Supplementary Material

Fig S1A is the XPS spectra of different materials. In Fig S1A, a is the XPS spectra of MWCNTs, b is the XPS spectra of ZSHPC, and c is the XPS spectra of ZSHPC/MWCNTs composites, It can be seen from Fig.S1A that MWCNTs and ZSHPC are perfectly compounded. Fig 1B is a high-resolution XPS sample ZSHPC of C1s, which can be decomposed into three peaks 284.86, 286.76, 288.34, corresponding to C=C graphite carbon, carbon, carbon-based (carbon). As shown in Fig.1c, the O 1s peak can be deconvolution into four small peaks at 530.83, 532.60, 533.46 and 534.22 eV, which are assigned to C=O, O=C-O, SO_x and H-O-H groups, respectively. The S 2p spectrum (Fig.1D) can be deconvoluted into three double peaks (S $2p_{3/2}$ and S $2p_{1/2}$). The first two states at 161.1 and 162.7 eV can be connected to S^{2-} in the sulfide, which further confirms the presence of zinc sulfide. The second dipole states at 164.3 and 165.4 eV are due to the C-S-C group, which indicates that the introduction of sulfuric acid realizes the incorporation of sulfur as a heteroatom into carbon. The third doublet is at 167.6 and 168.8 eV, corresponding to C-SO_x-C (x = 2-4) groups. The two peaks of Zn $2p_{3/2}$ and Zn $2p_{1/2}$ are 1020.93 and 1044.13 eV, respectively (Fig.1E), which are the characteristic peaks of Zn^{2+}. This analysis is roughly the same as the peak position in Zhang paper[1], but the results are not completely consistent because of the incorporation of MWCNTs in ZSHPC.

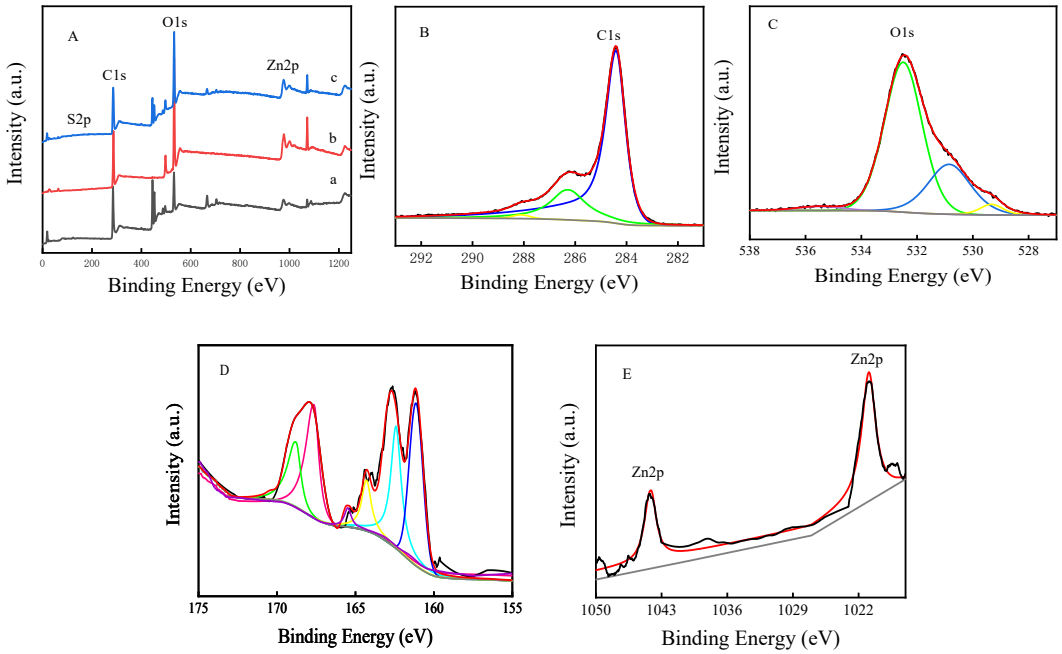

Fig.S1 (A) XPS survey spectra of (a) MWCNTs, (b) ZSHPC, (c) ZSHPC/MWCNTs; (B) C 1s, (C) O1s, (D) S 2p and (E) Zn 2p spectra of ZSHPC/MWCNTs

References:

1 K. Zhang, Z. Zhuo, G. Fan, Z. Wang, S. Chen, L. Xu, Y. Wen and P. Wang, *Nanoscale*, 2021, **13**, 20078–20090.