Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supporting information

Highly efficient photocatalytic degradation of emerging pollutant ciprofloxacin via a rational design of magnetic interfacial junction of mangosteen peel waste-derived 3D graphene hybrid material

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1. Preparation of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids

$Cd_{0.5}Zn_{0.5}S$ (0.1 g) was dissolved in deoxygenated DI water (20mL) to form a clear solution. Then, an aqueous solution (10mL) with the targeted amount of 3D graphene was transferred to the $Cd_{0.5}Zn_{0.5}S$ solution and stirred for 3 h under N_2 gas protection. By altering the amount of added 3D graphene, a series of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids with 1, 3, 5, and 7 wt% 3D graphene/$Cd_{0.5}Zn_{0.5}S$ were achieved. The mixture was then subjected to hydrothermal conditions at 180°C for 24 h in a 50 ml Teflon-lined stainless-steel autoclave. After the reaction, the samples were rinsed with DI water and separated by repeated centrifugation. After drying overnight (80°C) in an oven, the final products were collected for further characterization and experiments.

2. Supporting figures

Blue: 0.3 - 1.3 nm

Green: 0 - 1.2 nm

Red: 0 - 0.6 nm

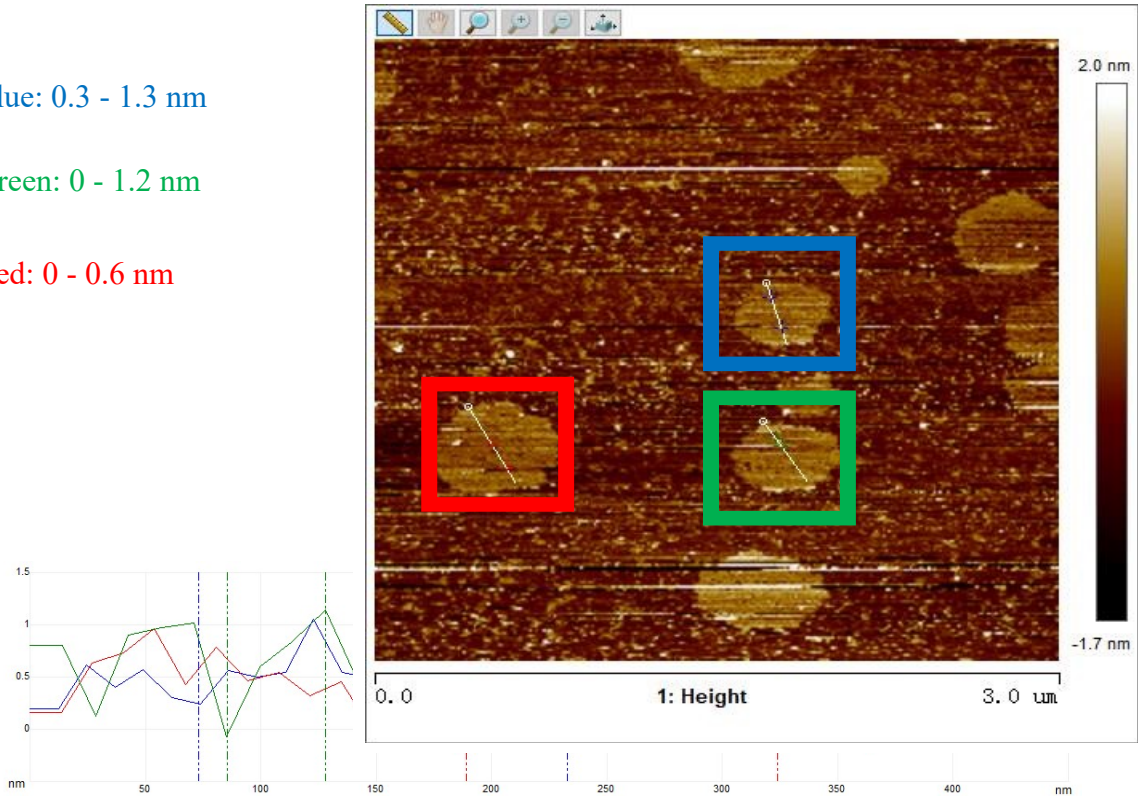

Fig. S1. AFM image of 3D graphene.

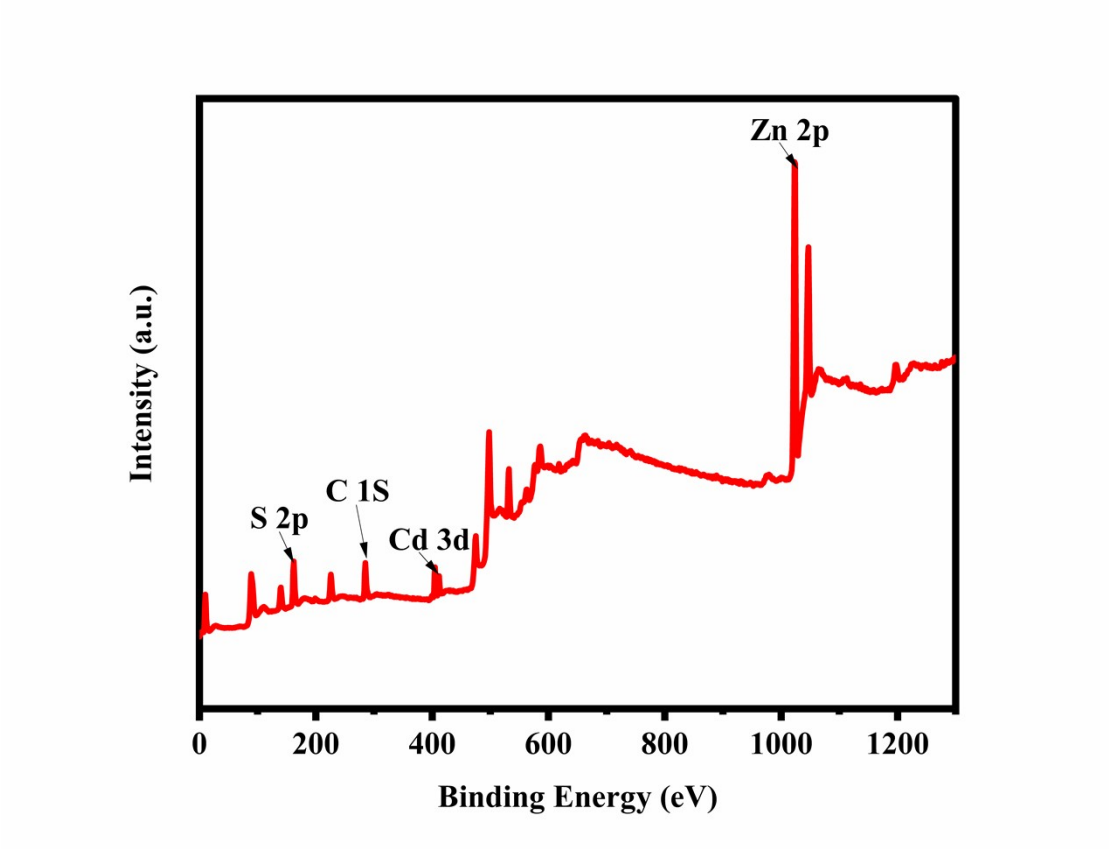

Fig. S2. XPS survey spectra of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids.

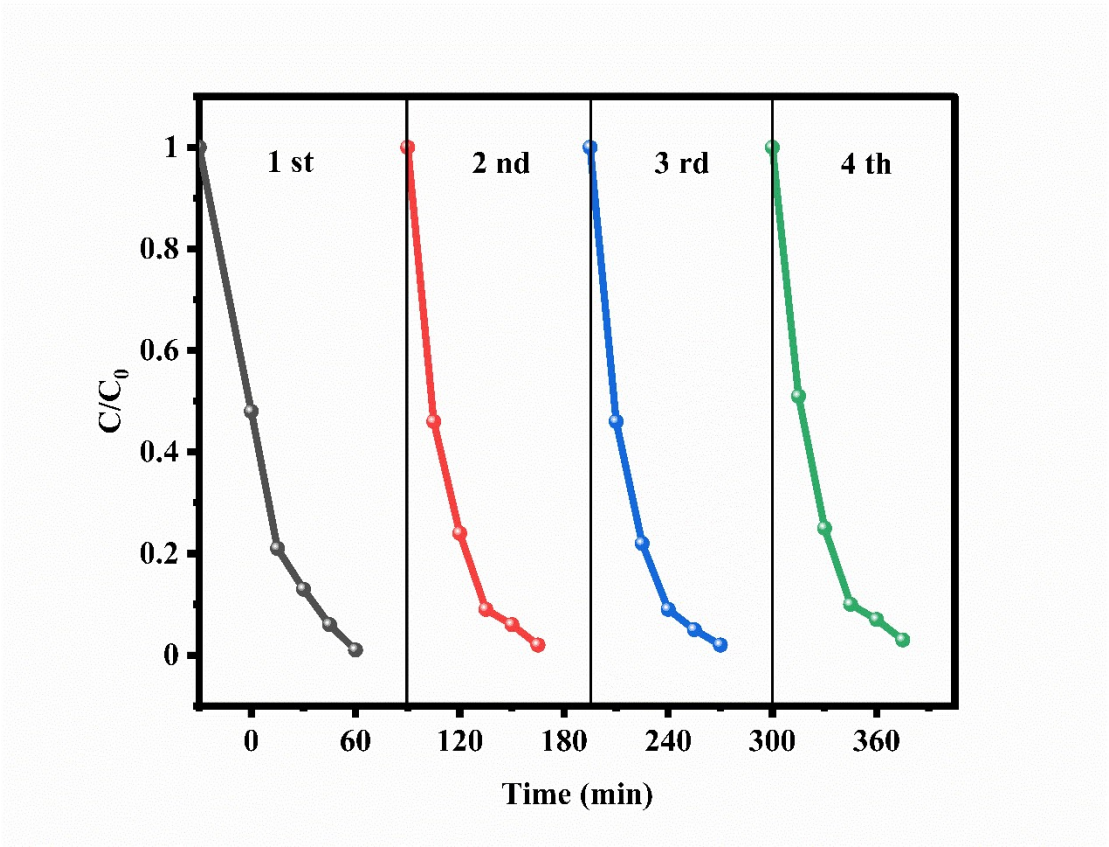

Fig. S3. Cyclic tests of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids.

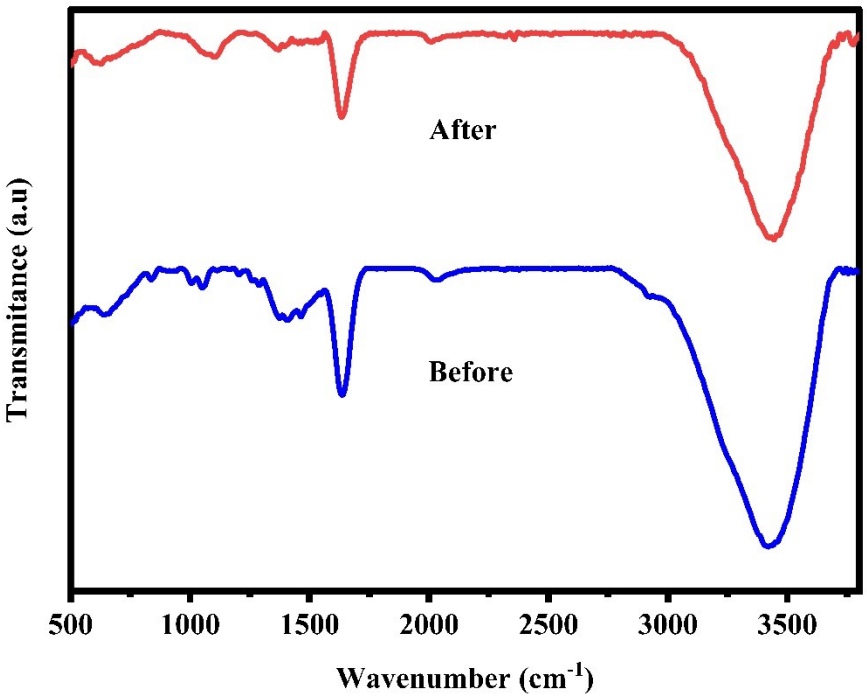

Fig. S4. FTIR image of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids before and after photocatalytic experiments.

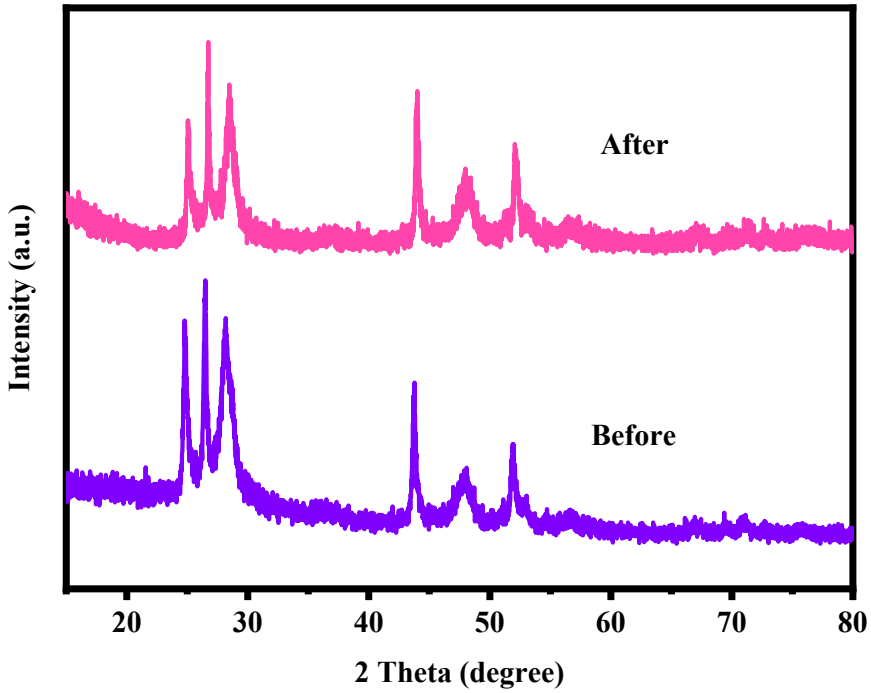

Fig. S5. XRD image of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids after the photocatalytic reaction.

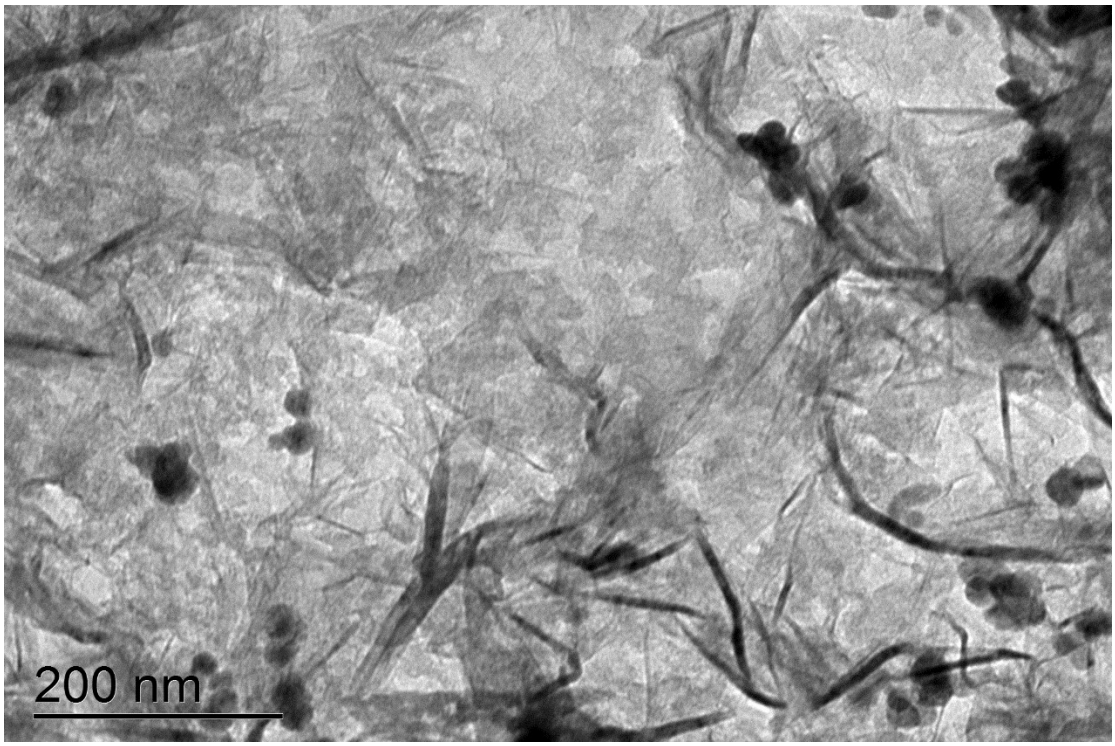

Fig. S6. TEM image of 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids after photocatalytic tests.

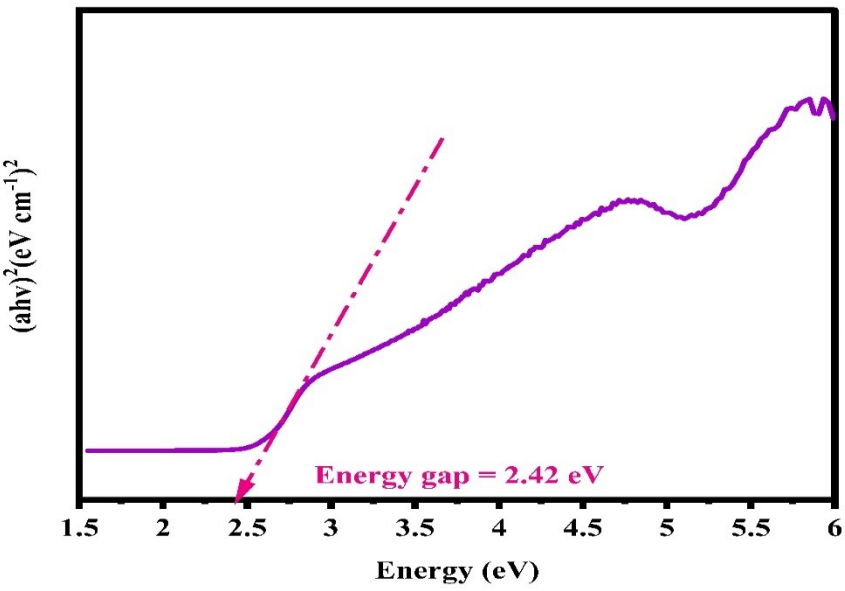

Fig. S7. Energy gap for bare $Cd_{0.5}Zn_{0.5}S$.

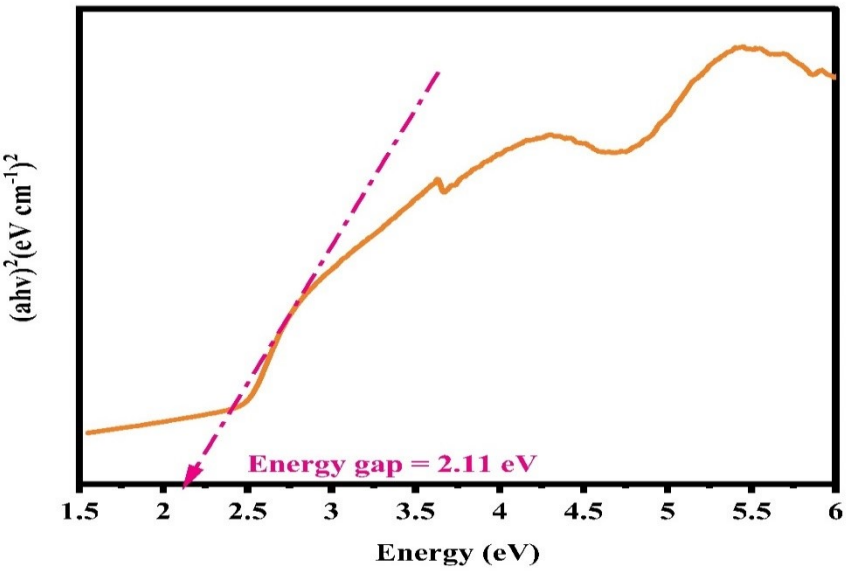

Fig. S8. Energy gap for 5%wt 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids.

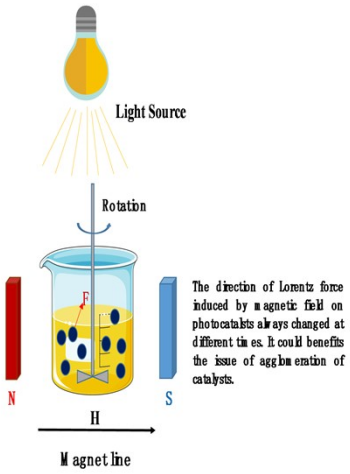

Fig. S9. Photocatalytic degradation system (left photo) and schematic diagram of the photocatalytic experiment with the magnetic field (right photo).

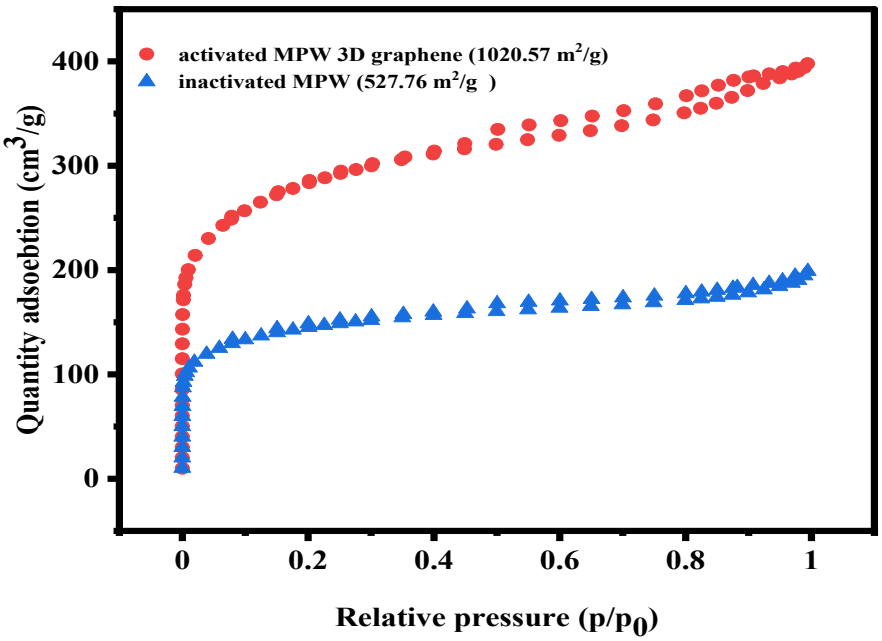

Fig. S10. BET results of inactivated mangosteen peel waste (MPW) carbon and activated MPW 3D graphene.

Table S1 Atomic ratio of $Cd_{0.5}Zn_{0.5}S$ and 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids.

Sample	Zn: Cd[a] (atomic ratio)
$Cd_{0.5}Zn_{0.5}S$	0.46:0.48
5%wt 3D graphene/$Cd_{0.5}Zn_{0.5}S$	0.50:0.49

[a] Measured by AAS

Table S2 Wt% content of $Cd_{0.5}Zn_{0.5}S$ and 3D graphene/$Cd_{0.5}Zn_{0.5}S$ hybrids.

Sample	Cd[a]	Zn[a]	S[b]	C[b]
$Cd_{0.5}Zn_{0.5}S$	28.95	29.18	35.7	-

5%wt 3D graphene/$Cd_{0.5}Zn_{0.5}S$	21.83	21.63	43.8	4.72

[a] Measured by AAS. [b] Measured by elemental analysis