Supplementary Information

Self-Damaging Aerobic Reduction of Graphene Oxide by *Escherichia coli*: Role of GO-Mediated Extracellular Superoxide Formation

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GO reduction by abiotically generated superoxide radical

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References

Material and Methods

GO reduction by abiotically generated superoxide radical

The reduction of GO by superoxide anion was verified by using the NADH/PMS reaction system.[S1] Generally, a 50 mL mixed system, which contained NADH (β-nicotinamide adenine dinucleotide 23-phosphate reduced tetrasodium salt hydrate, 200 μM), NBT (nitroblue tetrazolium chloride, 50 μM), and GO (20 mg/L) in PBS (phosphate buffer saline, 20 mM), was prepared and the reaction was initiated by adding 15 μM PMS (phenazinemethosulfate). Then the nanomaterial was collected via centrifugation and subjected for Raman spectroscopy analysis.

Table S1. DLS and polydispersity index (PDI) value of different concentration of GO in solutions over time

Concentration of GO (mg/ L)	Time (h)	DLS (nm)	Polydispersity index value (PDI)
5	0	145.91 ± 1.98	0.26 ± 0.02
	0.5	226.62 ± 8.78	0.34 ± 0.03
	1	280.54 ± 3.53	0.39 ± 0.02
	2	362.65 ± 4.60	0.48 ± 0.01
10	0	152.43 ± 11.57	0.25 ± 0.02
	0.5	328.3 ± 16.09	0.47 ± 0.01
	1	429.00 ± 2.12	0.49 ± 0.05
	2	613.60 ± 3.84	0.56 ± 0.03
20	0	159.25 ± 1.20	0.25 ± 0.03
	0.5	522.70 ± 9.55	0.47 ± 0.04
	1	570.05 ± 2.90	0.56 ± 0.01
	2	902.2 ± 1.64	0.61 ± 0.03

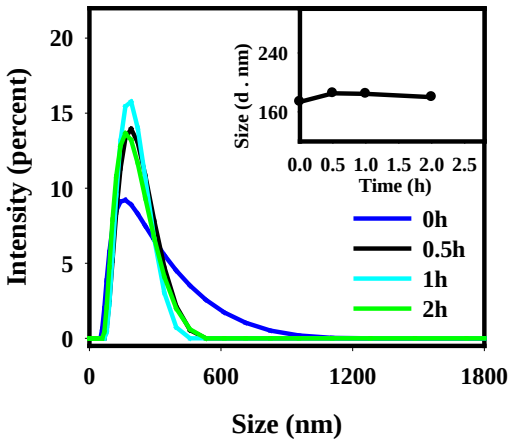

Figure S1. The size distribution change of BSA-coated GO over time in saline. GO (20 mg/L) was pre-wrapped with 10 g/L BSA. The insert shows the changes of hydrodynamic diameter over time. The experiments were carried out at least in triplicate.

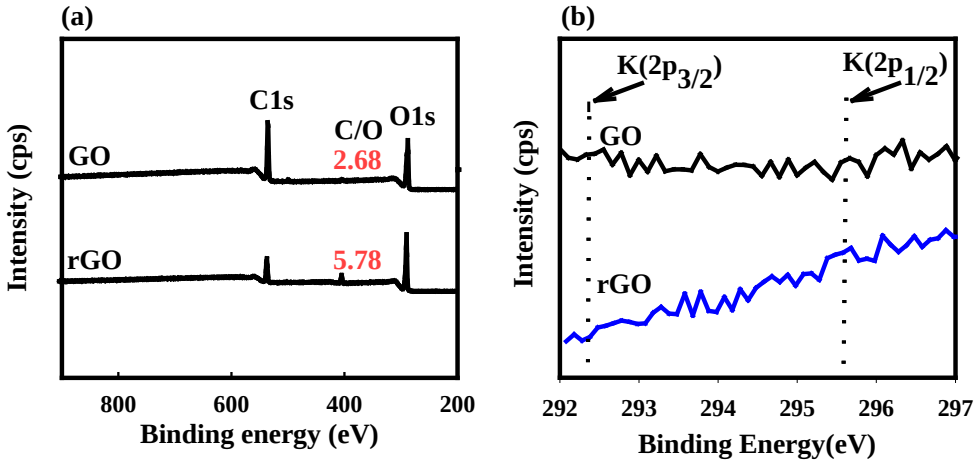

Figure S2. (a) The overall spectra of XPS analysis for pristine and bioreduced GO. (b) K (2p) core level of the GO sheets before and after incubation showing no microbial residues remained.

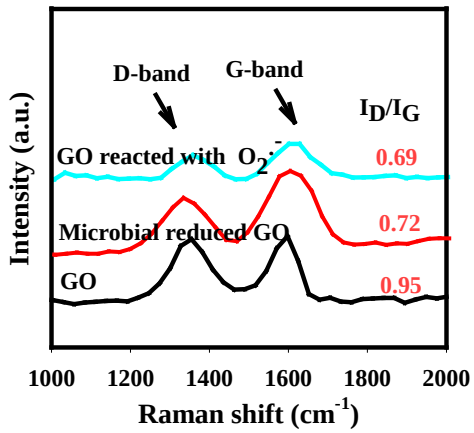

Figure S3. The Raman spectra shows that GO was reduced by abiotically generated $O_2^{\bullet-}$.

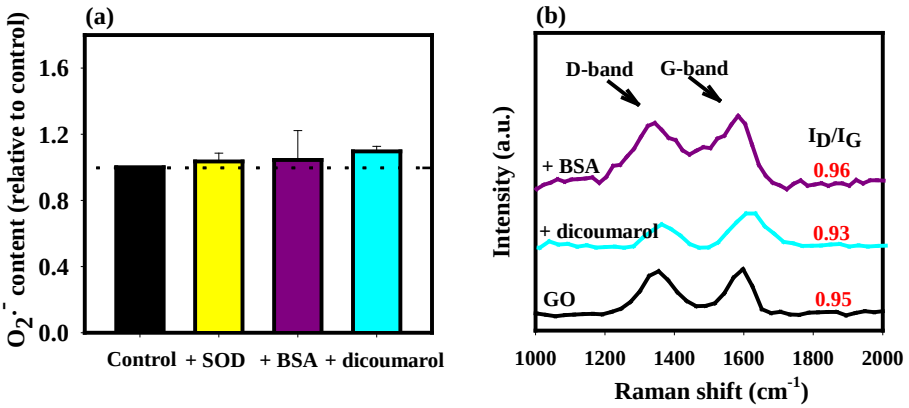

Figure S4. (a) The content of $O_2^{\bullet-}$ under various incubation conditions and (b) corresponding Raman spectra of GO after incubation. *E. coli* was incubated with 20 mg/L for 2 h in saline. If needed, 0.2 mg/L of SOD, 10 g/L of BSA and 0.2 mg/L of dicumarol were added, respectively. The experiments were carried out at least in triplicate and results were given as the mean values ± standard deviations.

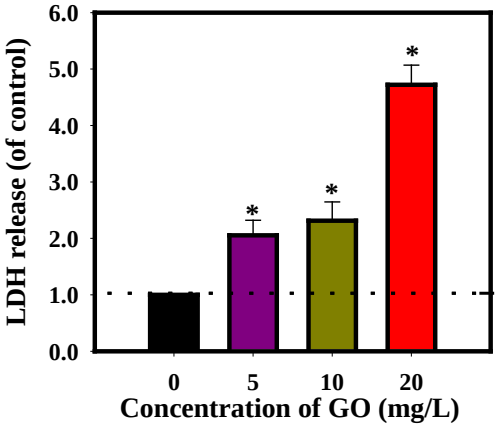

Figure S5. The cell viability (as measured by LDH release) drops in a dose-dependent manner concomitant with reduction. Bacteria were incubated with various concentrations of GO in saline for 0.5 h. The experiments were carried out at least in triplicate and results were given as the mean values ± standard deviations.

REFERENCES

S1. Qiu, Y.; Wang, Z. Y.; Owens, A. C. E.; Kulaots, I.; Chen, Y. T.; Kane, A. B.; Hurt, R. H. Antioxidant chemistry of graphene-based materials and its role in oxidation protection technology. Nanoscale **2014**, *6* (20), 11744-11755.