Electronic supporting information

Fluorescence Detection of Trace PCB101

Based on PITC Immobilized on Porous AAO Membrane

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Part S1. Quantum analysis of control experiments

According to the experiments, fluorescent membrane obtained by this method shows similar fluorescence intensity to that obtained by titrating a drop of (A very common one-off plastic burette was used in all titrating experiments. \(v=0.030\text{ ml}\)) \(10^{-5}\text{ mol/L PITC/n-hexane solution onto the AAO template after n-hexane completely evaporated. If the PITC molecules titrated onto the AAO surface are supposed to be homogenously distributed and have the same fluorescence quantum efficiency with those on the PITC@AAO membrane, the number of fluorescent molecules irritated by the light source can be approximately calculated. The area of porous AAO membrane is } 2.54 \text{ cm}^2 \text{ (diameter}=1.8 \text{ cm}). \text{ As PITC is homogenously distributed, the number of fluorescent molecules irradiated by the light source can be calculated by } \\
(10^{-5}\text{ mol/L} \times 0.028\text{ml}/\text{2.54cm}^2) \times S \\
(S \text{ is the area irradiated by the light source}).\text{ In order to compare the sensitivity of PITC in the membrane and the solution effectively, the concentration of PCB101 solution used for titration must meet demand as } \\
\frac{C_1 \times 2.54cm^2}{0.028ml \times 10^{-5} \text{ mol/L} \times S} = \frac{C_2}{C \times 1cm \times S} \\
\text{where } C, C_1 \text{ and } C_2 \text{ are the concentrations of PITC solution used, PCB101 titrated to the membrane, and PCB101 in 1.5 ml PITC solution respectively. The light pathway length through the cuvette is 1 cm. Here, PITC concentration of } C=1.1 \times 10^{-5}\text{ mol/L was applied, and } C_1 \text{ and } C_2 \text{ were 0.1 ppm and 1 ppm respectively.}

Part S2. Emission mechanism of PITC

To illuminate the enhancement mechanism, it is necessary to study the emission mechanism of PITC. The following experiment was carried out: PITC and 3-aminopropyltriethoxysilane was mixed in 1:1 stoichiometry in ethanol. The reaction occurred according to the following equation.
As the reaction going on, –NCS (the phenyl electron-donating group) on PITC, disappeared and the emission of PITC was quenched as a result of reduced electron potential. This could attest that PITC emission band around 350 nm might be the result of π⁺-π or π⁺-n transition of the π-conjugate system. Moreover, the emission of PITC would be red-shifted in solvent of increased polarity, the character of π⁺-π transition, thus PITC emission is determined to be π⁺-π transition in nature (Fig. S3).

**Fig. S1-S5**

![Fluorescence spectra of PITC@AAO membrane with different PITC concentrations. (λ<sub>ex</sub>=300 nm)](image-url)
**Fig. S2** Fluorescence spectra of (A) PITC@AAO membrane and (B) $1.1 \times 10^{-5}$ mol/L PITC/n-hexane solution titrated with 0.1 ppm and 1 ppm 3,3',4,4'-tetrachlorobiphenyl (PCB77), 2,3,3'-trichlorobiphenyl (PCB20), hexachlorobenzene (HB), pentachlorophenol (PCP) and PCB101 respectively. ($\lambda_{ex}=300$ nm)

**Fig. S3** Fluorescence spectra of $10^{-5}$ mol/L PITC in n-hexane and chloroform respectively. ($\lambda_{ex}=300$ nm)
Fig. S4 (A) Fluorescence spectra of 1.1×10⁻⁵ mol/L PITC/n-hexane solution, titrated with PCB101 (λ<sub>ex</sub>=300 nm). (B) The first and (C) second derivatives of PITC fluorescence spectra before and after being titrated with 1 ppm PCB101. (λ<sub>ex</sub>=300 nm)

Fig. S5 Structures of PCB101 and organochlorine analogs used.