

Supplementary information for

Yan Wang, Jin Wu, Shicheng Li, Rencai Fan, Mingjun Li, Xin Liu, Cheng-song Yuan, Yuanyuan Chang, Zequn Ma, Chunxian Guo, Chang Ming Li, Bo Chen, 2026. Stimuli-responsive magnetic black phosphorus-based nanoreactor for chirality-dependent anoikis induction in cancer therapy. *Bio-Des Manuf*, 9(5):845-867.

<https://doi.org/10.1631/bdm.2600068>

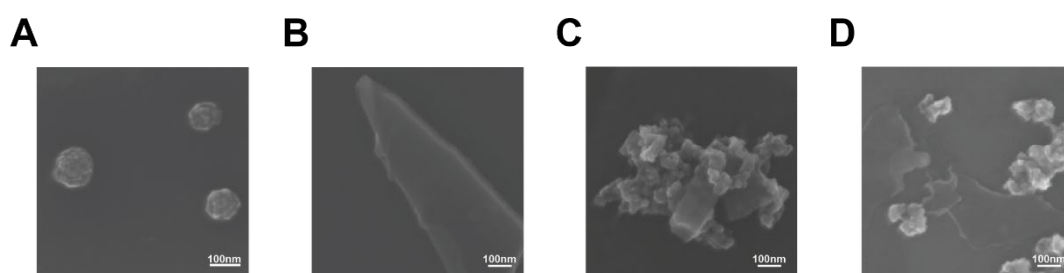


Fig. S1 Scanning electron microscopy (SEM) images of different material intermediates and assemblies. (A) MF. (B) BP. (C) C-MFBP. (D) T-MFBP.

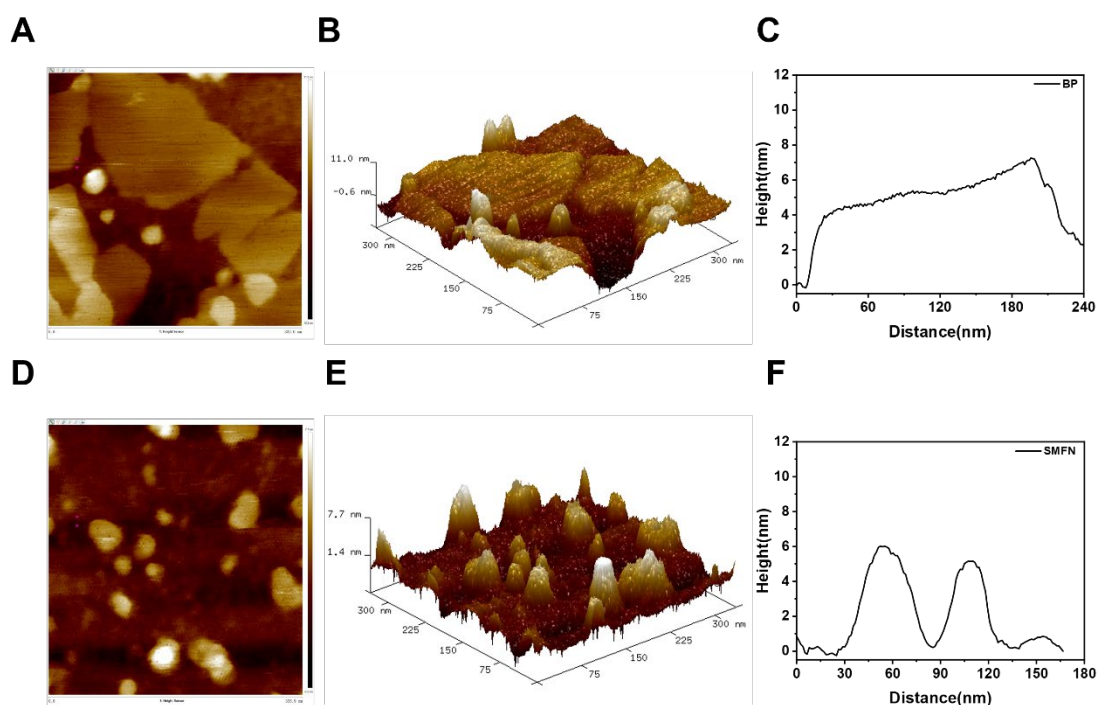


Fig. S2 Atomic force microscopy (AFM) characterization of the intermediate components. (A) AFM image of BP. (B) Corresponding 3D-rendered AFM image of BP. (C) Cross-sectional height profile of BP along the line indicated in (A). (D) AFM image of MF. (E) Corresponding 3D-rendered AFM image of MF. (F) Cross-sectional height profile of MF along the line indicated in (D).

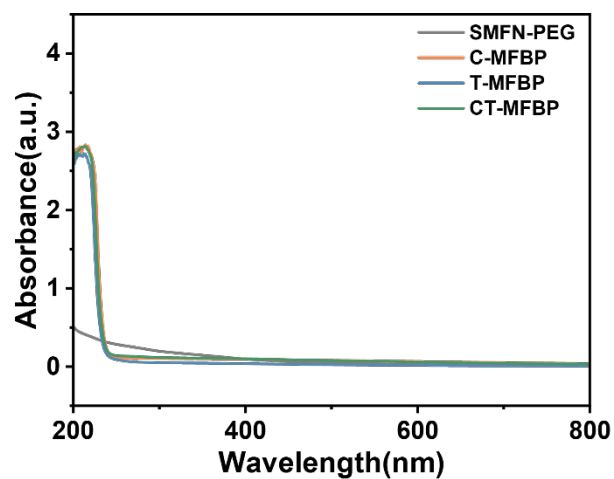


Fig. S3 UV-Vis absorption spectra of MF, C-MFBP, T-MFBP, and CT-MFBP.

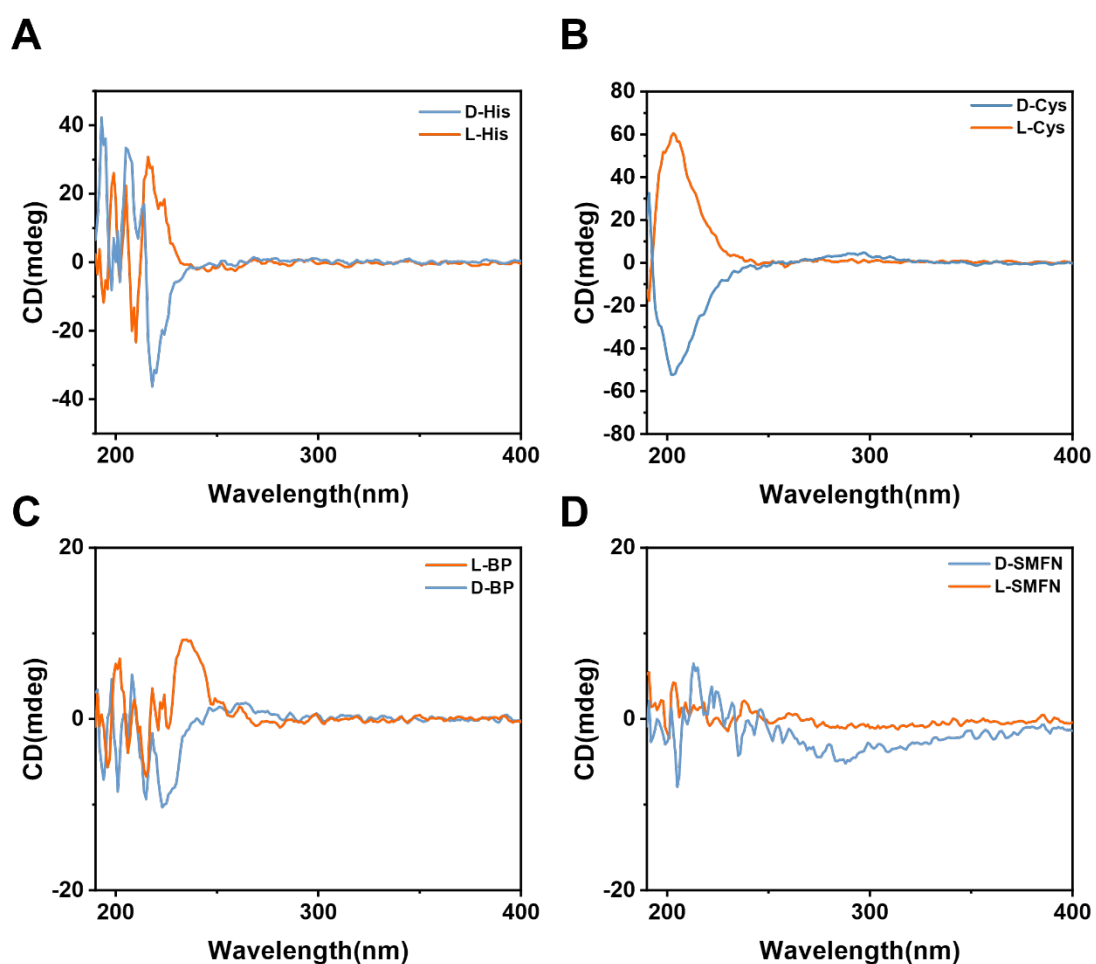


Fig. S4 Circular dichroism (CD) spectra of (A) D/L-His, (B) D/L-Cys, (C) D/L-Cys-BP, and (D) D/L-His-SMFN.

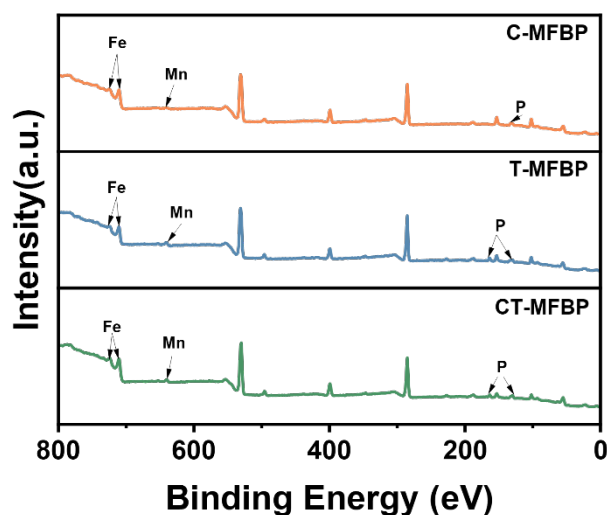


Fig. S5 Full-scale X-ray photoelectron spectroscopy (XPS) survey spectra of C-MFBP, T-MFBP, and CT-MFBP.

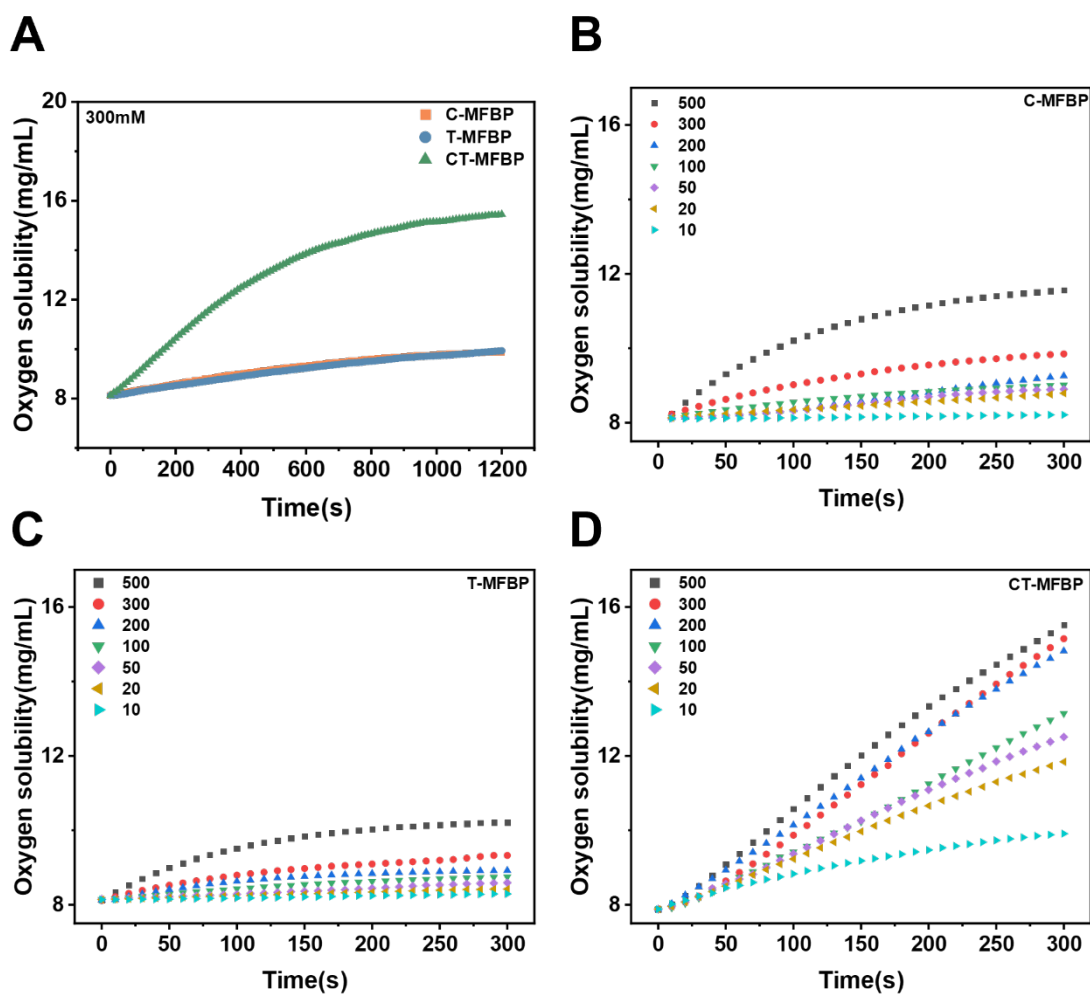


Fig. S6 Catalase-like oxygen generation activity of the materials. (A) Oxygen production by C-MFBP, T-MFBP, and CT-MFBP at a fixed H_2O_2 concentration of 300 mM. (B–D) Real-time oxygen generation curves for (B) C-MFBP, (C) T-MFBP, and (D) CT-MFBP in the presence of different H_2O_2 concentrations.

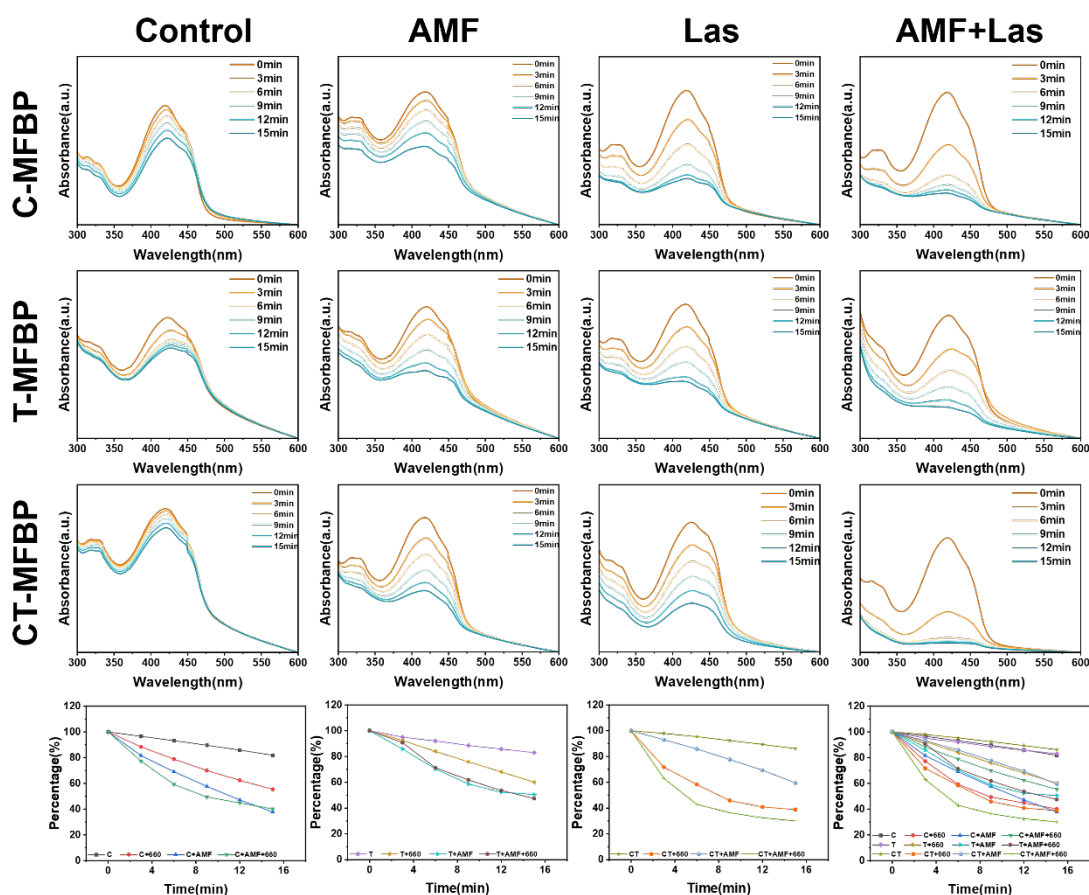


Fig. S7 Singlet oxygen generation by C-MFBP, T-MFBP, and CT-MFNP upon exposure to different stimuli: Alternating Magnetic Field (AMF), 660 nm NIR laser, and combined magnetic field plus laser (AMF+Las) treatment.

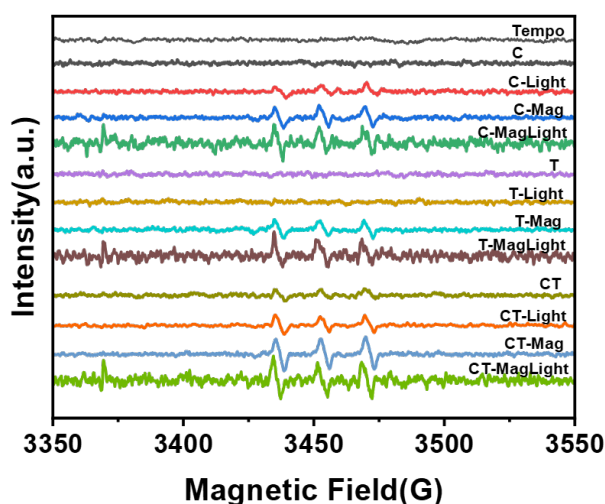


Fig. S8 Electron paramagnetic resonance (EPR) detection of singlet oxygen generation by C-MFBP, T-MFBP, and CT-MFNP upon exposure to different stimuli: Alternating Magnetic Field (Mag), 660 nm NIR laser (Light), and combined magnetic field plus laser (MagLight) treatment.

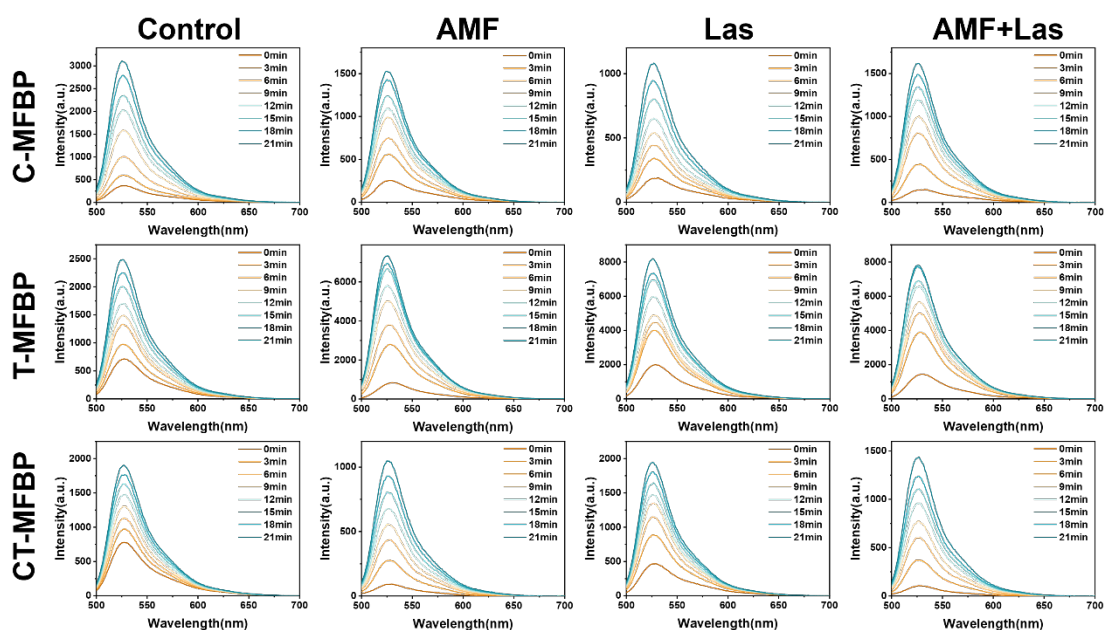


Fig. S9 Reactive oxygen species (ROS) generation by C-MFBP, T-MFBP, and CT-MFBP upon exposure to different stimuli: Alternating Magnetic Field (AMF), 660 nm NIR laser, and combined magnetic field plus laser (AMF+Las) treatment.

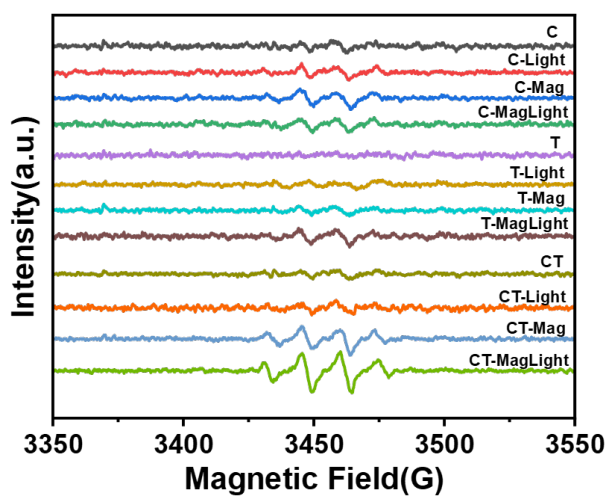


Fig. S10 Electron paramagnetic resonance (EPR) detection of hydroxyl radical generation by C-MFBP, T-MFBP, and CT-MFBP upon exposure to different stimuli: Alternating Magnetic Field (Mag), 660 nm NIR laser (Light), and combined magnetic field plus laser (MagLight) treatment.

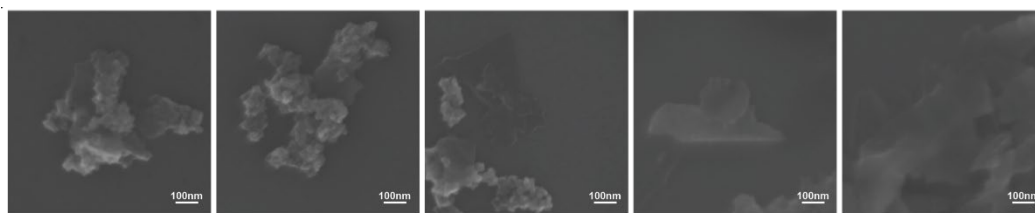


Fig. S11 Representative SEM image sequence illustrating the cleavage process of the TK-COOK linker within the CT-MFBP composite upon exposure to a magnetic field.

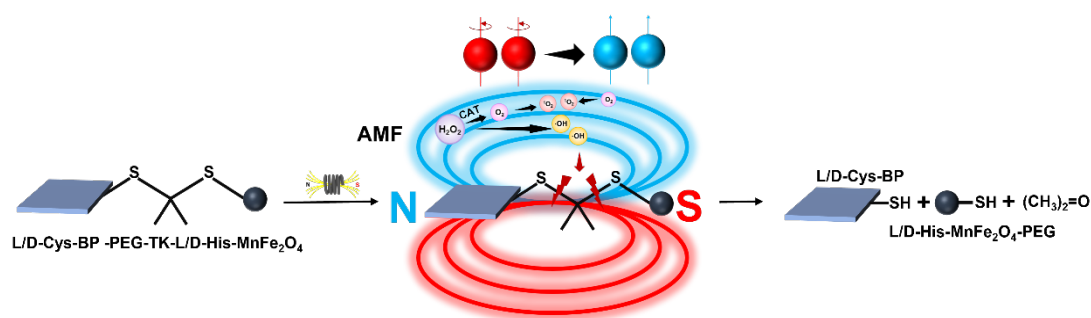


Fig. S12 The Mechanism Diagram of TK bond cleavage: ROS generated in situ oxidize thioketal sulfur atoms under AMF, cleaving C–S bonds, breaking structure into small fragments and triggering disassembly.

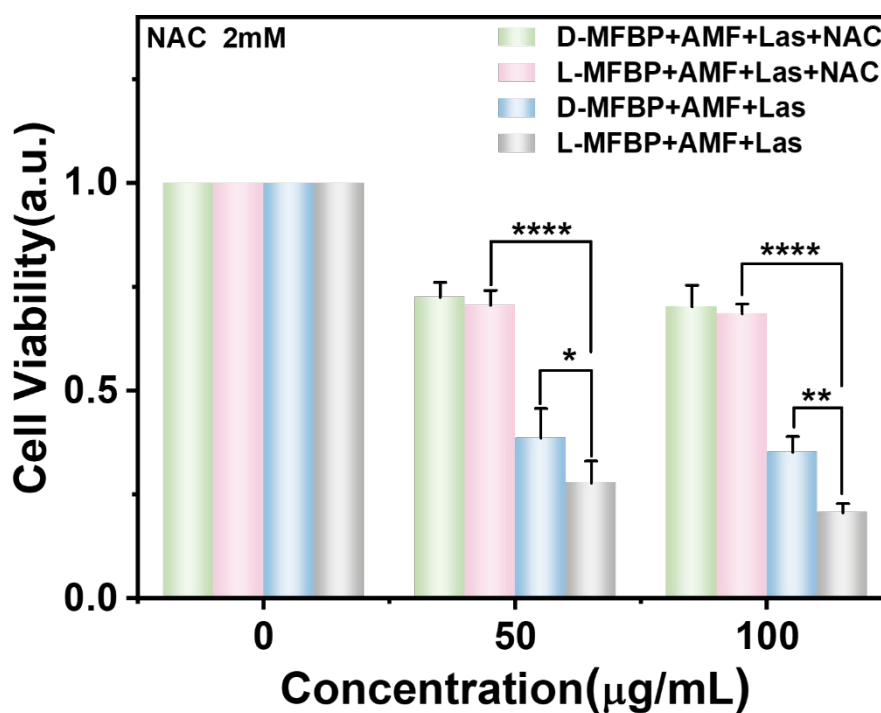


Fig. S13 Cell viability of cells treated with D-MFBP and L-MFBP under AMF+Las irradiation with or without NAC pretreatment. Data are expressed as mean±standard deviation ($n=3$). Statistical significances are indicated as * $p<0.05$, ** $p<0.01$, and **** $p<0.0001$

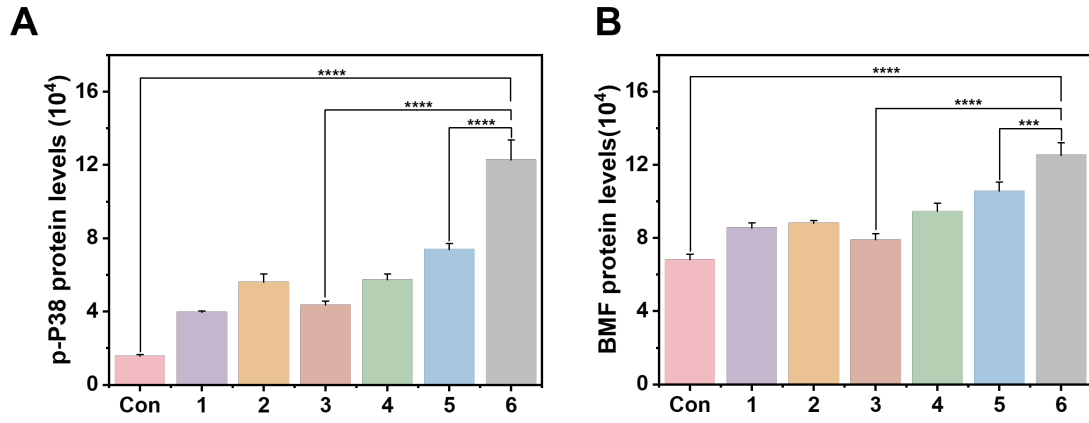


Fig. S14 (A) Semi-quantitative analysis of Western blot bands for p-P38. (B) Semi-quantitative analysis of Western blot bands for BMF. Data are expressed as mean $\pm$ standard deviation ($n=3$). Statistical significances are indicated as *** $p<0.001$ and **** $p<0.0001$