Supplementary Information

**Neutrophils Defensively Degrade Graphene Oxide in a Lateral Dimension Dependent Manner through Two Distinct Myeloperoxidase Mediated Mechanisms**

*Shiyi Huang1, Sijie Li1, Yanlei Liu2, Behafarid Ghalandari1, Ling Hao3, Chengjie Huang1, Wenqiong Su1, Yuqing Ke1, Daxiang Cui2, Xiao Zhi1\* and Xianting Ding1\**

1 State Key laboratory of Oncogenes and Related Genes, Institute for Personalized Medicine, School of Biomedical Engineering, Shanghai Jiao Tong University, Shanghai 200030, China

2 Shanghai Engineering Center for Intelligent Diagnosis and Treatment Instrument, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China

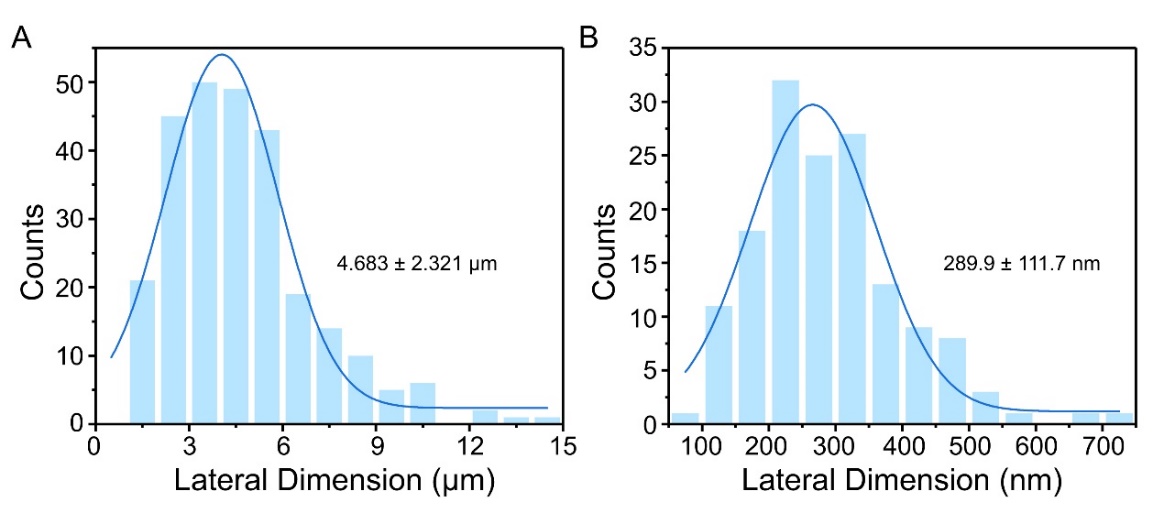
3 Department of Chemistry, George Washington University, Washington, D.C., 20052, USA.

\* Correspondence to: Xiao Zhi, Ph.D. and Xianting Ding, Ph.D.

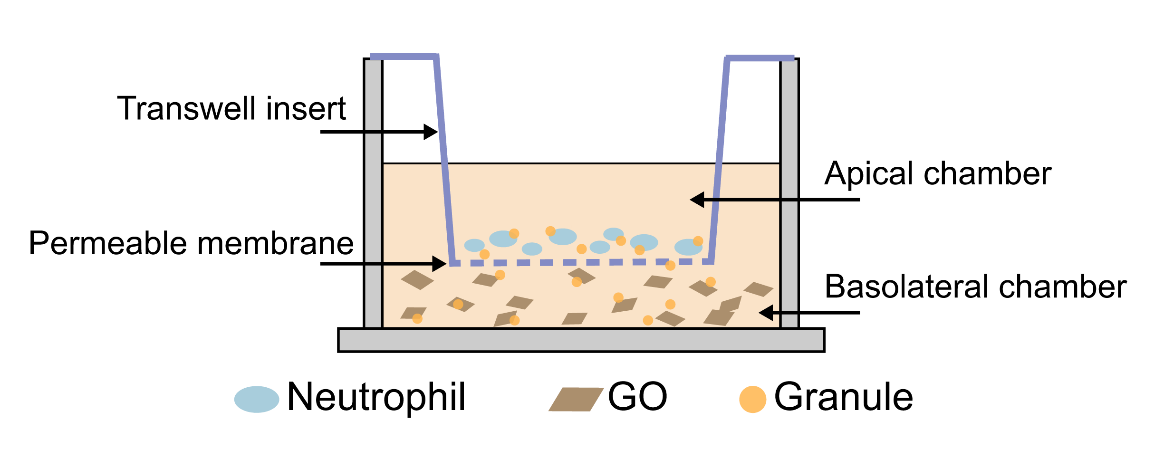
Table S1. Summary of physicochemical characterization of nGO and mGO.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Technique | nGO | mGO |
| Lateral dimension | Optical microscopya) | - | 2.572 – 8.128 μm |
| AFMb) | 289.9 ± 111.7 nm | 4.683 ± 2.321 μm |
| TEMc) | 249.0 ± 94.73 nm | 4.299 ± 0.824 μm |
| Number of layers | AFM | 1 layer (1~2 nm) | 1 layer (1~2 nm) |
| Surface charge | Zeta-potential | -31.14 mV | -32.90 mV |
| Degree of defects  (ID/IG) | Raman | 1.03 | 1.21 |
| C/O atomic ratio | XPS | 2.47 | 2.37 |
| Chemical composition | XPS | C: 71.17%,  O: 28.83% | C: 70.37%,  O: 29.63% |

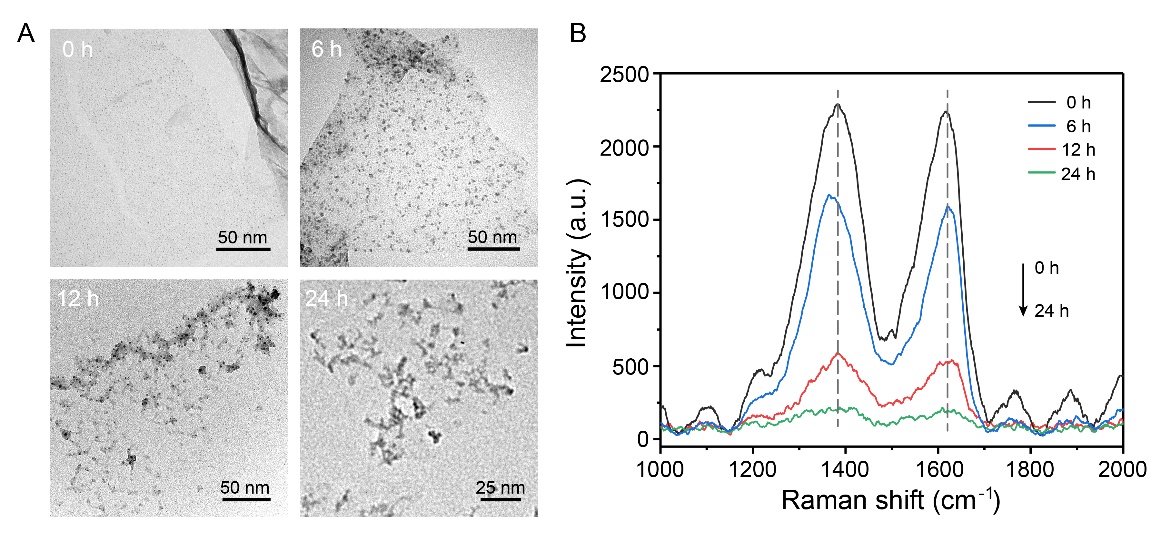
a) data is based on 12 sites; b) data is based on 7 sites; c) data is based on 6 sites



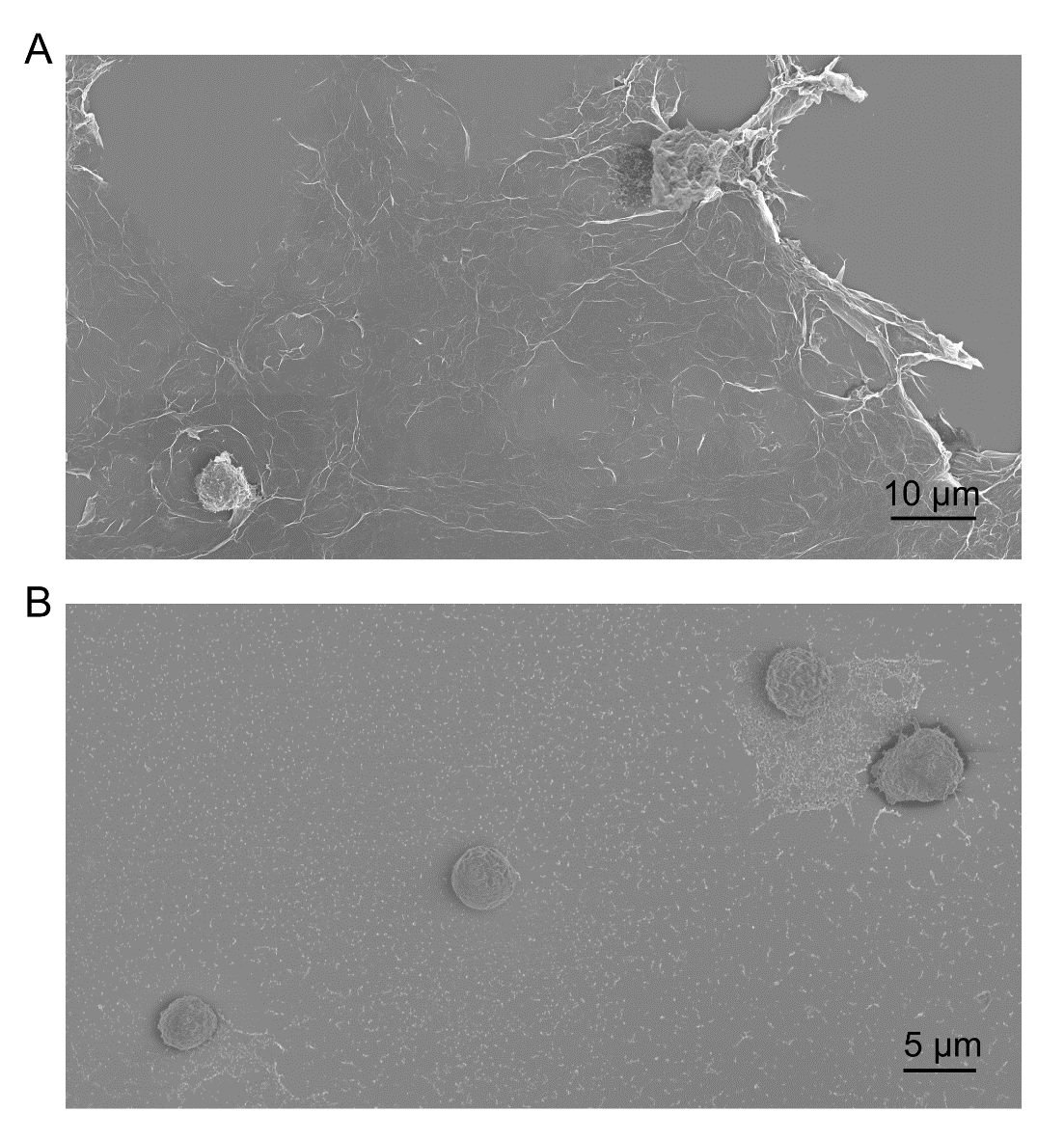
Supplementary Fig. 1: Lateral dimension distribution analysis of mGO (A) and nGO (B) by AFM.



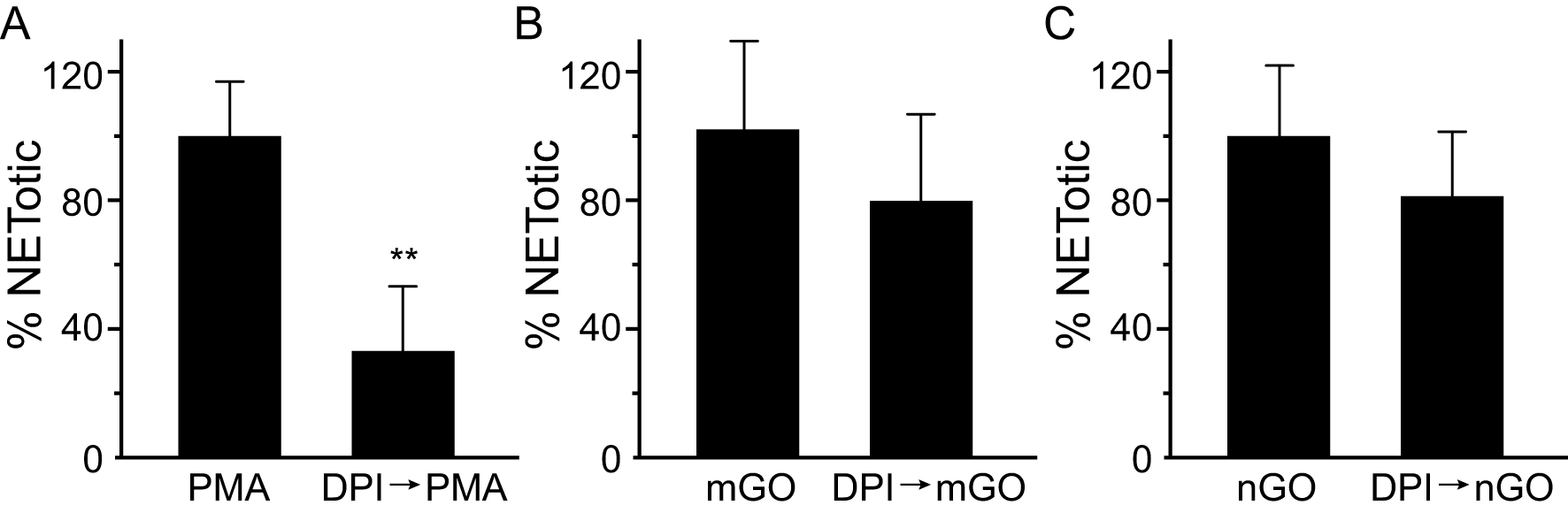
Supplementary Fig. 2: Schematic of the Transwell® used in GO biodegradation by neutrophils.



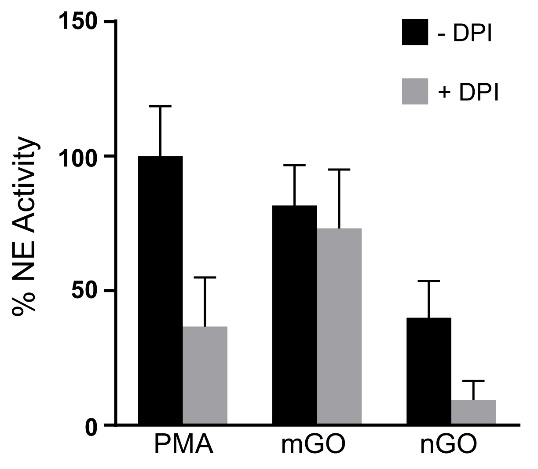
Supplementary Fig. 3: TEM images (A) and Raman spectra (B) of nGO sheets treated with neutrophils after 0, 6, 12, 24 h.



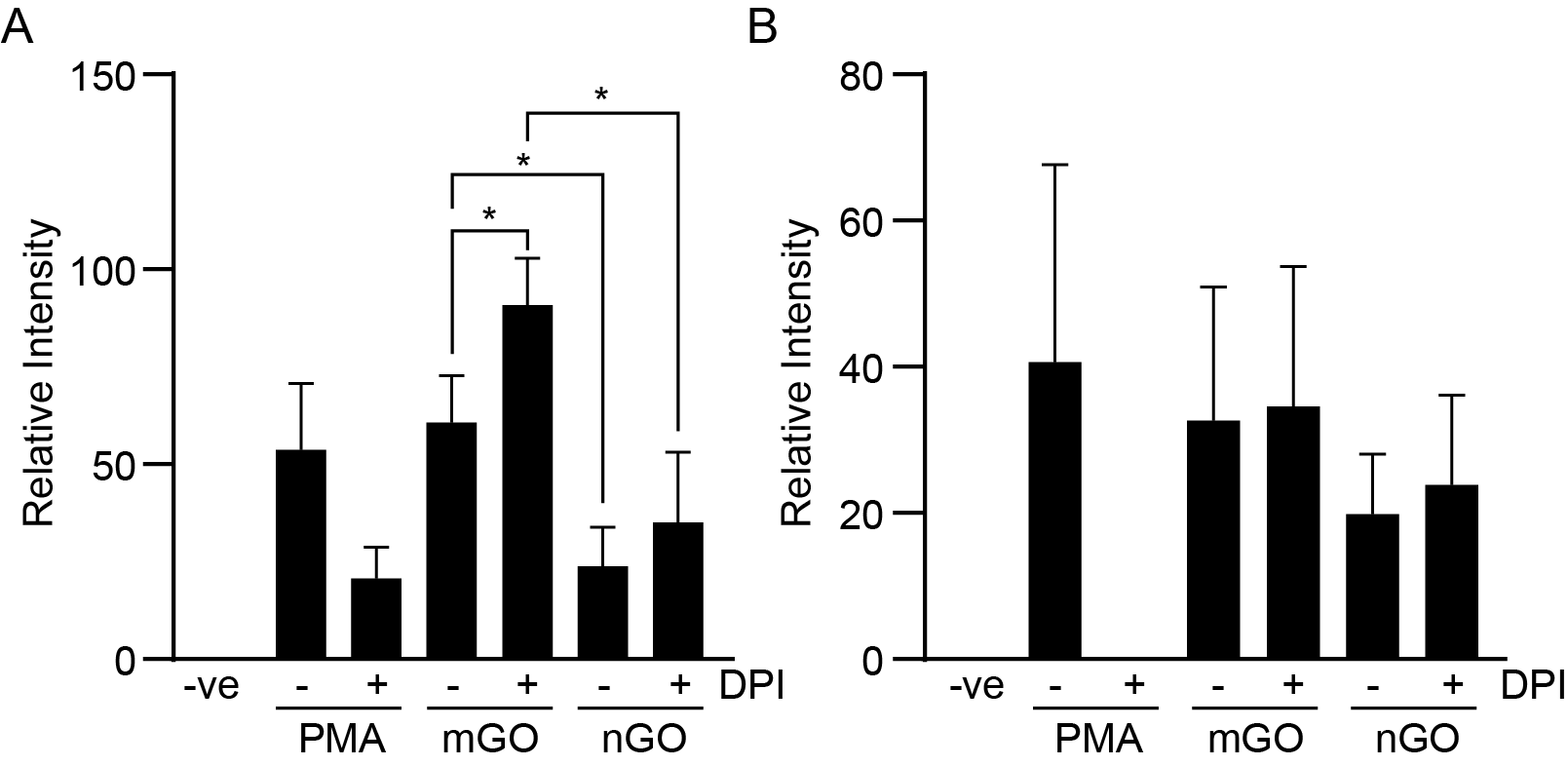
Supplementary Fig. 4: SEM images of mouse neutrophils after 3 h incubation with mGO (A) and nGO (B). Scale bars: (A) 10 μm, (B) 5 μm.



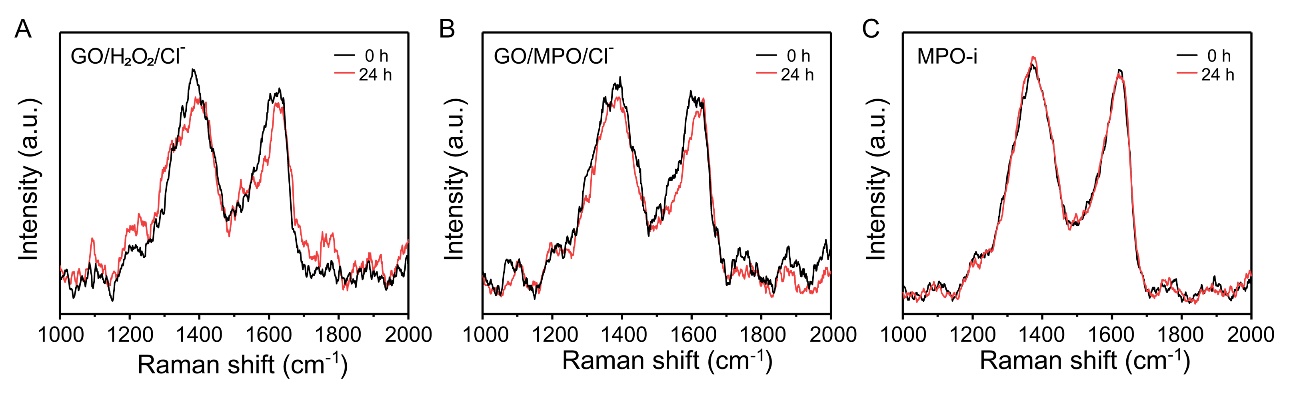
Supplementary Fig. 5: Quantification of the NETs release in neutrophils stimulated with PMA and mGO in the presence or absence of DPI (20 μM) for 2 h using a plate reader assay. The results are expressed as percentage of reduction in the presence of DPI compared with the activating agonist alone. DPI→PMA, neutrophils preincubated with DPI and then activated with PMA; DPI→mGO, neutrophils preincubated with DPI and then activated with mGO. \*\*P<0.01, Student’s *t* test.



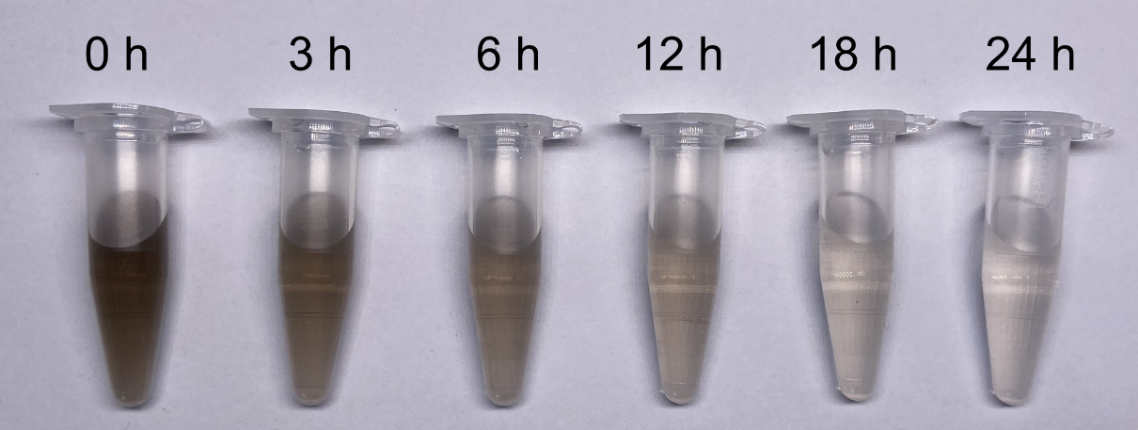
Supplementary Fig. 6: Quantification of NE activity in neutrophils stimulated with PMA, mGO and nGO which pre-treated with DPI (20 μM) or not.



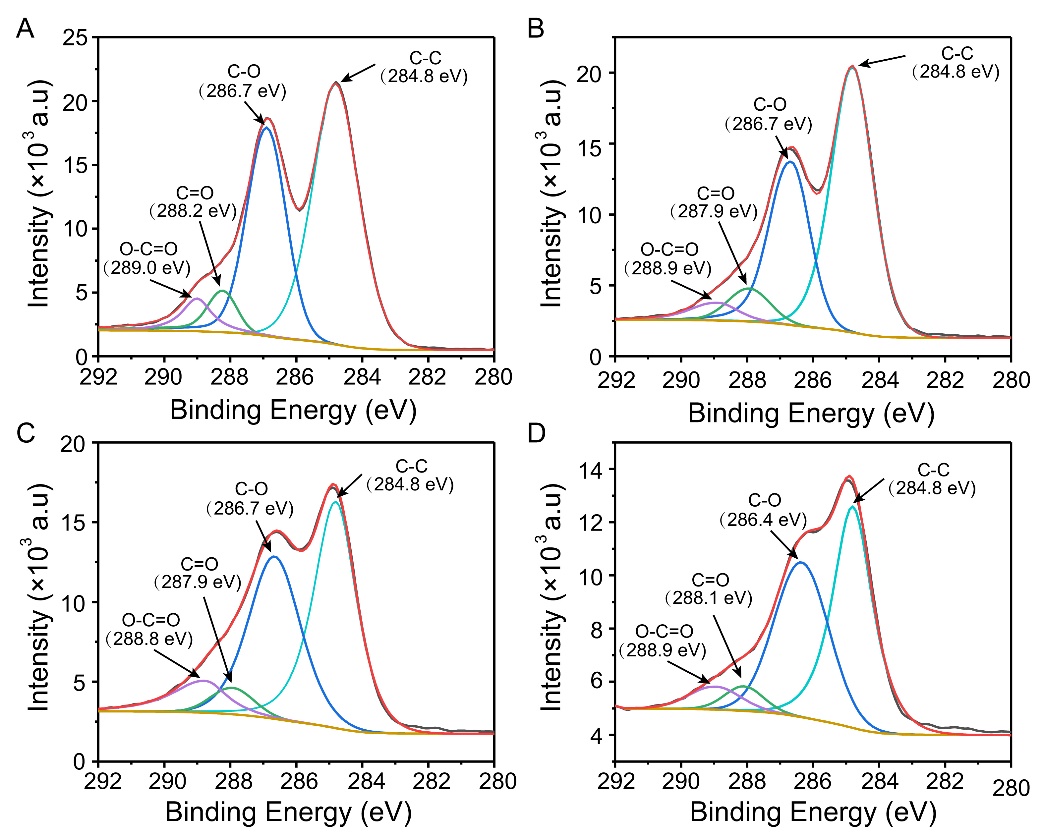
Supplementary Fig. 7: Densitometry analysis for the immunoblot analysis of p-ERK (A) and p-Akt (B). Data were normalized to total kinase. \**P*<0.05, Student *t*’s test.



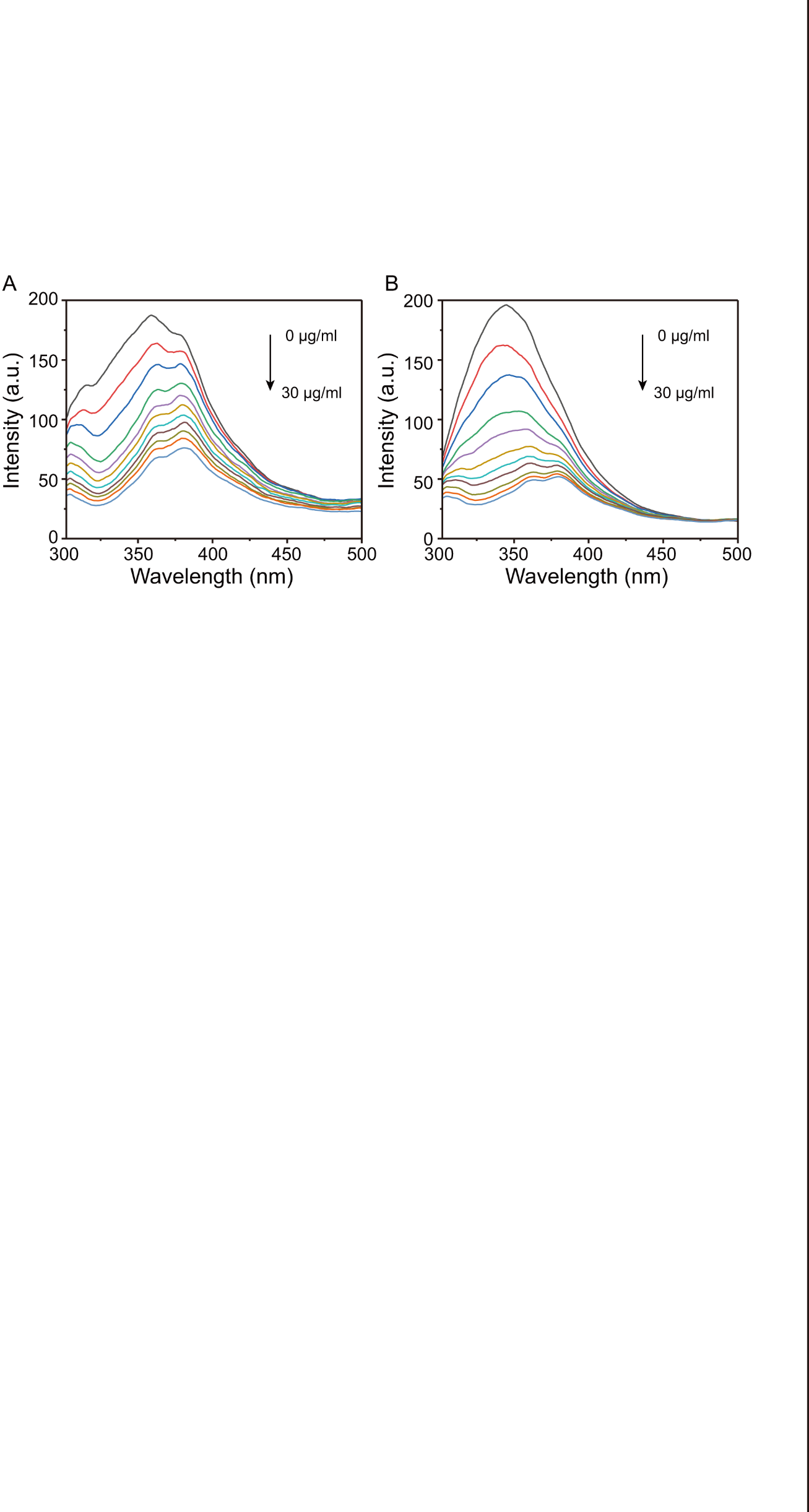
Supplementary Fig. 8: (A) Raman spectra of GO incubated with H2O2 + Cl- (without MPO) after 0 and 24 h. (B) Raman spectra of GO incubated with MPO + Cl- (without H2O2) after 0 and 24 h. (C) Raman spectra of GO sheets after 0 and 24 h in the presence of MPO inhibitor.



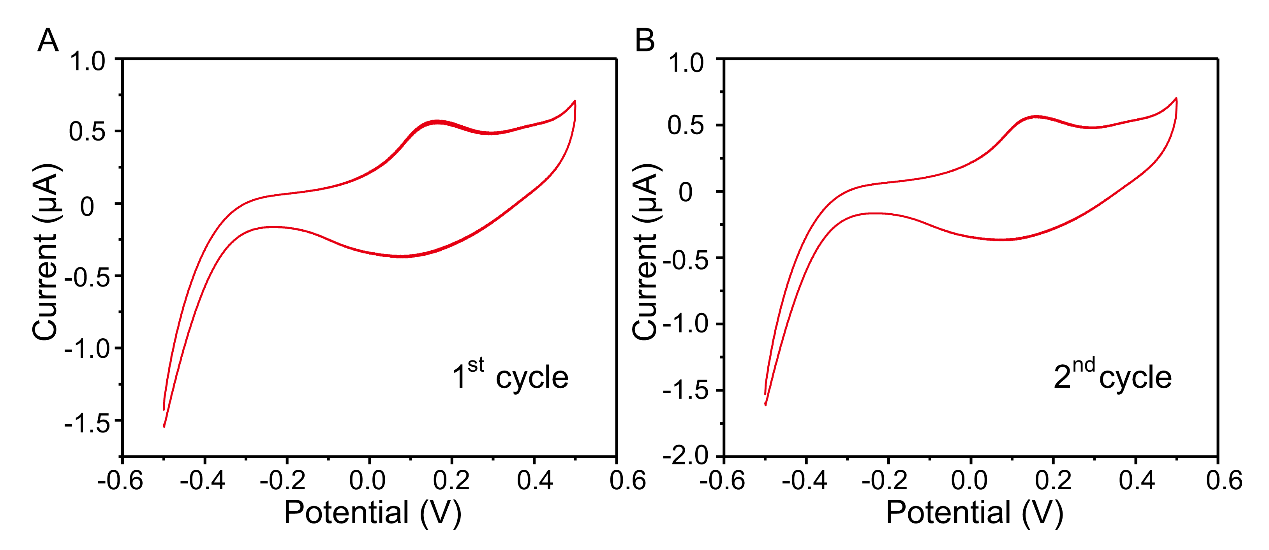
Supplementary Fig. 9: Photographs of GO samples before (0 h) and after (3, 6, 12, 18, and 24 h) the MPO-mediated biodegradation, where “0 h” represents the GO/MPO complex before adding H2O2.



Supplementary Fig. 10: XPS spectra of C 1s of GO (A), and biodegradation samples by MPO for 0 h (B), 12 h (C), and 24 h (D), where “0 h” represents the GO/MPO complex before adding H2O2, while “12 h” and “24 h” are GO/MPO degrading with H2O2.



Supplementary Fig. 11: Fluorescent emission spectra of MPO (30 μg/ml) in the presence of various concentrations of GO (0 ~ 30 μg/ml) at temperature T1 (A) and T2 (B) in 5 mM PBS (pH = 7.0). T1 equals 298.15 K, T2 equals 310.15 K.



Supplementary Fig. 12: Inherent electrochemistry measured in 50 mM PBS.