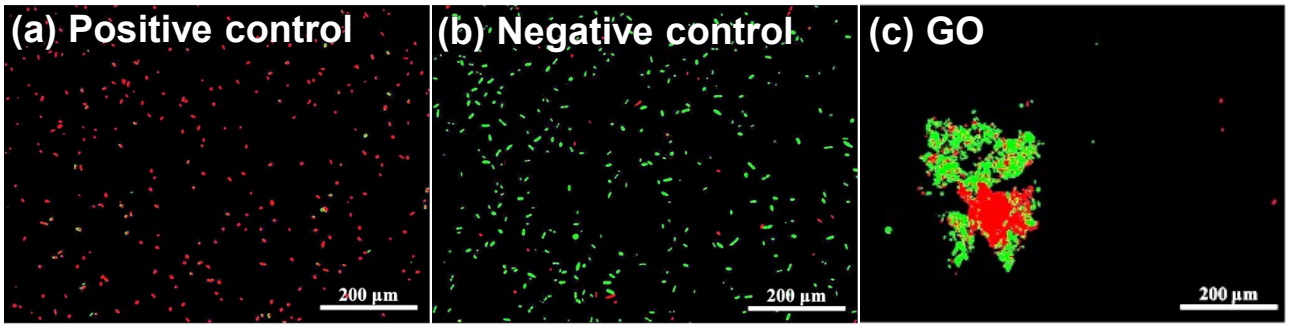


Figure S9. Membrane integrity assay showing bacterial cells treated with (a) 20% isopropanol as the positive control experiment, (b) without GO as the negative control experiment, and (c) with 40 mg/L parent GO in aqueous suspension.

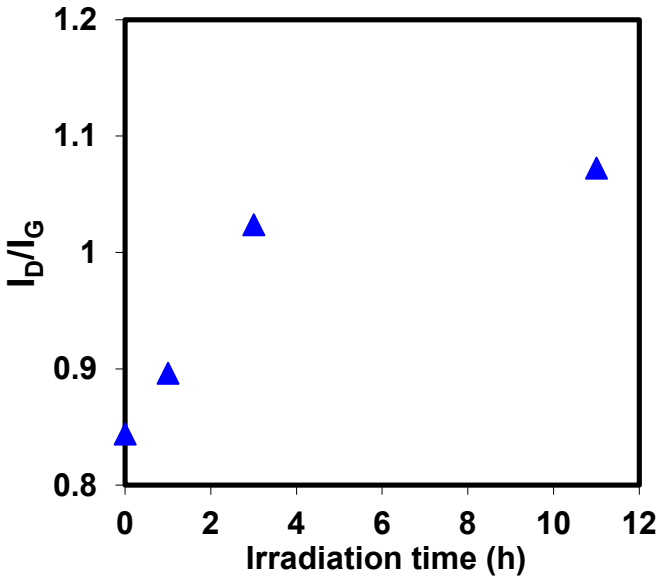


Figure S10. I_D/I_G of Raman spectra of GO samples before and after direct phototransformation.

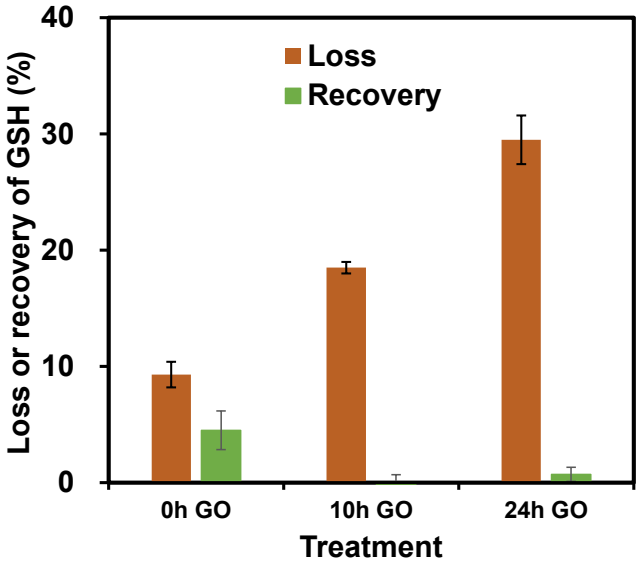


Figure S11. Recovery of GSH from GO materials retained on filter membranes. The experimental condition was identical to that reported in Figure 6. The filters were eluted with bicarbonate buffer solution for 10 times and the filtrates were collected for measurements of GSH.

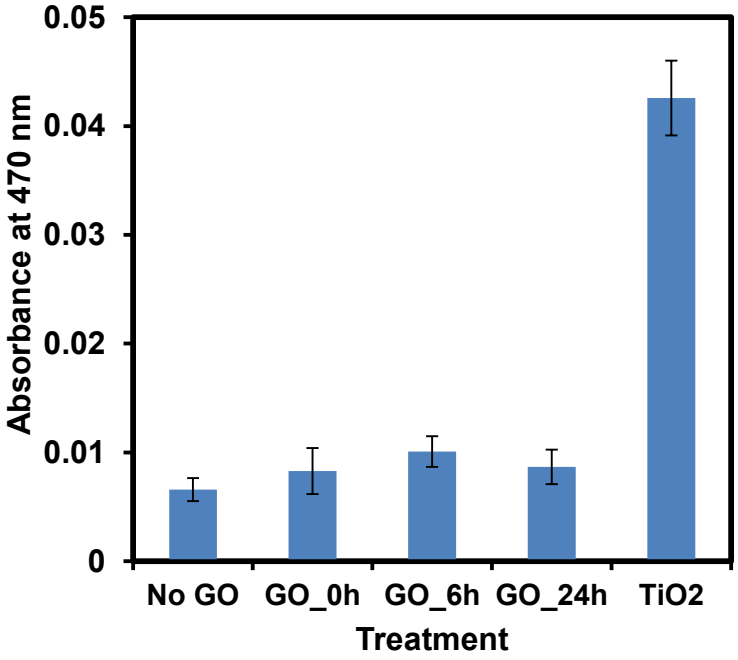


Figure S12. Superoxide formation detected by XTT. Condition: Nominal GO concentration = 10 mg/L, pH = 7 in phosphate buffer, [XTT] = 0.2 mM. TiO_2 indicates the positive control experiment that was performed using 40 mg/L TiO_2 (Degussa P25) and 0.2 mM XTT at pH = 7 under simulated sunlight irradiation. $p > 0.05$ for all treatments except TiO_2 versus no GO negative control.