Support Information

for

Facile preparation of a hydrophilic Eu-based ratiometric fluorescence nanosensor for Cu^{2+} ion detection and living cells imaging

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Fig. S1 H NMR spectrum of PAAC-Eu in DMSO-d_6/D_2O/HCl

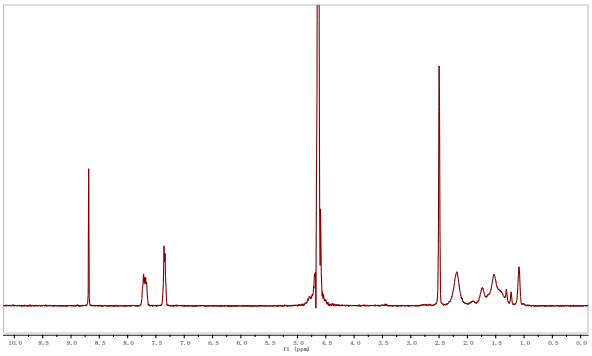

Fig. S2 (a) XRD analysis of PAAC-Eu, PAA, EuCl3•6H2O and CCAH, respectively. (b) TEM images of PAAC-Eu.

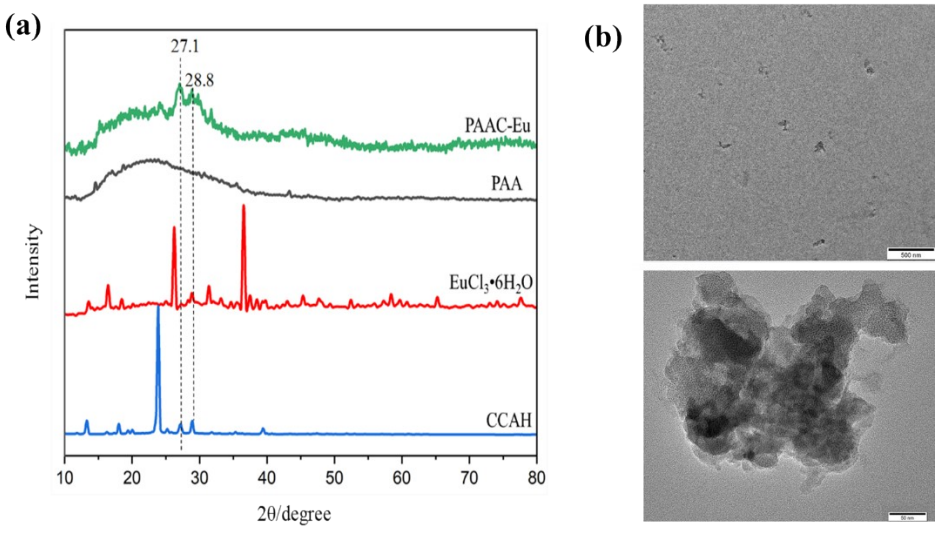

Fig. S3 TG analysis of PAAC-Eu.

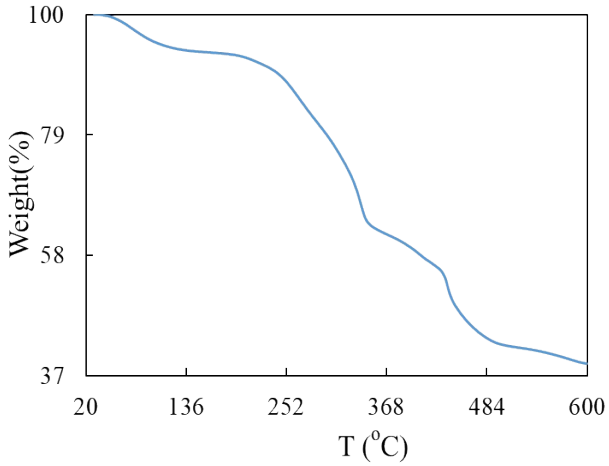

Fig. S4 Fluorescence spectra of PAAC-Eu (---) and CCAH (—) in HEPES buffer solution (pH 7.4) under the excitation wavelength of 350 nm.

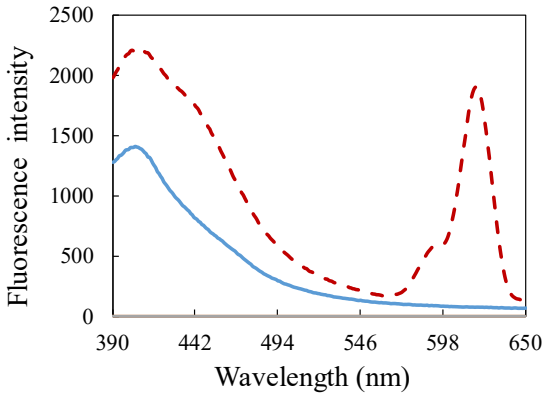

Fig. S5 The effects of pH values on PAAC-Eu luminescence at 406 nm and 618 nm, respectively. (λ_{ex}=350 nm)

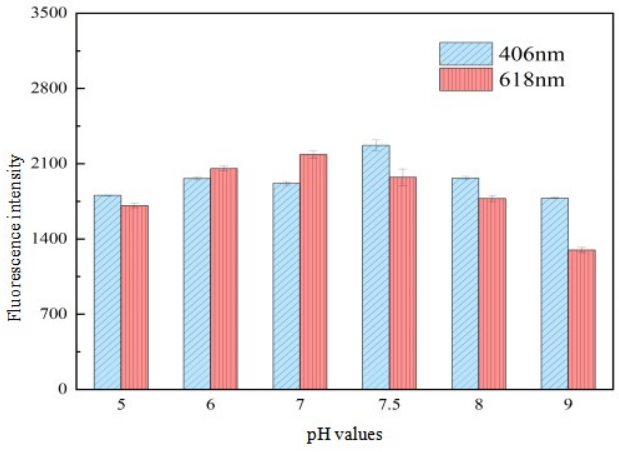

Fig. S6 The fluorescence intensities ratios of PAAC-Eu at 406 nm and 618 nm in pH 7.4 of aqueous solution upon continuous irradiating with a UV lamp. (λ_{ex}=350 nm)

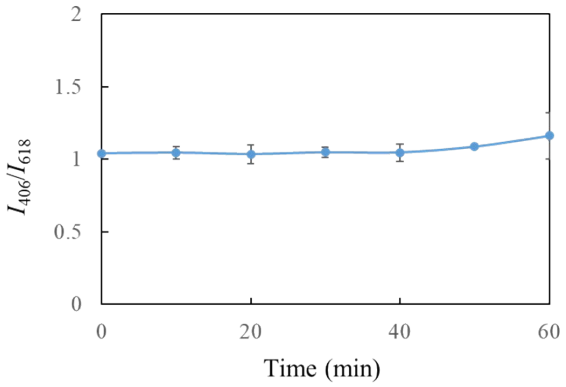

Fig. S7 The Stern-Volmer plot of PAAC-Eu in different concentrations of Cu^{2+} ion aqueous solution.

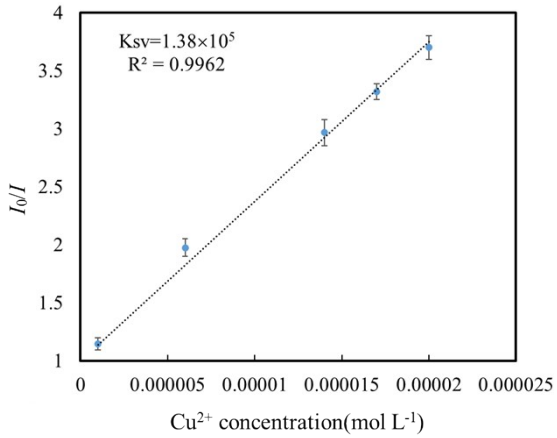

Fig. S8 The effects of pH values on Cu^{2+} detection. (λ_{ex}=350 nm)

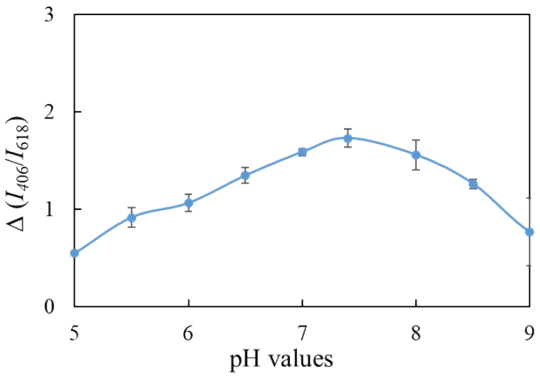

Fig. S9 The effects of reaction time on Cu^{2+} detection. (λ_{ex}=350 nm, pH 7.4)

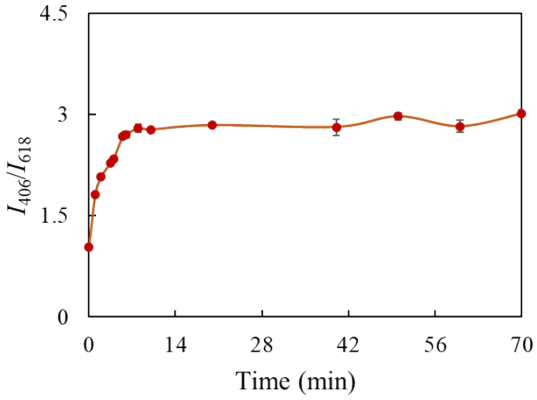

Fig. S10 Cytotoxicity of PAAC-Eu against the Hela cells.

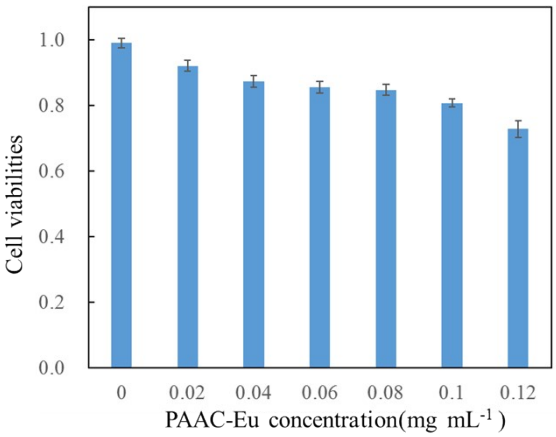

Fig. S11 XPS survey spectrum of PAAC-Eu-Cu (a), the high-resolution spectra for Cu(II) 2p for PAAC-Eu-Cu(b) and PAAC-Eu(c) and the high-resolution spectra for Eu(III) 3d(d), C1s (e) and O1s (f) of PAAC-Eu-Cu, reapectively.

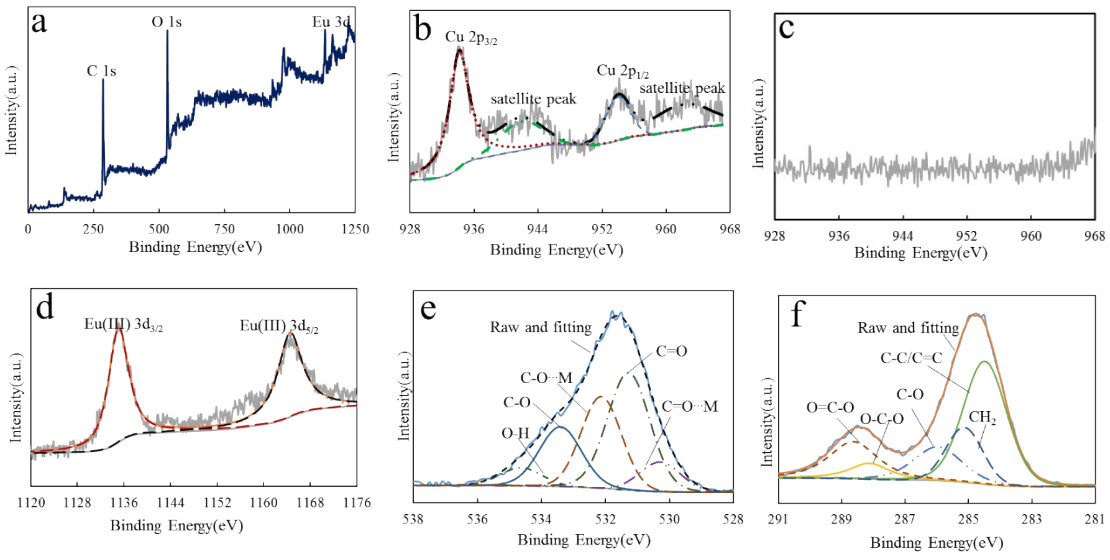

Fig. S12 UV-Vis absorbance spectra of PAAC-Eu solution containing the different amounts of Cu^{2+}.

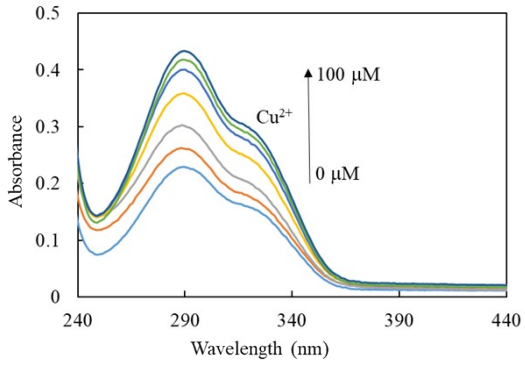

Fig. S13 FTIR spectra of PAAC-Eu(—) and PAAC-Eu-Cu (------) by KBr method, respectively.

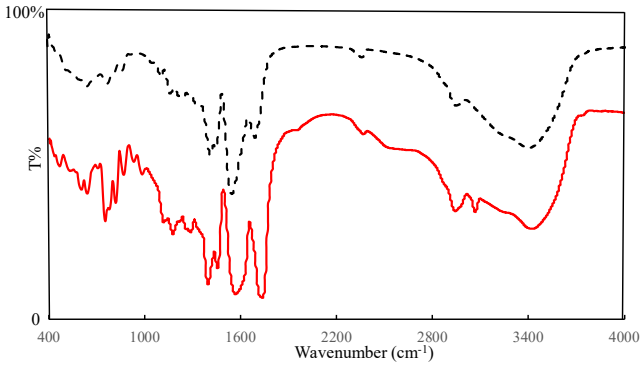

Fig. S14 The "on-off-on" phenomenon of PAAC-Eu fluorescence upon the alternate additions of Cu^{2+} and EDTA. (λ_{ex}=350 nm)

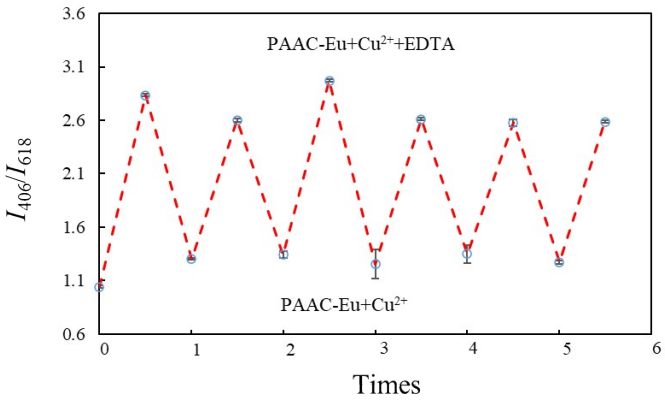

Table S1 Comparison of PAAC-Eu with several reported Eu-based fluorescence sensors for Cu^{2+} detection

Sensor	Preparation	Detection mode	Detection media	Linear range	DL	Ref.
Eu^{3+}-BHHCT-BPED	(1) Prepared 4,40-bis (100,100, 100,200,200,300,300-heptafluoro-400,600-hexanedione-600-yl)-chlorosulfo-terphenyl (BHHCT) dipicolylamine (DPA)-containing N,N-bis(2-pyridyl methyl)ethanediamine (BPED); (2) Synthesis of BHHCT–BPED at room temperature in dark for 5 days, and then cooridation with europium(III) for 24 h.	Fluorescence quenching	Borate buffer (0.05 M, pH 7.4, 0.1% CTAB	0.01-0.1 μM	3.7 nM	19
$[Eu_2(MTBC)(OH)_2(DMF)_3(H_2O)_4]\cdot 2DMF\cdot 7H_2O$	Solvothermal method in DMF at 100 °C for 12 h with $Eu(CH_3COO)_3$, and 4′,4′,4′,4′-methanetetrayltetrakis-[1,1′-biphenyl]-4-carboxylic acid (H4MTBC) as precursors	Fluorescence quenching	DMF:H_2O (1:1, v/v)	0-500 mg L^{-1}	17.2 μg L^{-1}	20
CPMFs	Hydrothermal method at 160 °C temperature for 8 hours using 3,5-dinitrosalicylic acid (DNSA), Eu^{3+}) as precursors	Fluorescence quenching	CH_3OH:H_2O (3 : 1), pH 7.03	2-12 μM.	1.42 μM	21
Eu^{3+}@CAU-11	CAU-11 was synthesized at 150 °C for 12 h using $AlCl_3\cdot 6H_2O$ and 4, 4′-sulfonyldibenzoic acid as precursors, and then stirred with Eu^{3+} for 24 h at room temperature	Fluorescence ratiometric	DMF	0.05-10 mM	6.2 μM	22
Eu-PUF-1.5	One-step co-polycondensation reaction	Fluorescence quenching	Water	-	0.28 μM	23
Colloidal $GdVO_4$:Eu^{3+}@SiO_2 nanocrystals	Colloidal $GdVO_4$:Eu^{3+} NCs was synthesized at 120 °C for 12 h using $Gd(NO_3)_3$, $Eu(NO_3)_3$, Na_3VO_4 and PAA as precursors in ethylene glycol/water, and then encapsulated with a uniform layer of ultrathin silica through a sol-gel strategy.	Fluorescence quenching	Water	1-20 μM	80 nM	24
EuW10/TMAB Composite	EuW10 and TMAB mixed solution was incubated for 1 day at 20.0 ±0.1 °C	Fluorescence quenching	Aqueous solution	0.2−1.0 μM	0.15 μM	25
FNP($SDC_{0.05}SDS_{0.95}$-LEuH-DPA)	Cl-LEuH was synthesized by a hydrothermal method at 90 °C for 12 h; and then SDC/SDS-LEuH was prepare by the ion-exchange method; Then $SDC_{0.05}SDS_{0.95}$-LEuH was exfoliated into monolayer nanosheets, which was mixed with DPA.	Fluorescence ratiometric	water–formamide	100 -1000 μM	4.91 μM	26
PAAC-Eu	One-pot coordination reaction of Eu^{3+} with commercially available poly(acrylic acid) and coumarin-3-carboxylic acid at room temperature for 2h.	Fluorescence ratiometric	pH 7.4 of HEPES buffer solution	0−20.0 μM	0.175 μM	This work