Supporting Information (SI)

From inorganic precipitation to organic aggregation: K_{sp} -mediated Specific Metal-ion Lighting-up Using a Triazolium Iodide Organic Fluorescence Tag

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- A. Synthesis and Characterization
- *Synthesis of TPEO-alkyne (3), TPEO-Ph (5)* Compound 5 and 6 were prepared according to the reported methods.¹
- 2 Synthesis of AIETOI (1a)

Into a 50 mL two-necked round-bottom flask was added **5** (0.2 g, 0.37 mmol). After being evacuated and refilled with nitrogen three times, ACN (10 mL) was injected followed by dropwise addition of MeI (0.22 mL, 3.7 mmol). The reaction mixture was stirred at 60 °C for 3 days, and then the crude product **1a** was purified by a silica-gel column using a dichloromethane–acetonitrile mixture (10:1, v/v). Pale yellow solid was obtained in a yield of 92.9%. ¹H NMR (400 MHz, CDCl₃): δ (ppm) 3.41 (t, 2H), 4.35 (s, 3H), 4.98 (t, 2H), 5.38 (s, 2H), 6.68 (d, 2H), 6.99-7.05 (m, 6H), 7.10-7.15 (m, 7H), 7.25-7.34 (m, 9H), 9.30(s, 1H). ¹³C NMR (400 MHz, DMSO-*d*₆) δ (ppm): 34.97, 38.82, 54.55, 58.50, 114.67, 126.93, 127.52, 128.39, 129.10, 130.33, 136.66, 139.86, 140.30, 143.73, and 155.98. ESI (+)-MS: calcd. For C₃₈H₃₄N₃O⁺ 548.2702 [M⁺]; found 548.2698 [M⁺].



Schme S1. Synthesis of AIETOBF

3 Synthesis of AIETOBF

Under nitrogen, a solution of **5** (266.5 mg, 0.5 mmol) and trimethyloxonium tetrafluoroborate (370 mg, 2.5 mmol) in 25 mL dichloromethane was stirred at room temperature overnight. Water (10 mL) was added to quench the alkylating agent. After continuous extraction with dichloromethane, the organic layer solvent was removed in vacuo. The oily residue was then resolved by a small amount of dichloromethane and acetonitrile was purified by column chromatography (CH₂Cl₂/ACN = 1/2) .The yellow precipitate was obtained, and then filtered and dried to get the title compound. Yielded 80%. ¹H NMR (400MHz, DMSO-*d*₆): δ (ppm) 3.26 (t, 2H), 4.26 (s, 3H), 4.90 (t, 2H), 5.37 (s, 2H), 6.84 (d, 2H), 6.86-6.97 (m, 8H), 7.13-7.15 (m, 9H), 7.23-7.30 (m, 5H), 8.94(s, 1H). ¹³C NMR (400 MHz, DMSO-*d*₆) δ (TMS, ppm): 34.97, 38.75, 54.53, 58.44, 114.66, 126.93, 127.03, 128.39, 129.19, 130.32, 132.54, 136.66, 137.38, 139.86, 140.31, 143.73, 143.81, 155.98. ESI (+)-MS: calcd. for C₃₈H₃₄N₃O⁺ 548.2702 [M⁺]; found 548.2766 [M⁺].





Fig.S1. ¹H NMR of AIETOI in CDCl₃.



Fig.S3 Mass spectra of AIETOI.



Fig.S4 UV-Vis absorption spectrum of AIEOTI



Fig.S5 Photostability of AIETOI upon Ag^+/Hg^{2+} binding under continuous UV light irradiation.



Fig.S6 Effect of pH on the fluorescence intensity of AIETOI towards Ag⁺ and Hg²⁺.



Fig.S7 Effect of ionic strength on the fluorescence intensity of AIETOI towards Ag⁺



Fig.S8 Plot of PL intensity of AIETOI with increase of [Ag⁺] and [Hg²⁺]



Fig.S9 PL intensity of AIETOI with different ratios of Ag⁺/Hg²⁺





Fig.S12 Mass spectra of AIETOBF



Fig.S13 Fluorescence spectral change of AIETOBF (40 μ M) when treated with 0.1 equiv of each metal ion.



Fig.S14 Fluorescence spectral change of AIETOI-Ag when treated with different concentration of Na_2S .

Table S1

Compounds	K _{sp}	Temperature (°C)
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Agl ²	8.28 X 10 ⁻¹⁷	25
Hgl ₂	2.9 X 10 ⁻²⁹	25
Pbl ₂	9.3×10 ⁻⁹	25
HgS	4 X 10 ⁻⁵³	25
Ag ₂ S	6.3 X 10 ⁻⁵⁰	25

- 1. L. F. Zhang, W. P. Hu, L. P. Yu and Y. Wang, *Chem. Commun.*, 2015, **51**, 4298-4301.
- 2. Z. C. H. Tan, R. C. Vought and R. B. Pontius, *Anal. Chem.*, 1972, **44**, 411-413.