Electronic Supplementary Material (ESI) for Analyst.
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Supplementary Information

EXPERIMENTAL SECYION

Materials and Measurements

All organic solvents were obtained from Beijing Chemical Works. All chemicals were purchased from the commercial sources (Sigma-Aldrich, Arcos and Alfa-Aesar). Six microorganisms (Amp^r *E. coli*, *P. aeruginosa*, *S. aureus*, *B. licheniformis*, *C. albicans, S. cerevisiae*) were selected as representative strains, all of which were purchased from China General Microbiological Culture Collection Center. 1 × PBS (pH = 7.4) was used throughout the research. Fluorescence spectra were measured on a Hitachi F-4500 fluorometer equipped with a xenon lamp excitation source. Photographs of bright-field and fluorescence-field were taken with a fluorescence microscope (Ti2-U, Nikon, Japan). Fluorescence intensities of TPEs before and after adding microorganisms were recorded on a microplate reader (Varioskan Flash) using black 96-well plates.

Preparation of TPE Solution

TTAPE[1], Z-TPE-9 and E-TPE-9[2] (TPEs) was synthesized as described in the previous literature. TPEs with aggregation-induced luminescence properties were prepared into stock solution with a concentration of 1 mM, which was stored in a refrigerator at 4 °C to avoid light, and diluted to the corresponding concentration with 1 × PBS for experiments.

Preparation of Microbial Solutions

A monoclonal colony was selected from the cultured plate and placed in a centrifuge tube containing 10 mL liquid medium. For Amp^r *E. coli*, an additional 10 μL was added containing 50 $\mu g \cdot mL^{-1}$ ampicillin. LB medium for Gram-negative bacteria (Amp^r *E. coli* and *P. aeruginosa*), NB medium for gram-positive bacteria (*S. aureus* and B. licheniformis), and YPD medium for fungi (*C. albicans* and *S. cerevisiae*). Subsequently, constant temperature shakers were used for subculture. (For bacteria, it should be shaken at 37 °C for 8-12 h, while for fungi, it should be shaken at 30 ℃ for 8 ~ 12 h). The microorganisms were collected by centrifugation at 7100 rpm for 3 min, washed twice with 1 × PBS, and then resuspended in 1 × PBS. The bacterial solution was diluted so that its optical density at 600 nm was 1.0 (OD_{600}=1.0).

Fluorescence Spectrum Measurements

Different volumes of TPE stock solution were added to 100 μL bacterial solution (OD_{600}=1.0), then the total volume was supplemented to 500 μL with 1 × PBS, and the final concentrations of TPEs were 5, 10, 25, 50, 75 and 100 μM, respectively. Incubated at the appropriate temperature (37 °C for bacteria and 30 °C for fungi) for 30 min. The control group was a TPE dilution without the addition of bacterial solution and at the same concentration. The fluorescence spectra of the solutions were then tested under 330 nm excitation by Hitachi F-4500 fluorometer equipped with a xenon lamp excitation source.

Fluorescence Imaging Measurements

TPEs were first added to the microbial suspension (final concentration was 5 μM) and

the samples were incubated for 30 min. Microbiological suspensions were centrifuged (10000 rpm, 10 min) to remove the supernatant and then added 10 μL sterile 1 × PBS (10 mM, pH = 7.4) to mix evenly. Dripped 5 μL suspended liquid to the slide and slowly covered the coverslips, which was placed under a fluorescence microscope for observation. Fluorescence imaging images of microorganisms were captured and collected using a Nikon Ti2-U inverted fluorescence microscope.

Experimental Procedure for Pathogen Identification

Mixed different volumes of TPE reserve solution with 100 μL of bacterial solution (OD_{600}=1.0), then added the 1 × PBS with the final volume of 500 μL. Incubated at the appropriate temperature (37 ℃ for bacteria and 30 ℃ for fungi) for 30 min, then transferred to the black 96-well plate. All the fluorescence intensities were recorded on a microplate reader with λ_{ex}=330 nm and λ_{em}=461 nm. The control group was TPE solution without microbes under the same treatment conditions. The relative fluorescence intensity of TPEs before and after incubation with microorganisms, namely $(I-I_0)/I_0$, were calculated by Microsoft Excel, where I is the fluorescence intensity of TPE after adding microbes, and I_0 was the fluorescence intensity of TPE alone. The obtained relative fluorescence intensity $(I-I_0)/I_0$ could be converted into a 2D canonical score plot by IBM SPSS Statistics 22 software, showing the identification results of many kinds of microorganisms.

Table S1. Table of zeta potential changes of microorganisms before and after binding with different concentrations of TPEs (5 μM, 10 μM)

Concentration of TPEs	Samples	Zeta potentials (ζ, mV)
	Amp^r *E. coli*	-42.0 ± 1.0
5 μM	Amp^r *E. coli* + TTAPE	-42.7 ± 0.8
	Amp^r *E. coli* + Z-TPE-9	-45.5 ± 1.1
	Amp^r *E. coli* + E-TPE-9	-40.9 ± 0.3
10 μM	Amp^r *E. coli* + TTAPE	-39.6 ± 1.1
	Amp^r *E. coli* + Z-TPE-9	-40.1 ± 0.3
	Amp^r *E. coli* + E-TPE-9	-41.0 ± 0.2
	S. aureus	-32.5 ± 1.4
5 μM	*S. aureus* + TTAPE	-31.8 ± 3.2
	S. aureus + Z-TPE-9	-24.2 ± 0.0
	S. aureus + E-TPE-9	-28.7 ± 1.0
10 μM	*S. aureus* + TTAPE	-27.9 ± 0.1
	S. aureus + Z-TPE-9	-26.9 ± 1.7
	S. aureus + E-TPE-9	-26.4 ± 2.2
	C. albicans	-23.5 ± 1.4
5 μM	*C. albicans* + TTAPE	-22.4 ± 1.2
	C. albicans + Z-TPE-9	-22.7 ± 0.5
	C. albicans + E-TPE-9	-22.9 ± 0.1
10 μM	*C. albicans* + TTAPE	-20.0 ± 0.5
	C. albicans + Z-TPE-9	-21.5 ± 0.5
	C. albicans + E-TPE-9	-21.9 ± 0.9

λ_{em}=461 nm.)

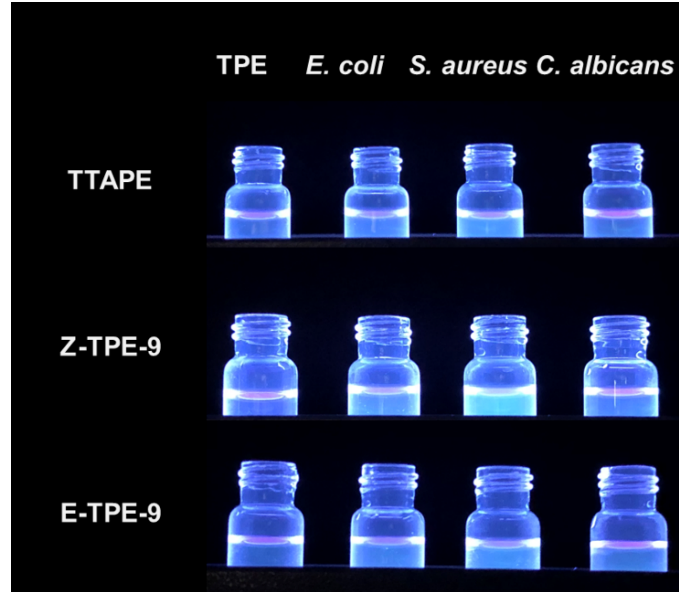

Figure S1. Photographs of the three TPE materials and different microorganisms before and after incubation under UV lamp (TPE material concentration was 50 µM).

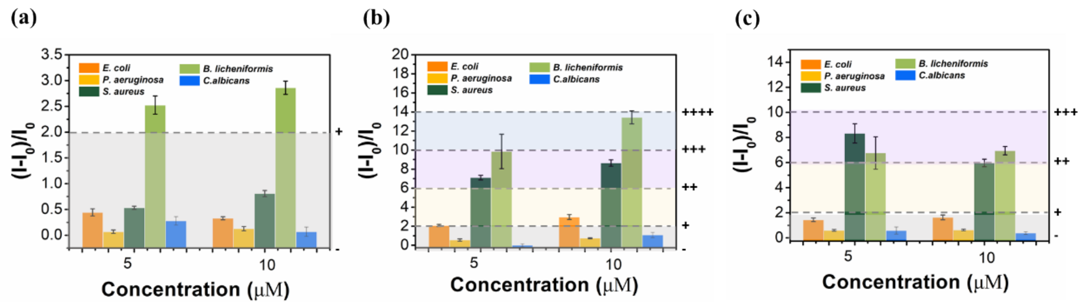

Figure S2. Histogram of fluorescence ratios of 5 µM and 10 µM (a) TTAPE, (b) Z-TPE-9 and (c) E-TPE-9 incubated with Amp^r *E. coli*, *P. aeruginosa, S. aureus*, *B. licheniformis*, *C. albicans* and *S. cerevisiae*, respectively. (Where I is the fluorescence intensity value of TPE materials combined with microorganisms at 461 nm, I_0 is the fluorescence intensity value of TPE itself at the same concentration. λ_{ex}=330 nm, λ_{em}=461 nm.)

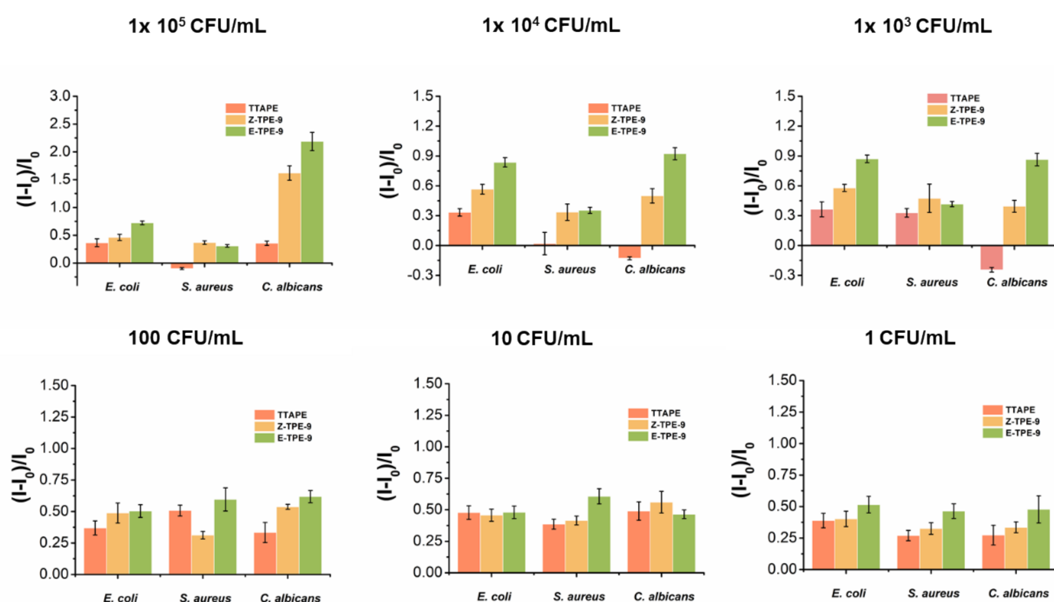

Figure S3. Fluorescence response of TPE after the addition of microbes (1 ~ 1×10^5 CFU/mL). Each value was the average of eight independent measurements, error bar shows the standard deviation of these measurements. λ_{ex}=330 nm, λ_{em}=461 nm. I_0 and I are the fluorescence intensity of TPE in the absence and presence of microbes.

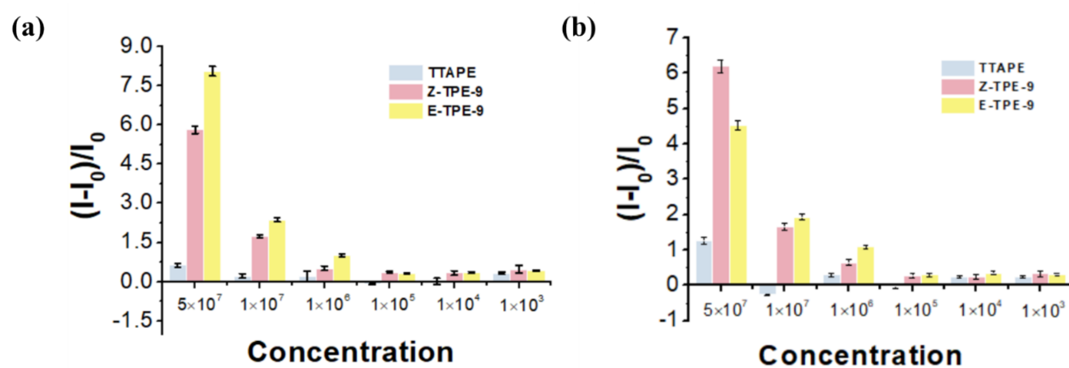

Figure S4. Fluorescence response patterns of different concentrations of *S. aureus* by (a)5 µM or (b) 10 µM TTAPE, Z-TPE-9 and E-TPE-9, respectively.

REFERENCES

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