Supporting information

Compiling Modules of Photosensitizers and Quaternary Phosphonium Blocks into Materials' Networks Independently by co-Polymerization Strategy: An Effective Way to Fabricate Antimicrobial Agents to Against Drug Resistance

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Content

1. ^{1}H, ^{13}C and ^{31}P NMR spectra of compounds.

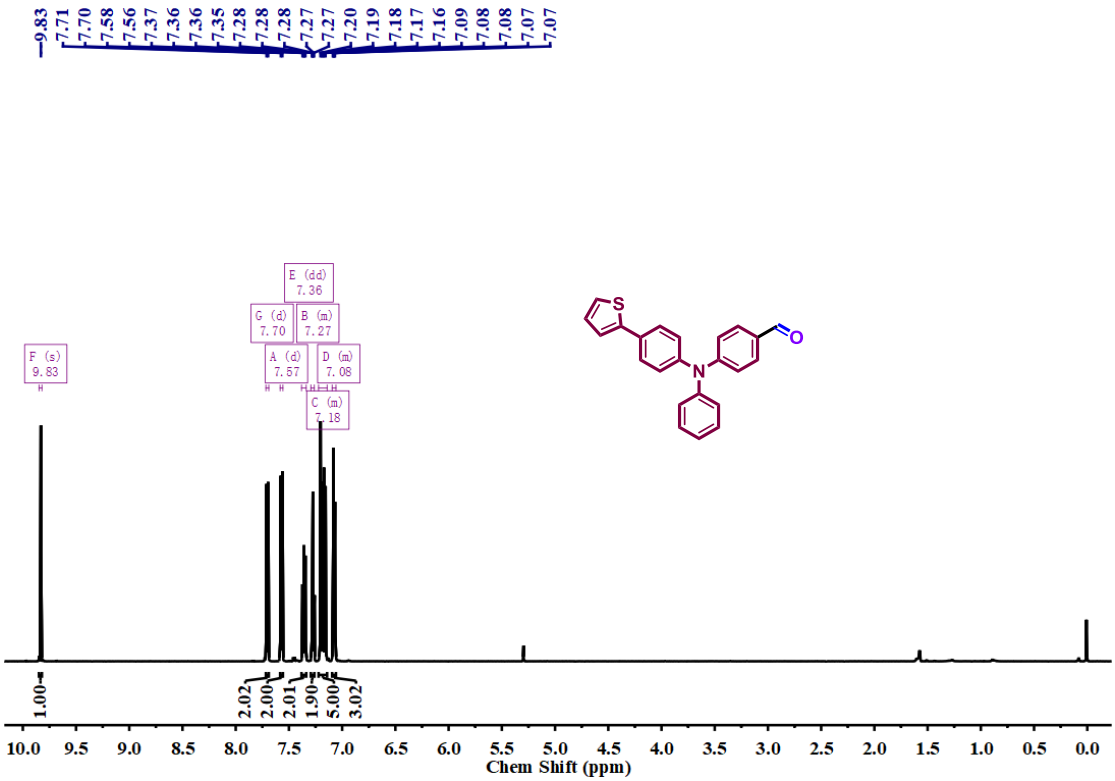


Figure S1. ^{1}H NMR spectrum of Th-TPA-CHO measured in $CDCl_3$ at room temperature.

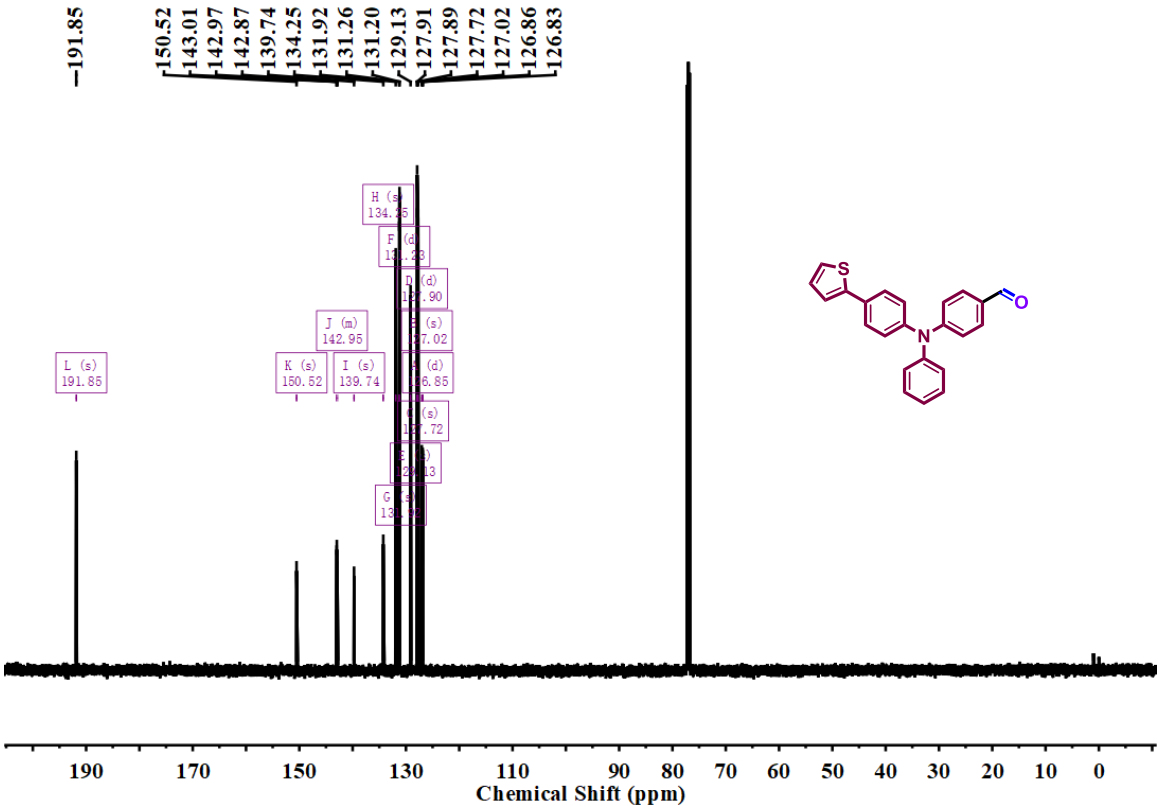


Figure S2. ^{13}C NMR spectrum of Th-TPA-CHO measured in $CDCl_3$ at room temperature.

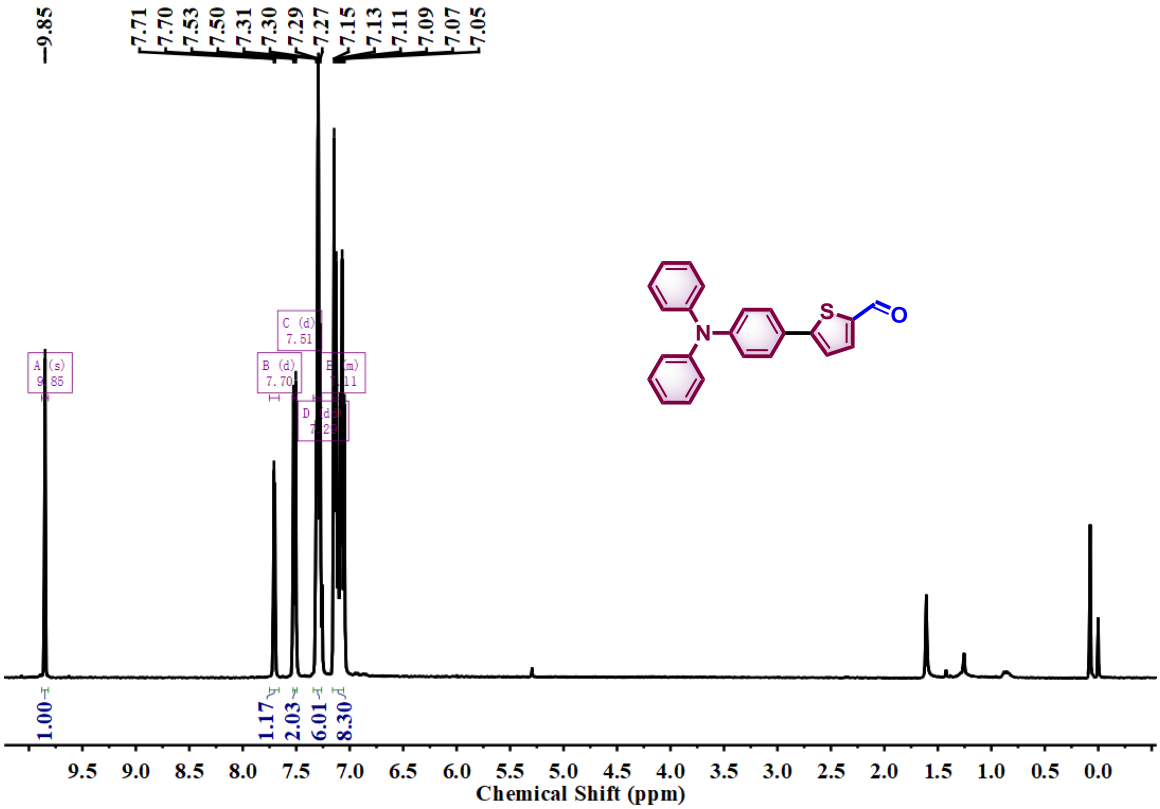


Figure S3. ^{1}H NMR spectrum of TPA-Th-CHO measured in $CDCl_3$ at room temperature.

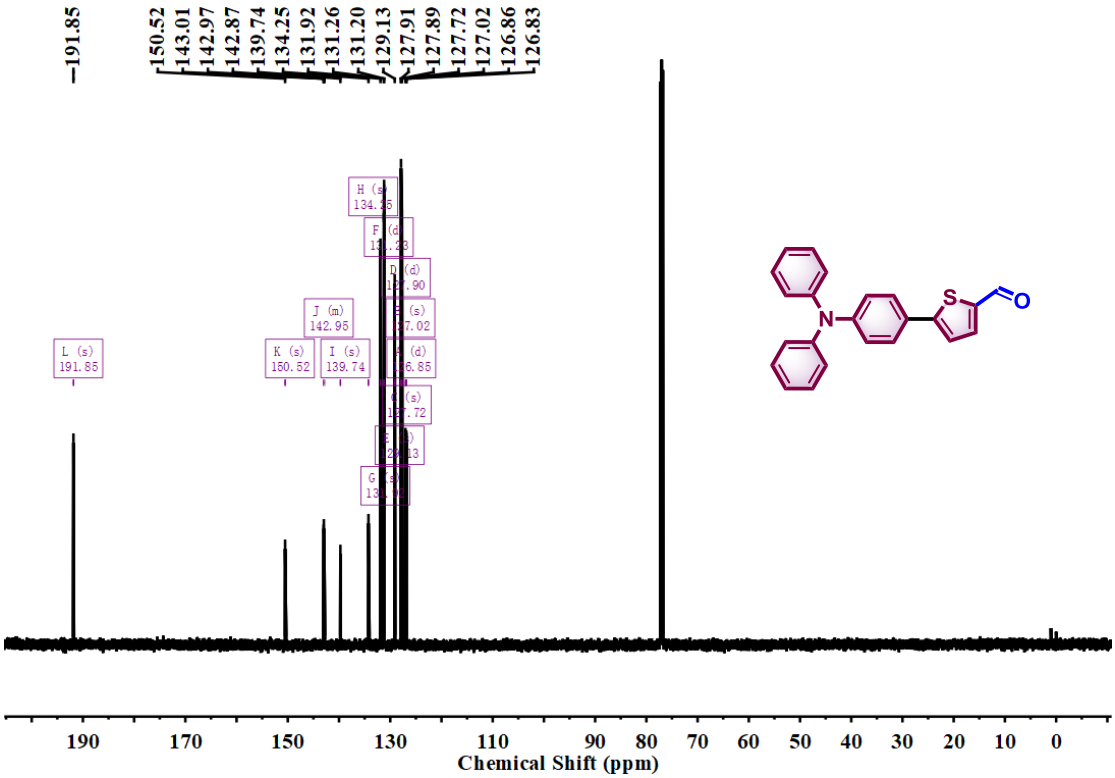


Figure S4. ^{13}C NMR spectrum of TPA-Th-CHO measured in $CDCl_3$ at room temperature.

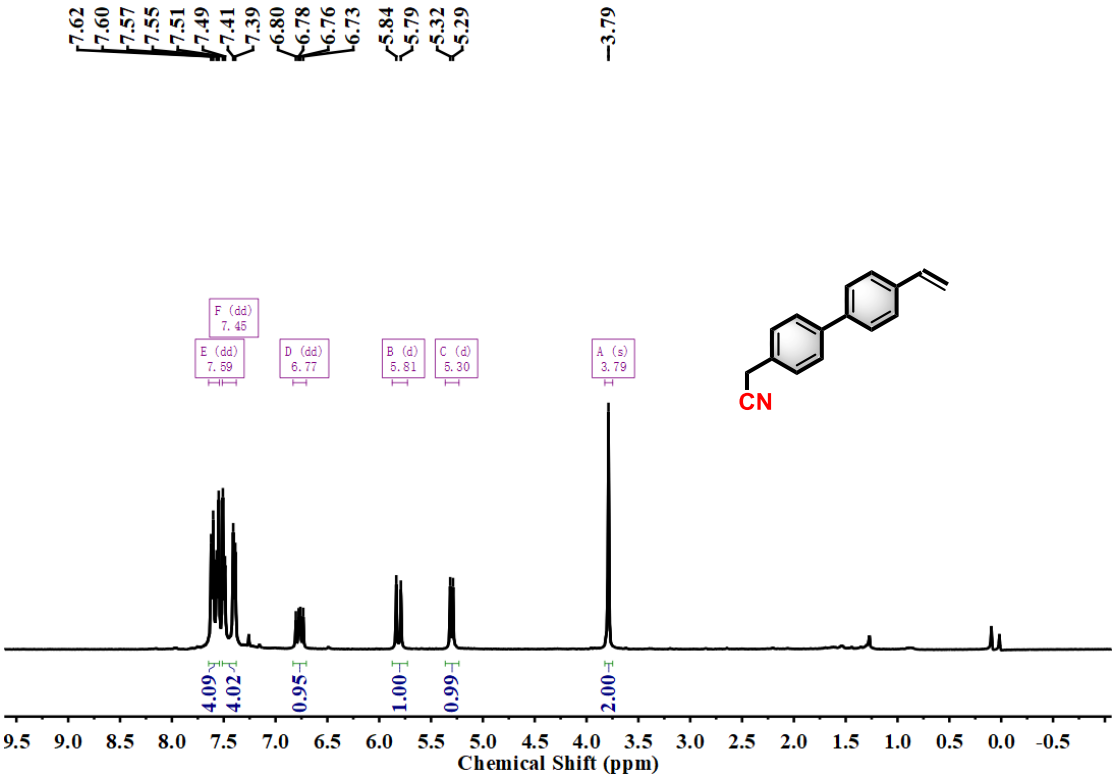


Figure S5. ^{1}H NMR spectrum of Vba measured in $CDCl_3$ at room temperature.

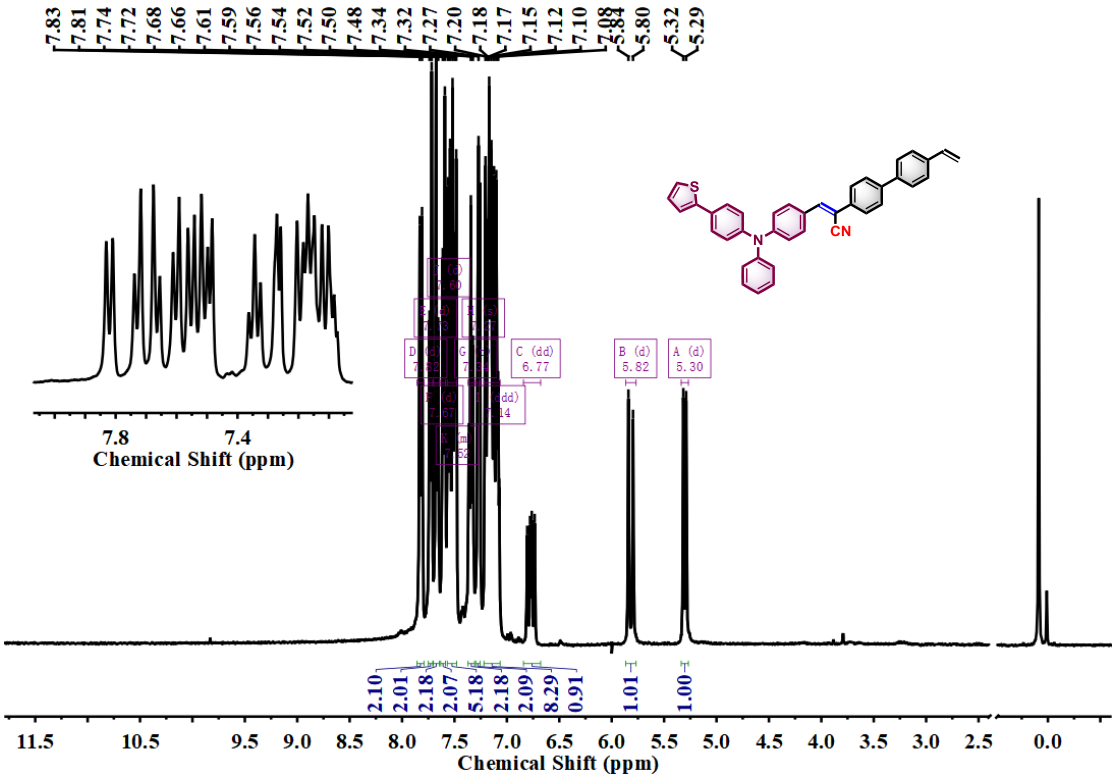


Figure S6. ^{1}H NMR spectrum of TPAs-1 measured in $CDCl_3$ at room temperature.

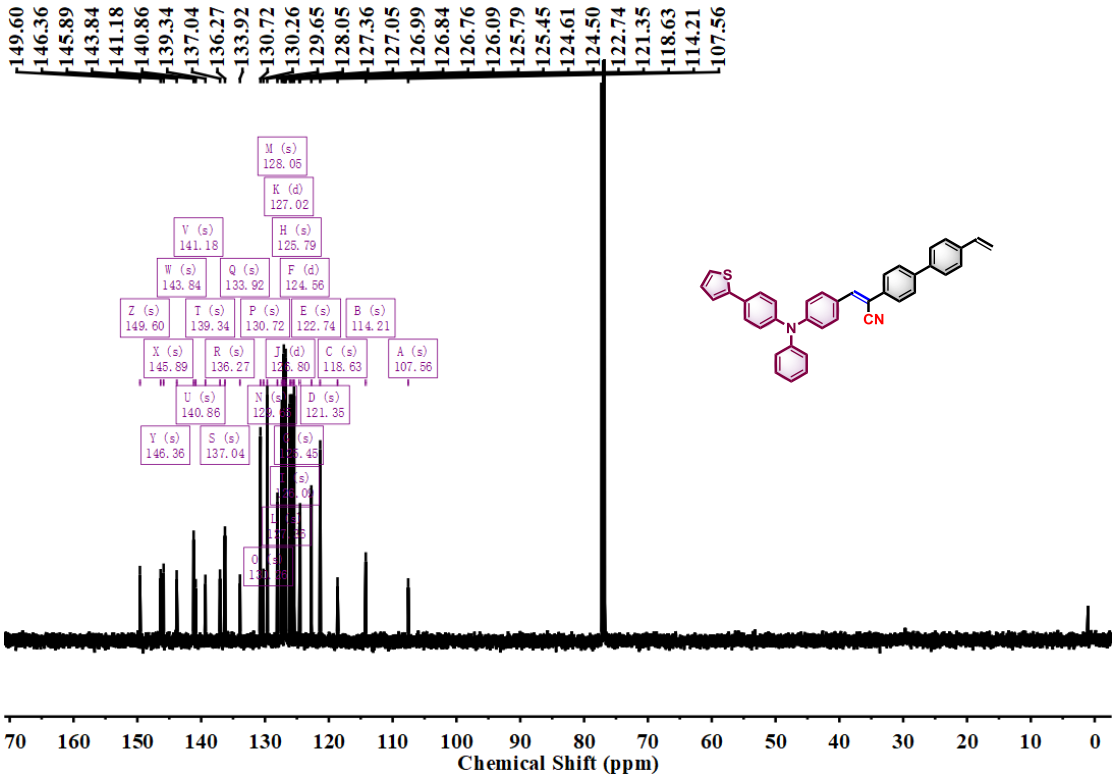


Figure S7. ^{13}C NMR spectrum of TPAs-1 measured in $CDCl_3$ at room temperature.

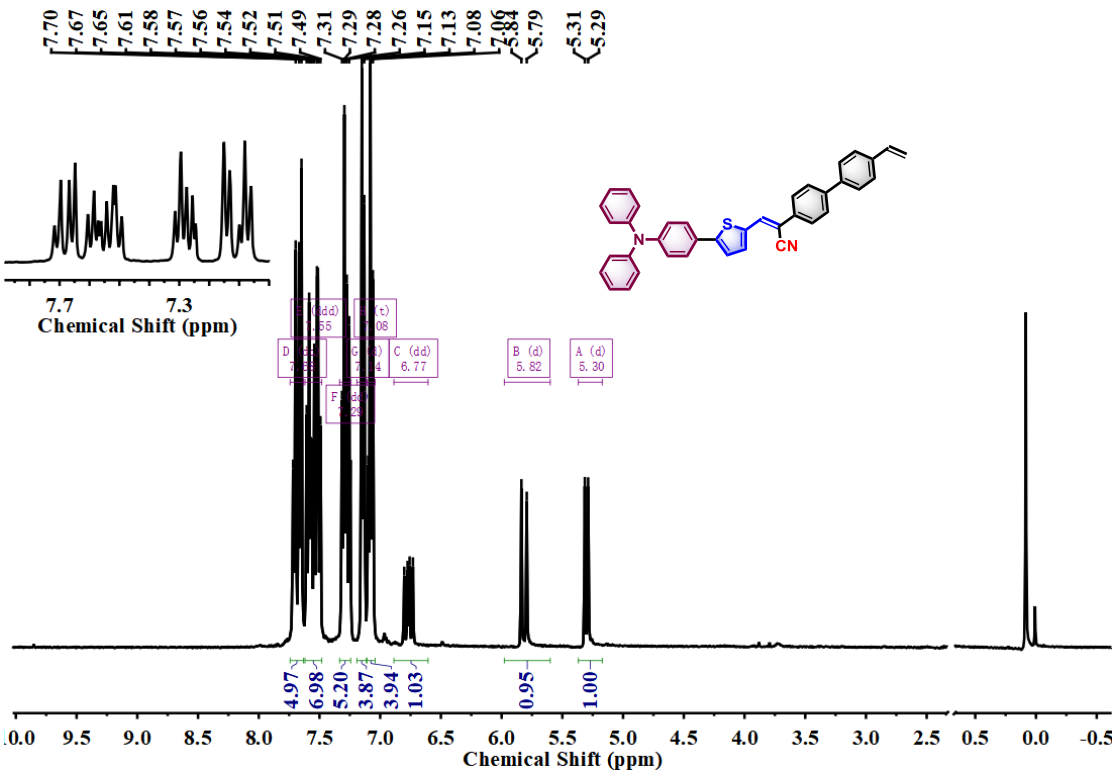


Figure S8. ^{1}H NMR spectrum of TPAs-2 measured in $CDCl_3$ at room temperature.

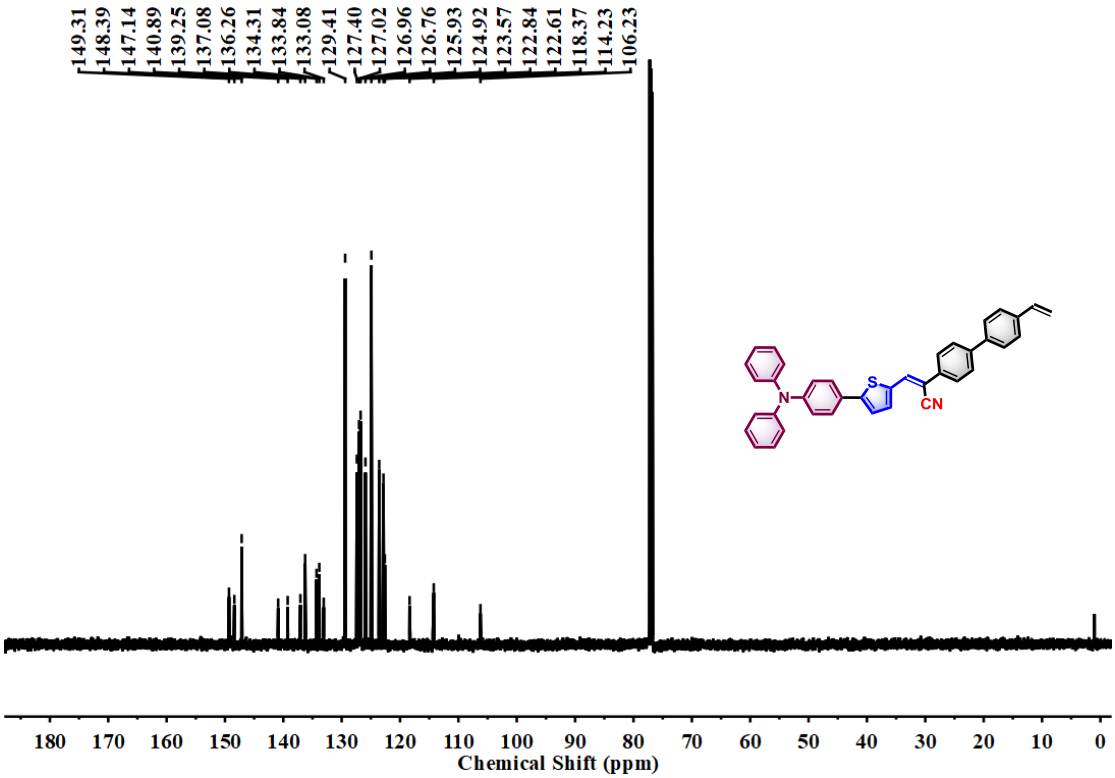


Figure S9. ^{13}C NMR spectrum of TPAs-2 measured in $CDCl_3$ at room temperature.

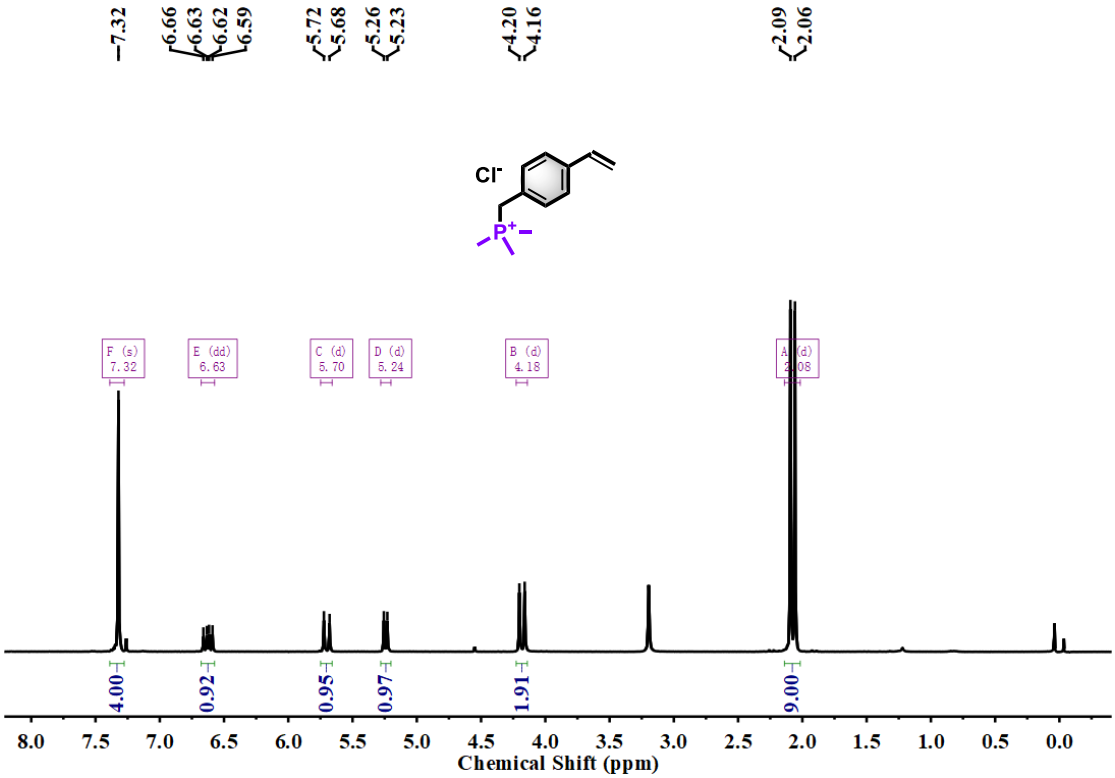


Figure S10. ^{1}H NMR spectrum of P^{+}-1 measured in $CDCl_3$ at room temperature.

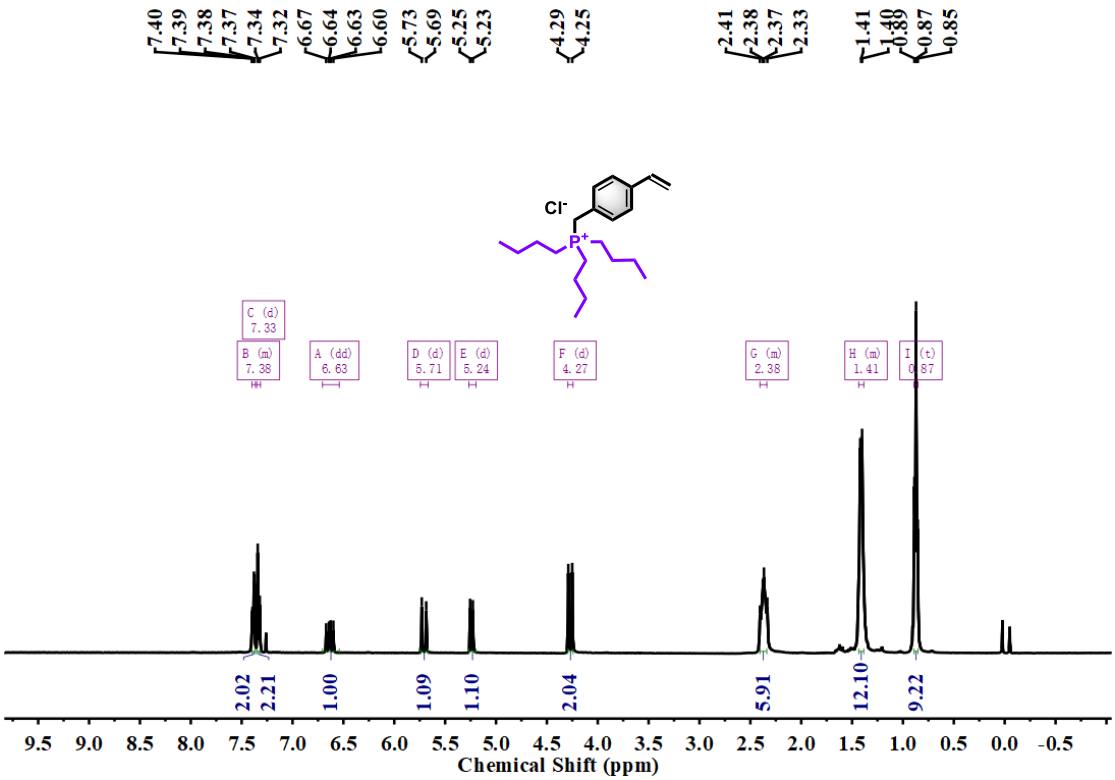


Figure S11. ^{1}H NMR spectrum of P^{+}-4 measured in $CDCl_3$ at room temperature.

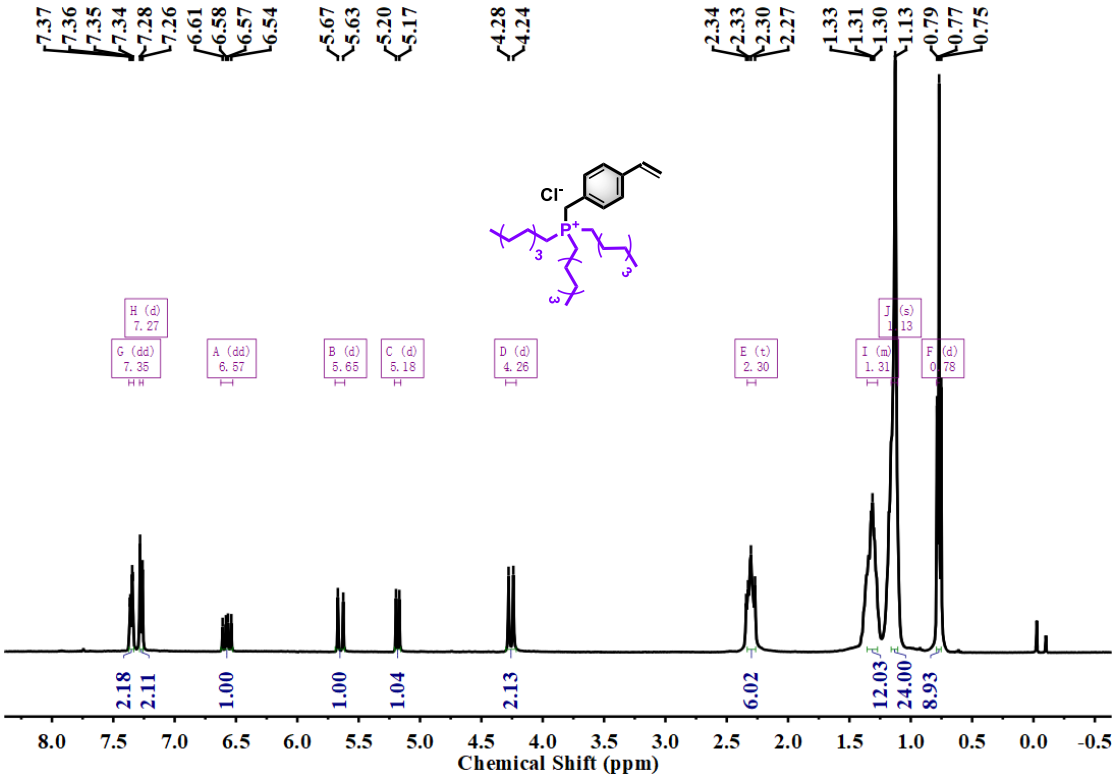


Figure S12. ^{1}H NMR spectrum of P^{+}-8 measured in $CDCl_3$ at room temperature.

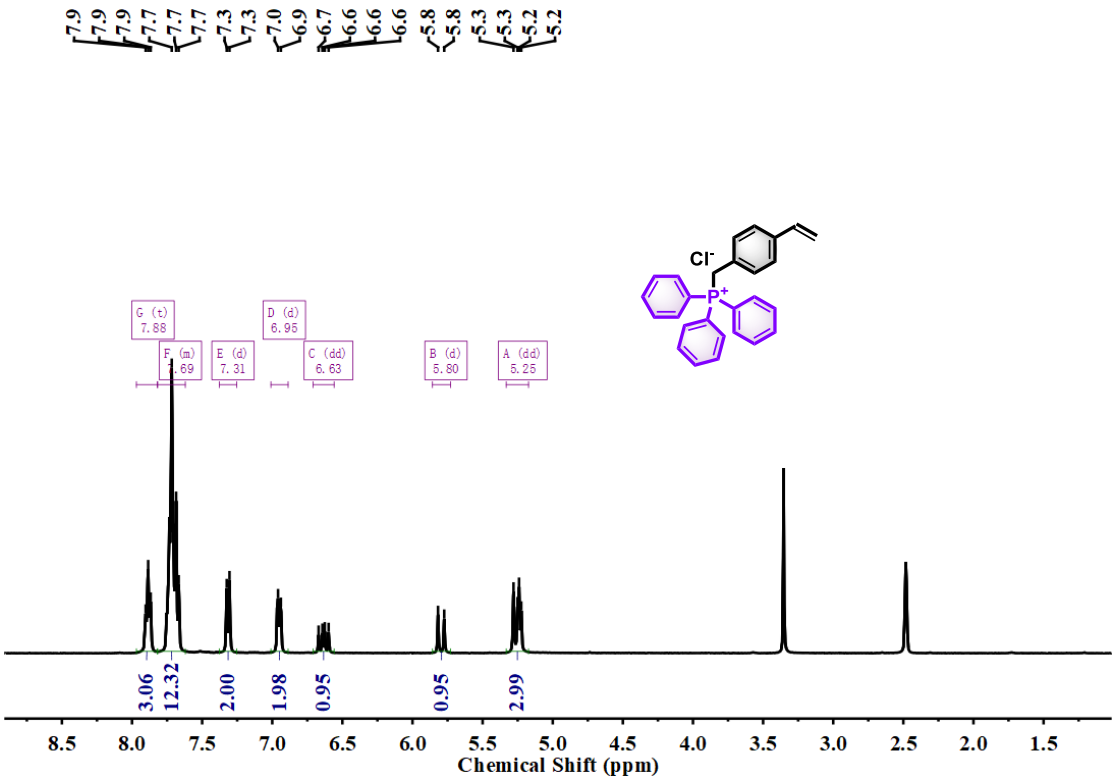


Figure S13. ^{1}H NMR spectrum of P^{+}-Ph_3 measured in DMSO-*d6* at room temperature.

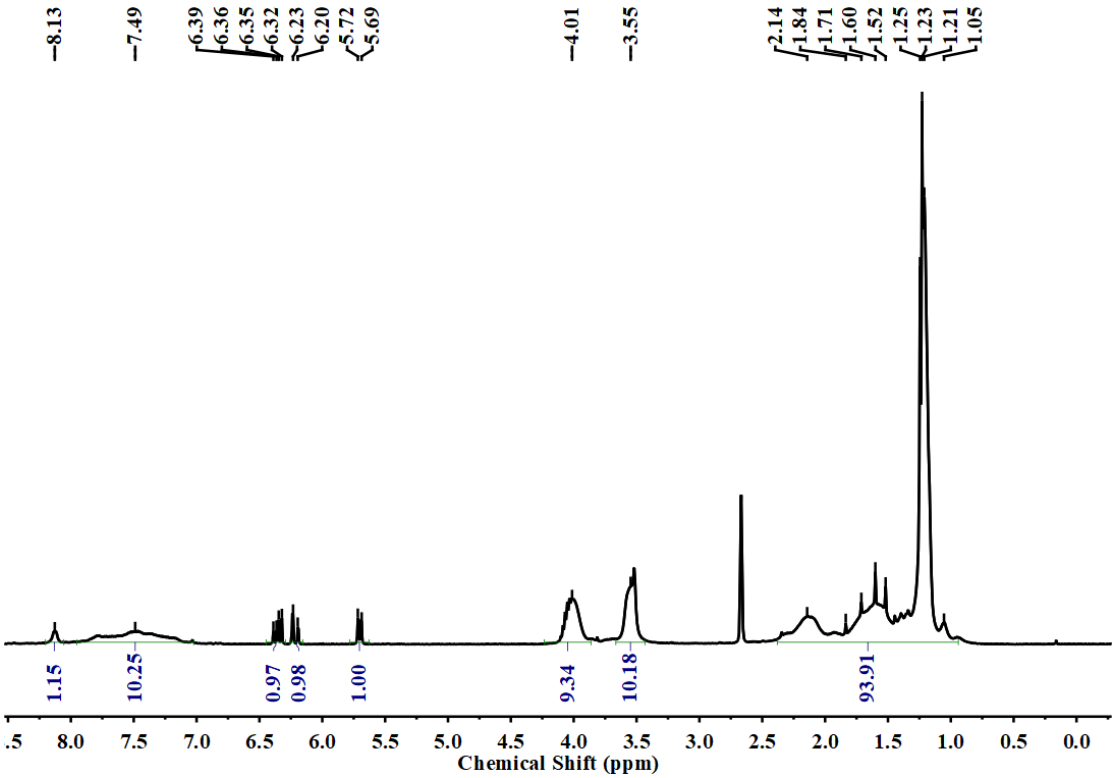


Figure S14. ^{1}H NMR spectrum of Poly(TPAs-2&P^{+}-4) measured in DMSO-d_6 at room temperature.

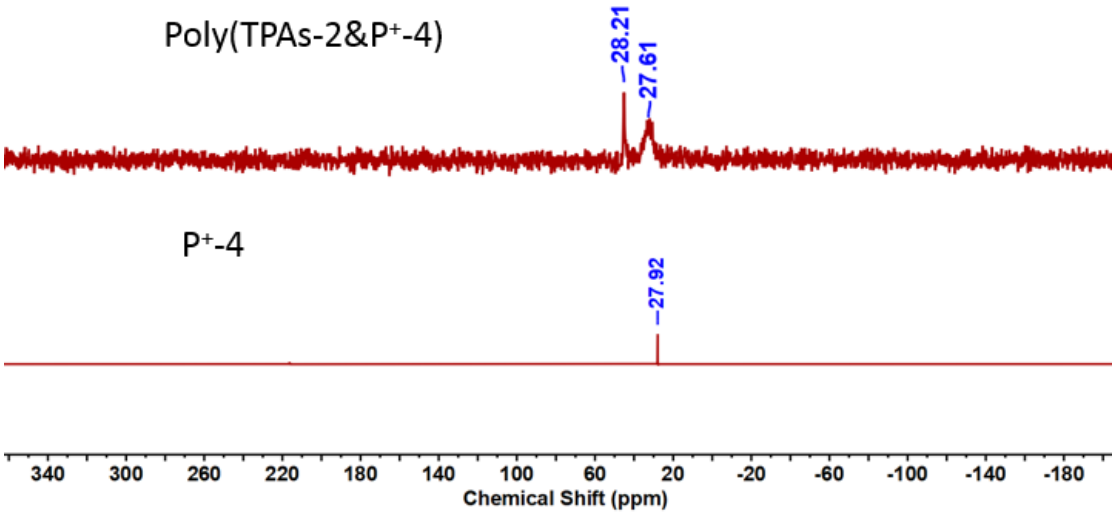


Figure S15. ^{31}P NMR spectrum of Poly(TPAs-2&P^{+}-4) and P^{+}-4 measured in DMSO-*d6* at room temperature.

2. FT-IR spectrum of compounds

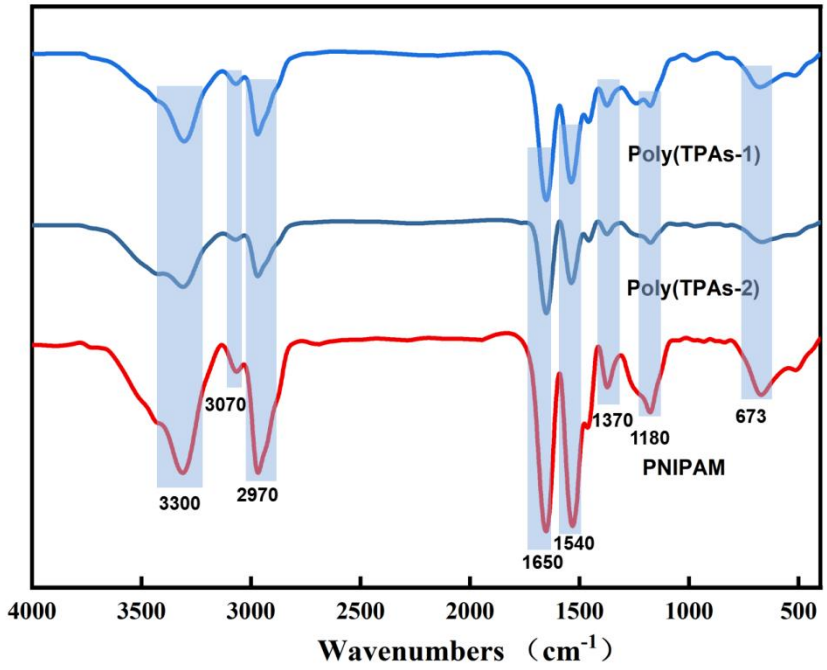


Figure S16. FT-IR spectra of PNIPAM, Poly(TPAs-1) and Poly(TPAs-2) (KBr tablet).

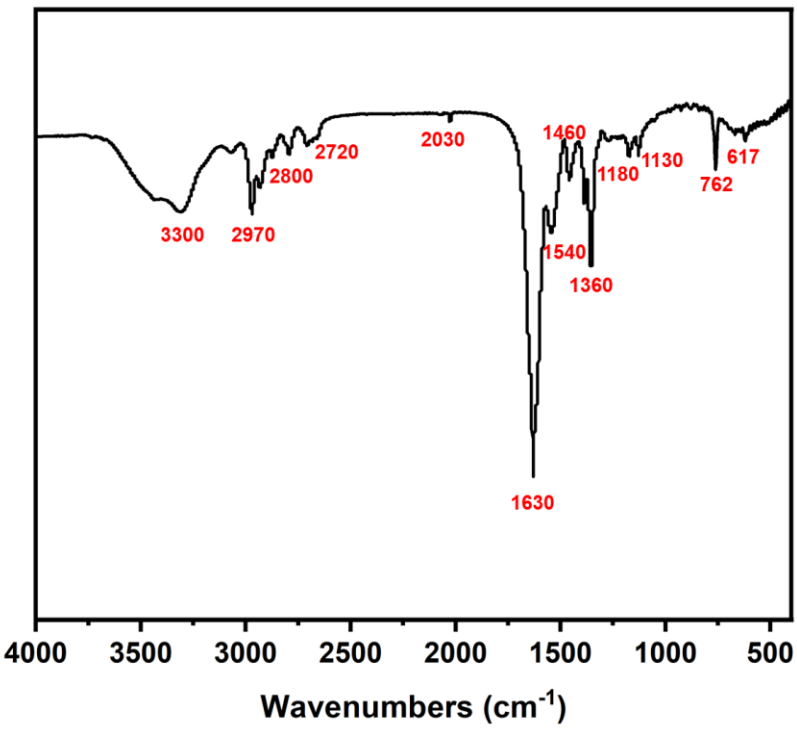


Figure S17. FT-IR spectra of Poly(TPAs-2&P+-4) (KBr tablet).

3. Density functional theory (DFT) calculation

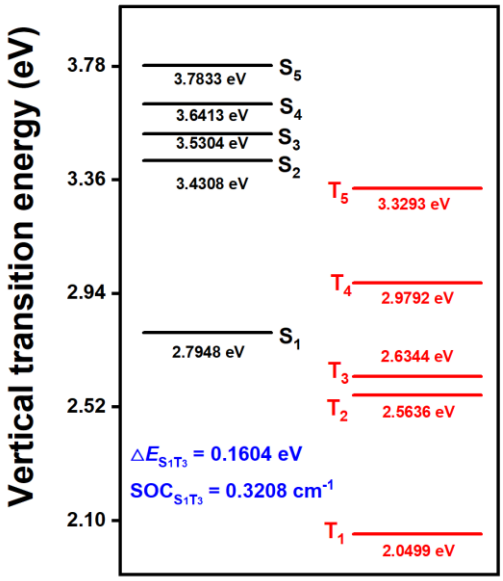


Figure S18. Singlet and triplet energy levels, ΔE_{ST} values, and SOC values of TPAs-1.

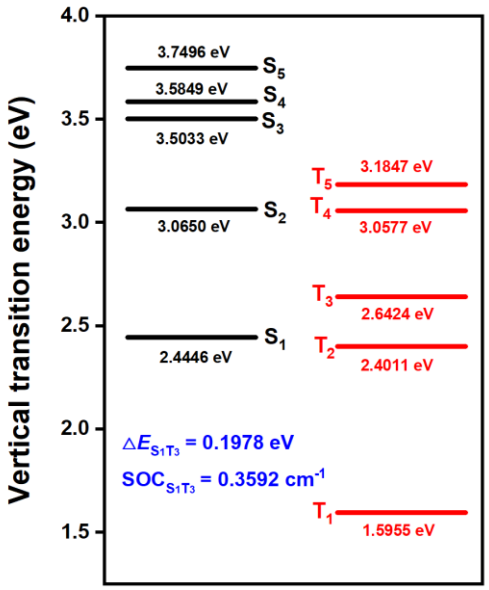


Figure S19. Singlet and triplet energy levels, ΔE_{ST} values, and SOC values of TPAs-2.

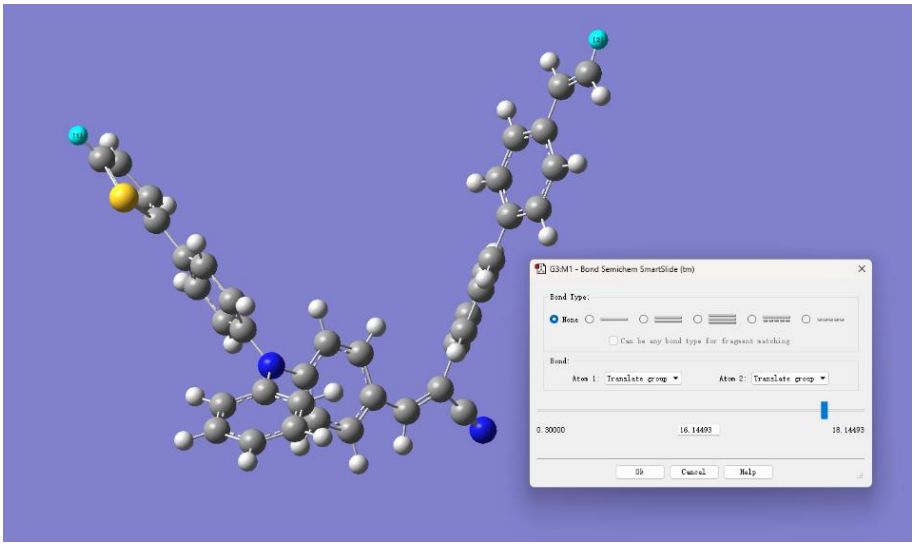


Figure S20. The calculated molecular length of TPAs-1.

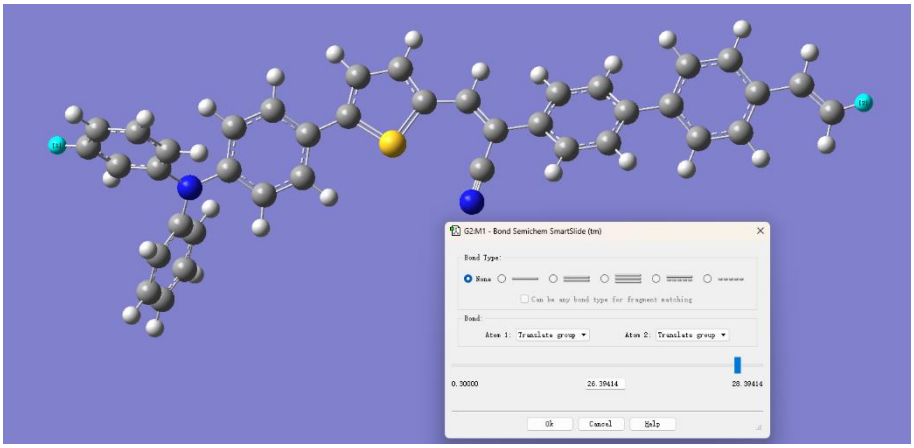


Figure S21. The calculated molecular length of TPAs-2.

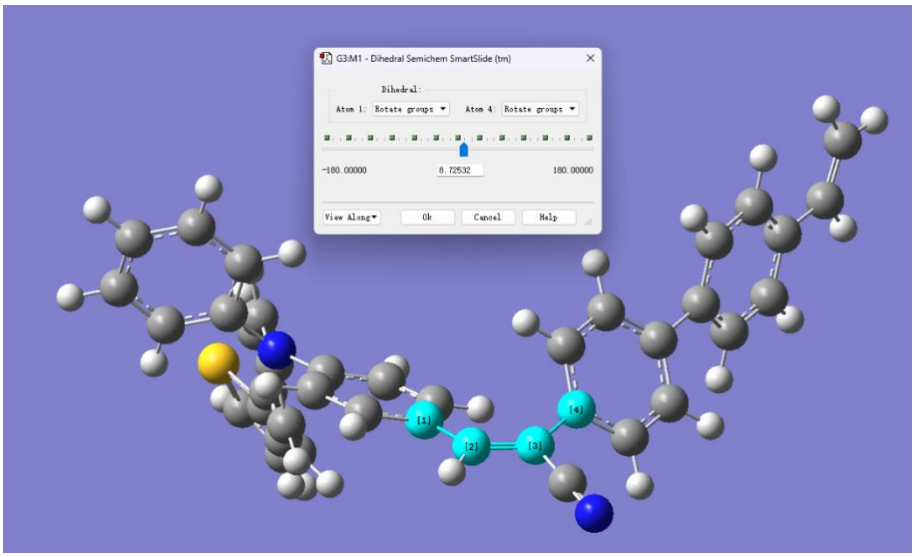


Figure S22. Dihedral angle of C-C=C-C in TPAs-1.

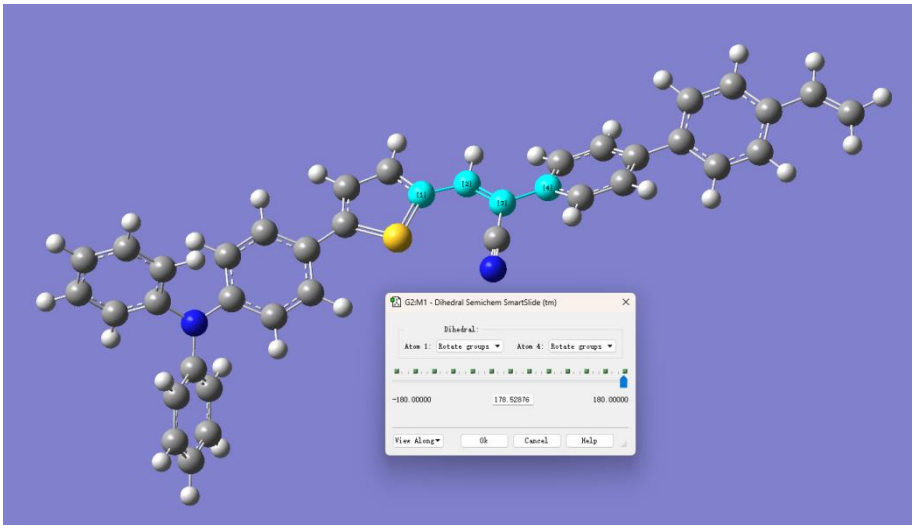


Figure S23. Dihedral angle of C-C=C-C in TPAs-2.

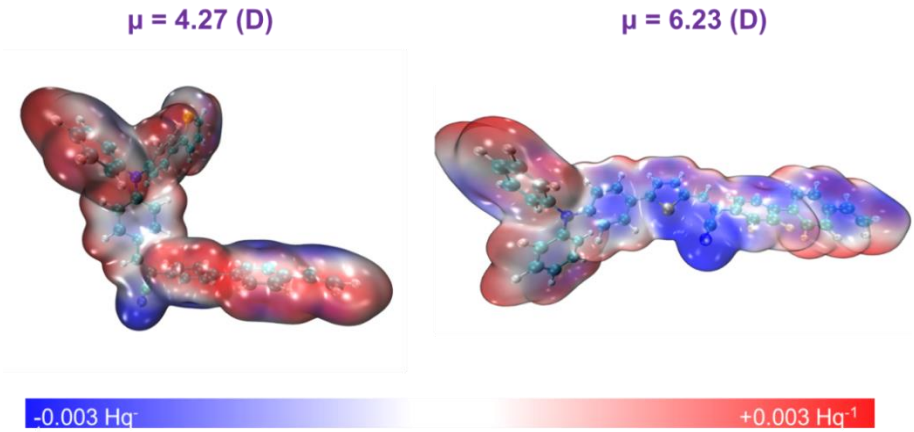


Figure S24. The dipole moment and electrostatic distribution of TPAs-1 and TPAs-2.

4. Fluorescence quantum yield

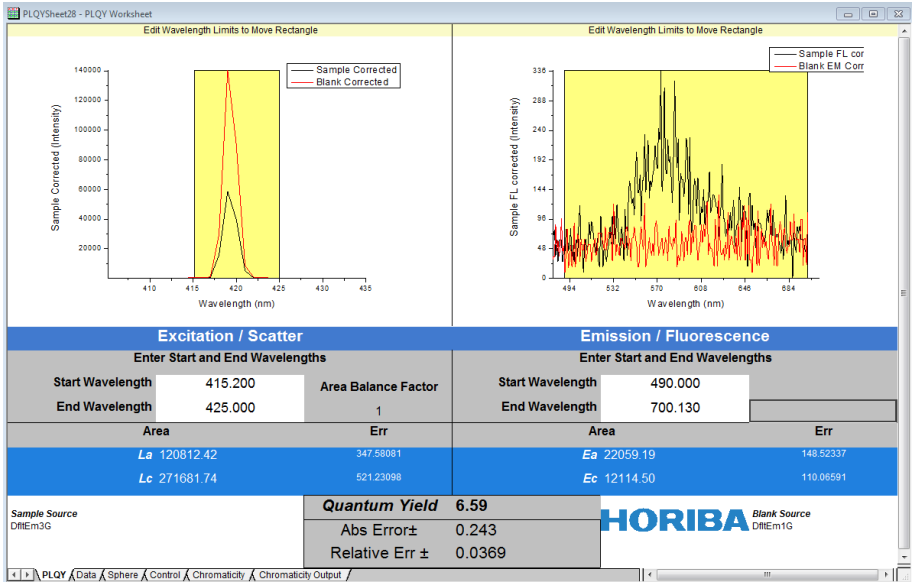


Figure S25. Fluorescence quantum yield of TPAs-1.

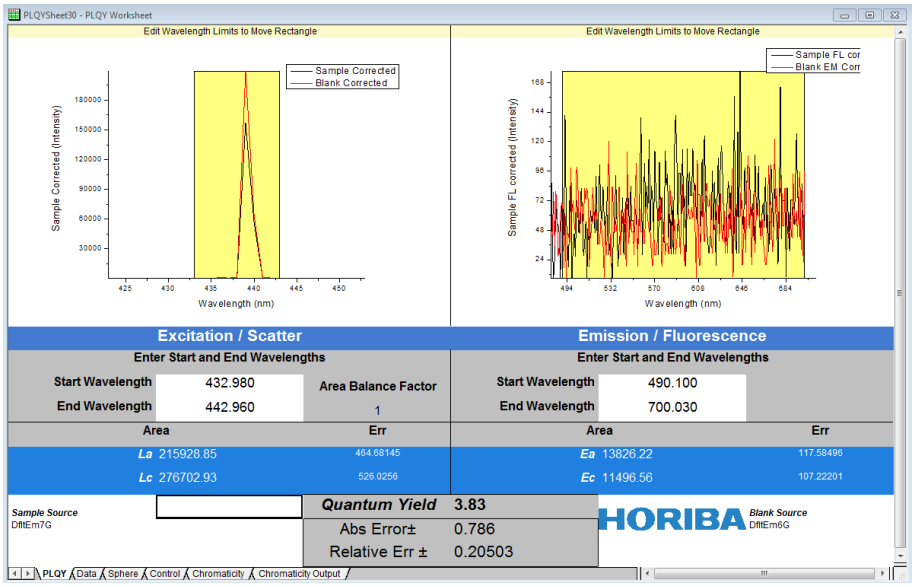


Figure S26. Fluorescence quantum yield of TPAs-2.

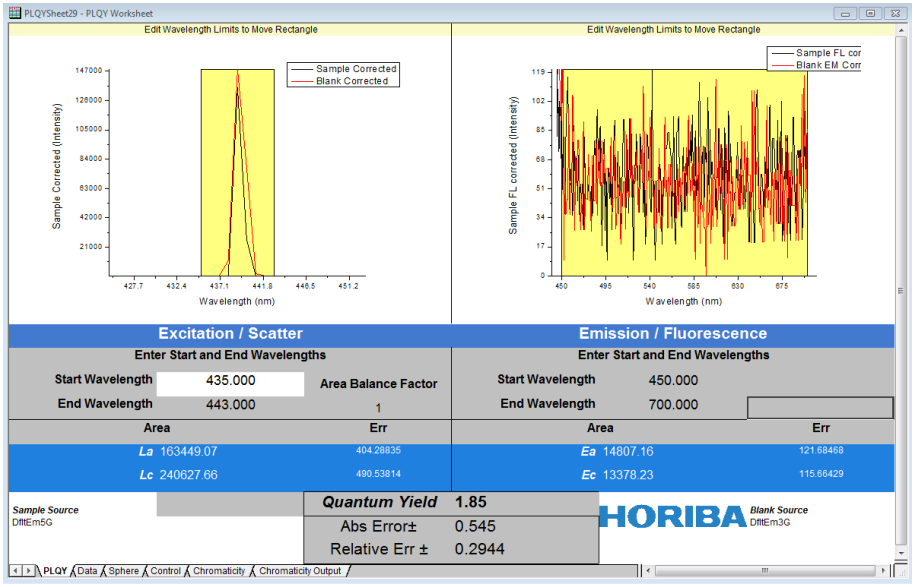


Figure S27. Fluorescence quantum yield of Poly(TPAs-2&P^{+}-4).

5. Zone of inhibition

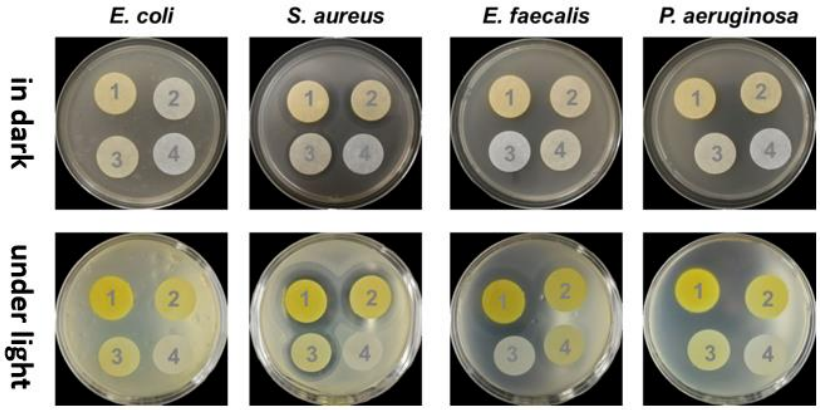


Figure S28. Inhibition zone of Poly(TPAs-2&P^{+}-4) against four kinds of bacteria at different concentrations (The numbers 1, 2, 3 and 4 in the figure represent 70, 50, 30 and 0 mg/mL respectively).

6. Minimum inhibitory concentration (MIC)

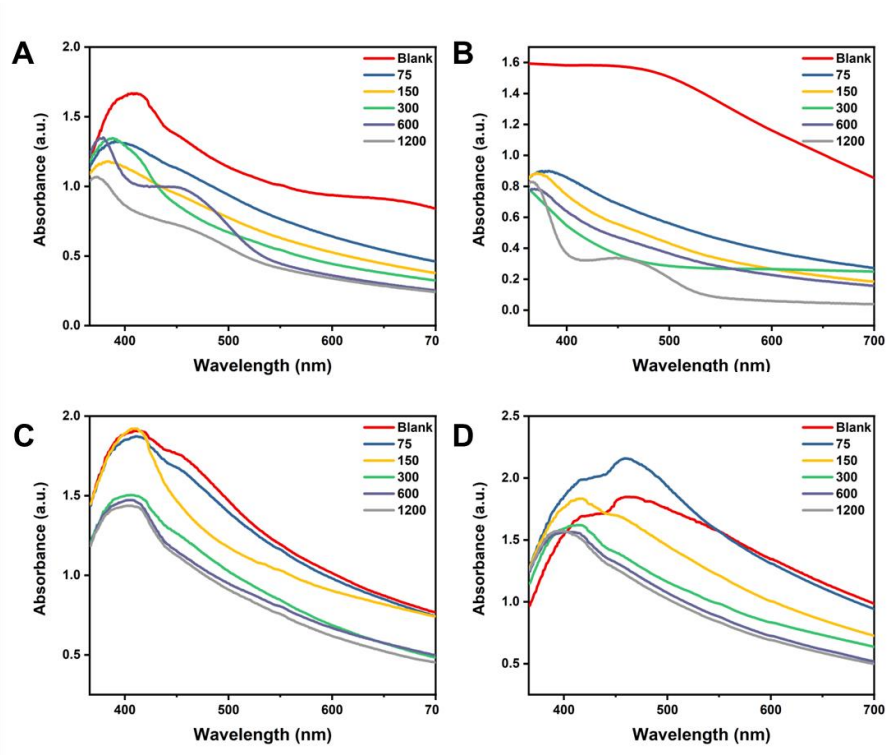


Figure S29. The absorbance of *E. coli* (A), *S. aureus* (B), *P. aeruginosa* (C) and *E. faecalis* (D) under different concentrations of Poly(TPAs-2&P^{+}-4).

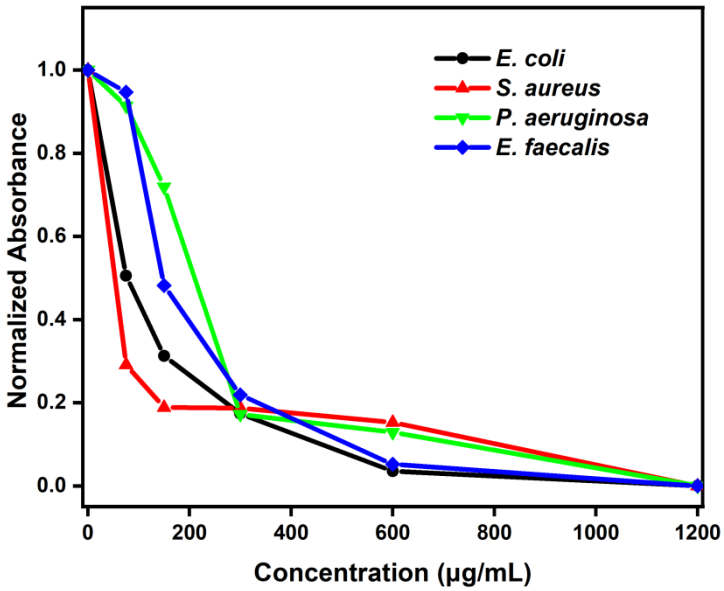


Figure S30. Absorbance of bacteria at 600 nm at different concentrations of Poly(TPAs-2&P^{+}-4).

7. Morphological changes of bacteria

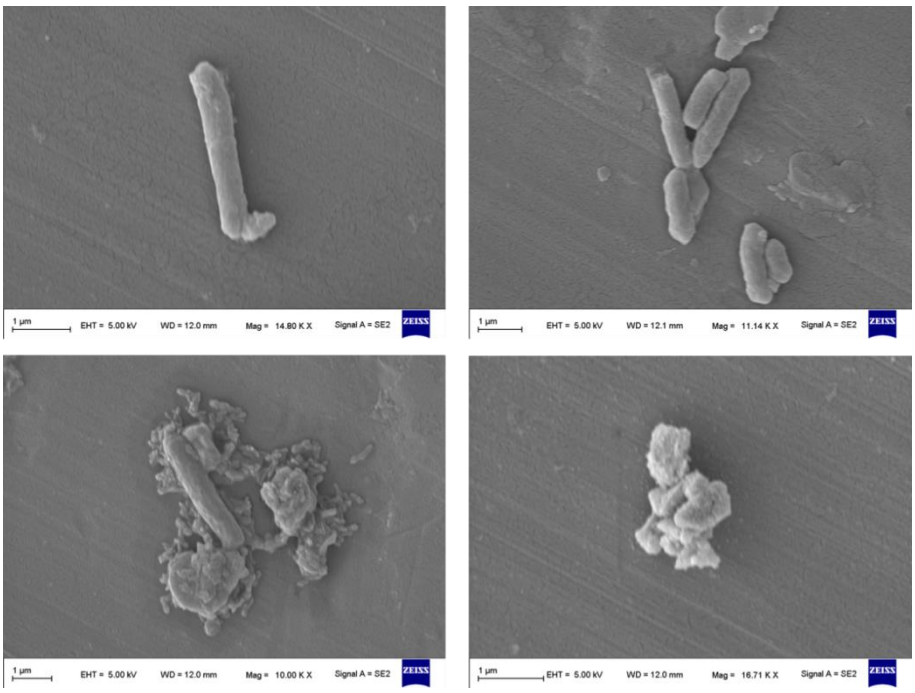


Figure S31. Morphological changes of *E. coli* before and after Poly(TPAs-2&P^{+}-4) treatment (Conc.: 30 mg/mL).

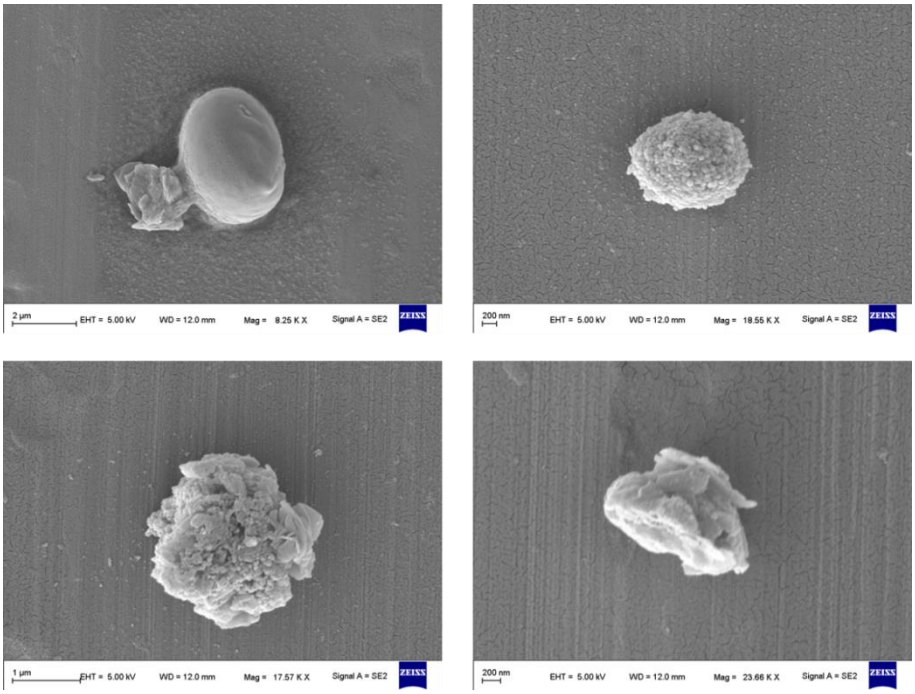


Figure S32. Morphological changes of *S. aureus* before and after Poly(TPAs-2&P^{+}-4) treatment (Conc.: 30 mg/mL).

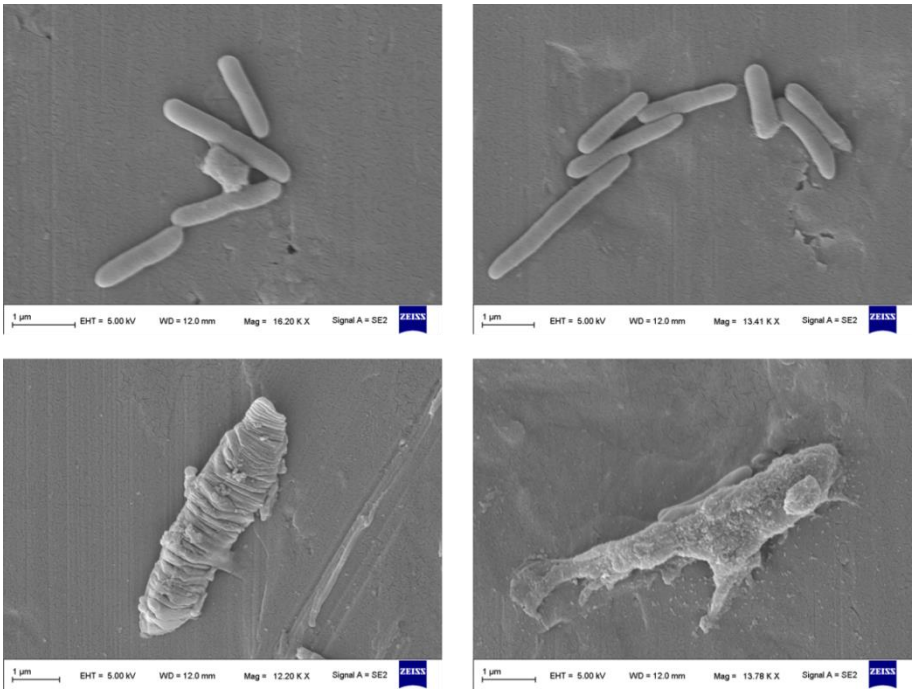


Figure S33. Morphological changes of *P. aureginosa* before and after Poly(TPAs-2&P^{+}-4) treatment (Conc.: 30 mg/mL).

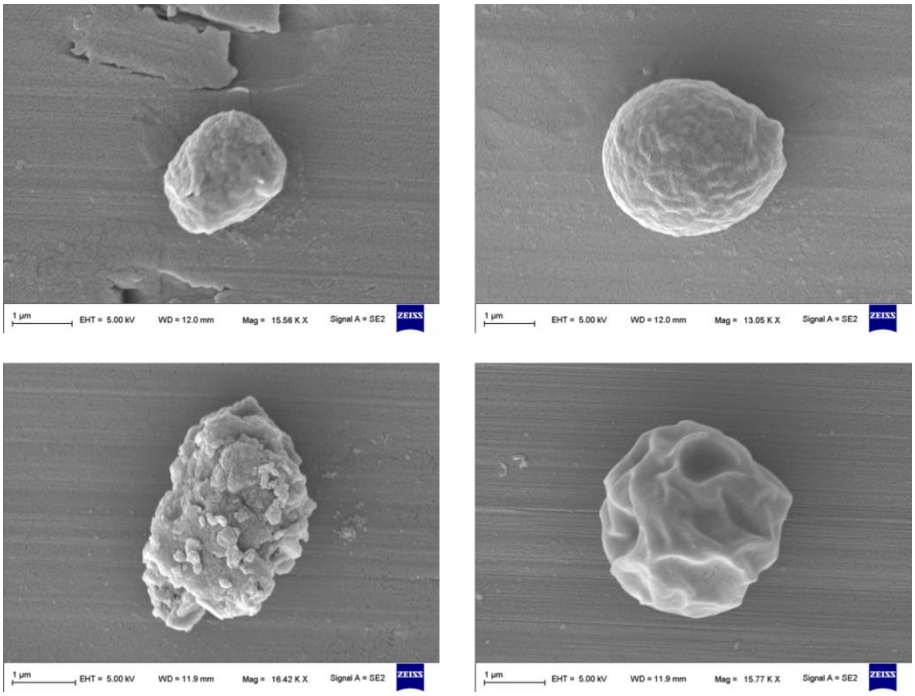


Figure S34. Morphological changes of *E. faecalis* before and after Poly(TPAs-2&P^{+}-4) treatment (Conc.: 30 mg/mL).

8. Cell imaging

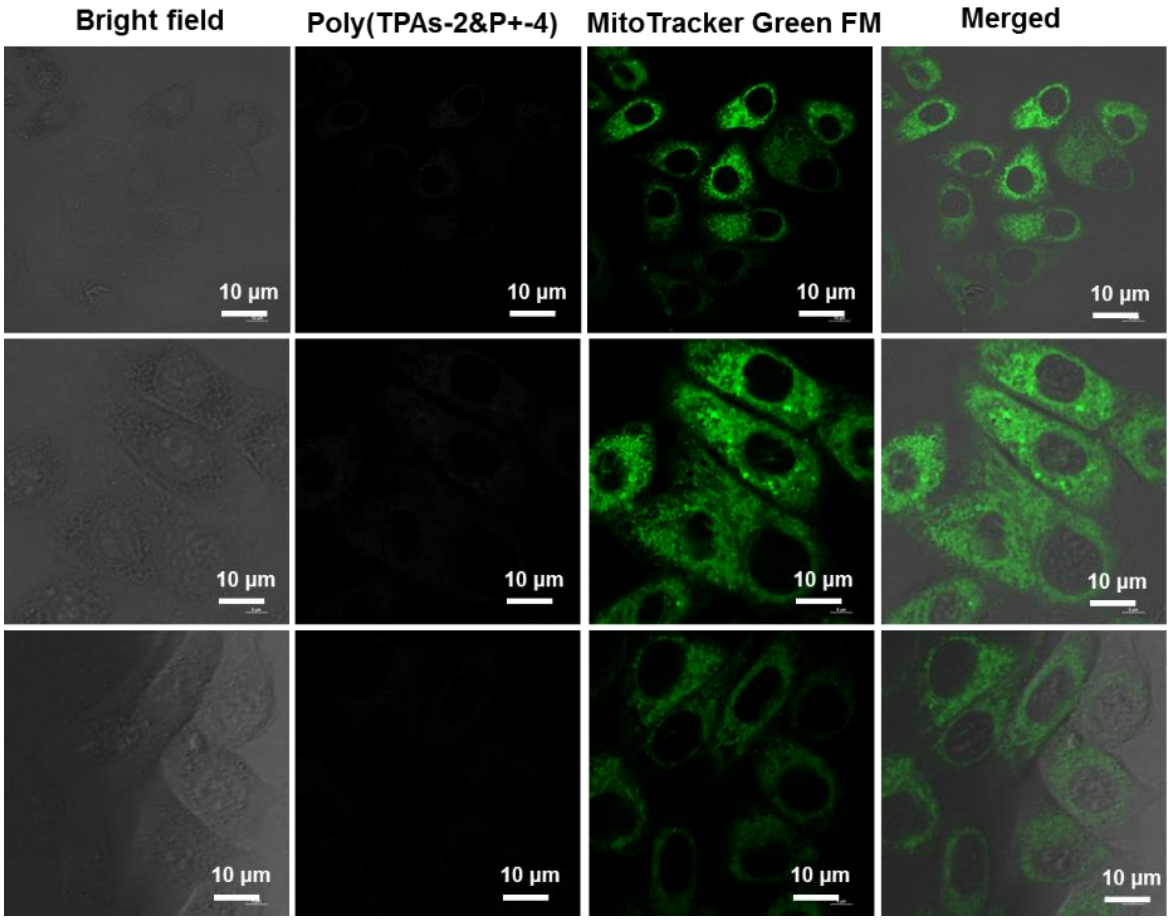
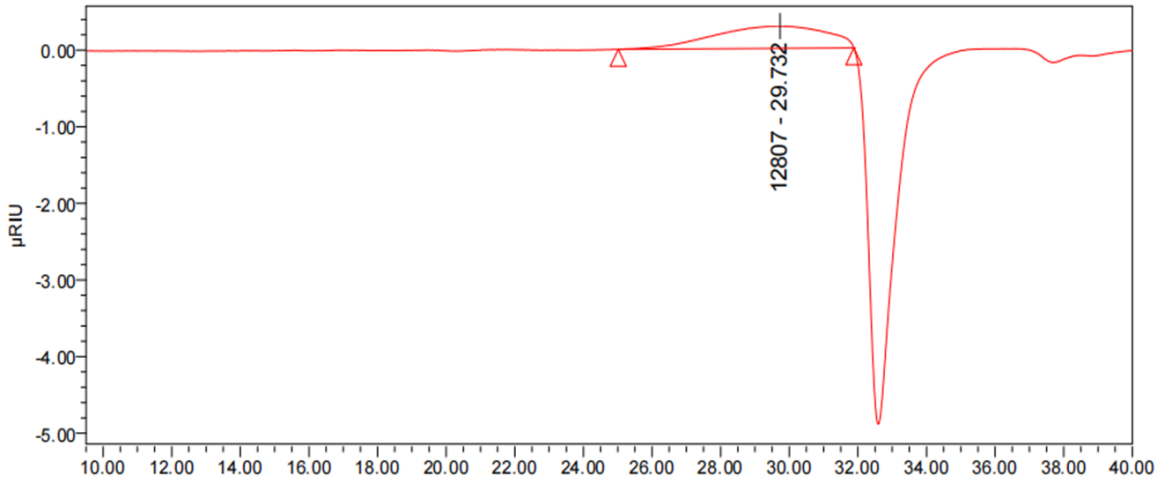


Figure S35. The co-staining poly(TPAs-2&P^{+}-4) with Mito Tracker Green FM to HeLa cells.

9. Gel permeation chromatography test



Sample	Solvent	Retention time (minutes)	Mn	Mw	Mz	Mz+1	Polydispersity	Height (microvolts)	Area (microvolts*seconds)
Poly(TPAs-2&P^{+}-4)	DMF	29.732	12990	16309	19816	23932	1.234708	291	66862

Figure S36. GPC analysis of Poly(TPAs-2&P^{+}-4) in acetonitrile using RI detection.

10. Lower critical solution temperature (LCST) test

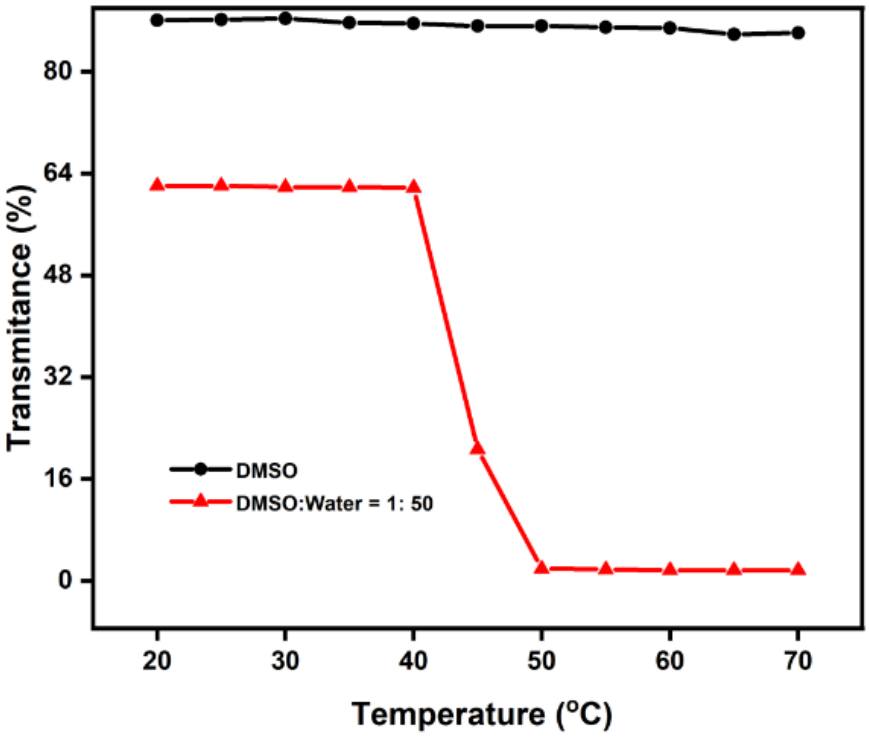


Figure S37. The transmittance of Poly(TPAs-2&P^{+}-4) (Conc.: 50 mg/mL) with the increase of temperature under DMSO and DMSO/water mixture (1:50 v/v).

10. Thermogravimetric Analysis (TGA) test

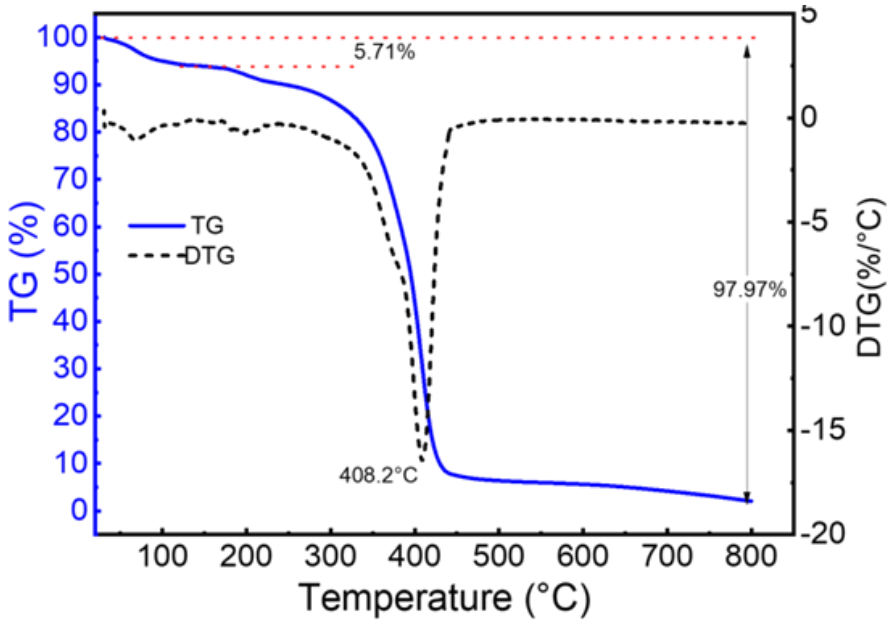


Figure S38. Thermogravimetric (TG) and derivative thermogravimetric (DTG) curves of Poly(TPAs-2&P^{+}-4) under nitrogen atmosphere**.**

11. Antibacterial positive control test

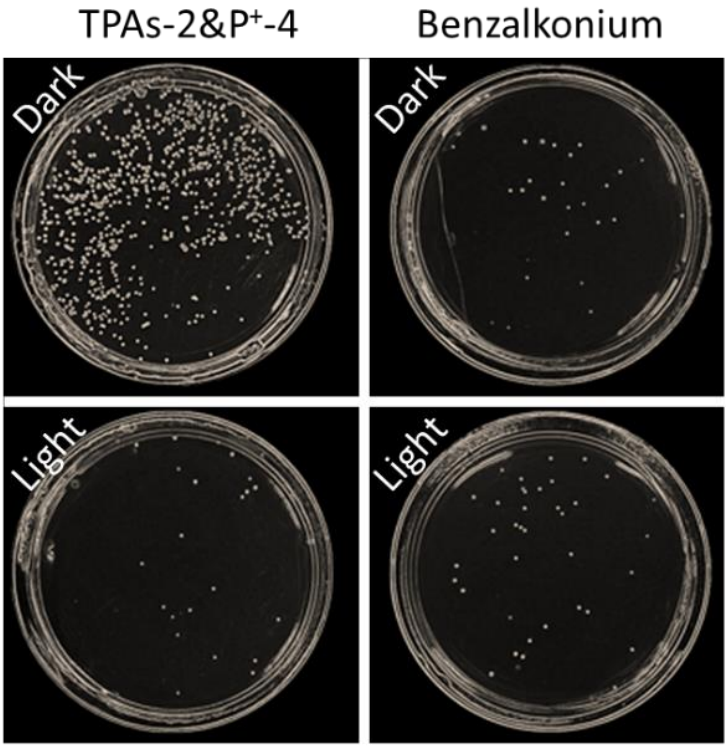


Figure S39. The antibacterial effects of Poly(TPAs-2&P^+-4) and benzalkonium chloride at the same working concentration (50 μg/mL) under dark and light conditions.