Supporting Information

for

Metal-organic coordination polymers of $Tb_{2-x}Eu_x(BDC)_3(H_2O)_n$ with tunable fluorescence and smart response toward aldehydes ($0 \le x \le 2$, BDC=1,4-benzenedicarboxylate)

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1. Chemicals and Instrumentation

1.1 Chemicals. $Tb(NO_3)_3 \cdot 5H_2O$ and $Eu(NO_3)_3 \cdot 5H_2O$ were purchased from Aldrich. Na_2BDC (BDC=1,4-benzenedicarboxylate) was purchased from TCI Shanghai. Cetyltrimethyl ammonium bromide (CTAB) and acetaldehyde were purchased from Chengdu Kelong Chemical Reagent Company. Formaldehyde, propionaldehyde, methanol, ethanol, N,N-dimethylformamide, dimethyl sulfoxide, and tetrahydrofuran were all purchased from Chongqing Chuandong Chemical (Group) Co., Ltd. All chemicals were of analytical grade. Millipore purified water (18.2 MΩ) was used throughout.

1.2 Instrumentation. The fluorescence spectra were measured on a Hitachi F-2500 spectrophotometer (Tokyo, Japan). And the scanning electron microscope (SEM) images were observed with a Hitachi S-4800 scanning electron microscope (Tokyo, Japan). AL204 analytical balance was purchased from METTLER TOLEDO. H1650-W centrifuge was purchased from Xiangyi Centrifuge Instrument Co., Ltd. (Changsha, China). DZF-6020 vacuum drying box was purchased from Shanghai Qixin Scientific Instrument Co., Ltd. (Shanghai, China). KXH202-1AB constant temperature drying box was made by Shanghai science analysis test instrumentation factory and

Chengdu science analysis test set company. A QL-901 vortex mixer (Qilinbeier instrument manufacture Ltd., Haimen, China) was used to blend the solutions. Powder X-ray diffraction patterns were collected on an XD-3 X-ray diffractometer (Beijng, China).

2. Methods

2.1 Procedures for Fluorescence detection of aldehydes.

A certain amount of $Ln_2(BDC)_3(H_2O)_n$ (Ln = Tb, Eu) was dispersed in doubly distilled water, named Solution A for further use. 50 μL Solution A and a certain volume of the aldehyde solution were mixed together. The mixture was then diluted to 500 μL with doubly distilled water and mixed thoroughly again. Afterwards, the mixture was transferred for fluorescence measurements.

2.2 Calibration of the concentration of aldehydes

2.2.1 Calibration of the concentration of formaldehyde

According to the method in the environmental protection standard HJ601-2011 of the People's Republic of China for determination of formaldehyde in water, the concentration of formaldehyde used in this work was calibrated to 0.94 mol/L.

2.2.2 Calibration of the concentration of acetaldehyde

According to GBZ/T 160.54-2007, the concentration of acetaldehyde used in this work was calibrated to 0.905 mol/L.

3. Supporting figures

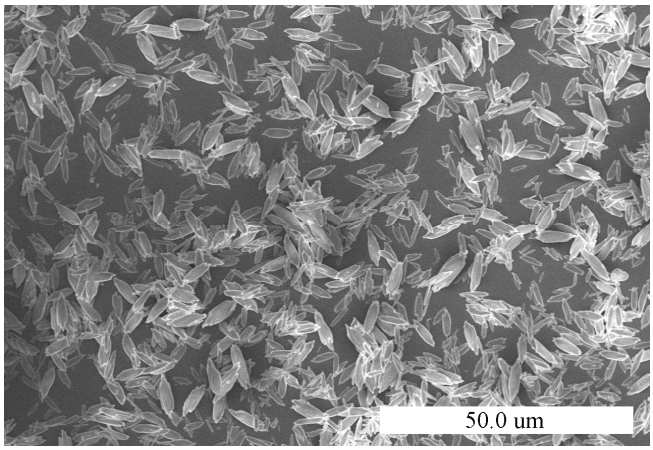

Fig. S1 SEM images of $Eu_2(BDC)_3(H_2O)_n$ particles.

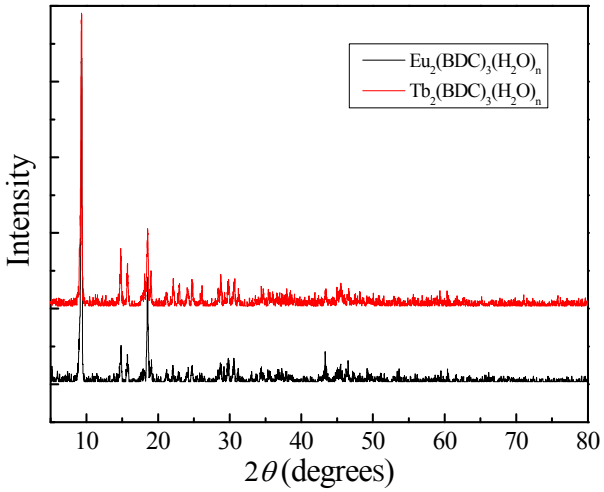

Fig. S2 Powder X-ray diffraction pattern of the $Ln_2(BDC)_3(H_2O)_n$ polymers (Ln = Tb, Eu).

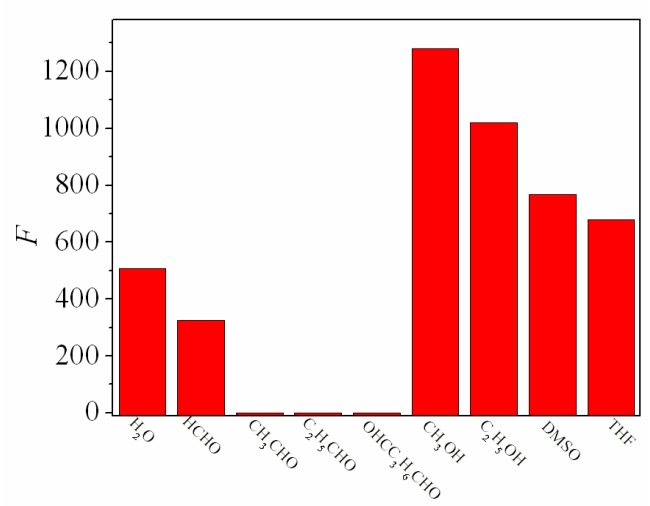

Fig. S3 The emission intensity of the $Eu_2(BDC)_3(H_2O)_n$ polymers at 615 nm in the presence of a succession of organic reagents.

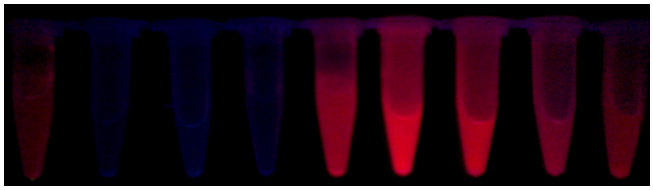

Fig. S4 $Eu_2(BDC)_3(H_2O)_n$ polymers redispersed in different analytes (excitated at 254 nm and monitored at 615 nm). From left to right were HCHO, CH_3CHO, C_2H_5CHO, $OHCC_3H_6CHO$, H_2O, CH_3OH, C_2H_5OH, DMSO, and THF.

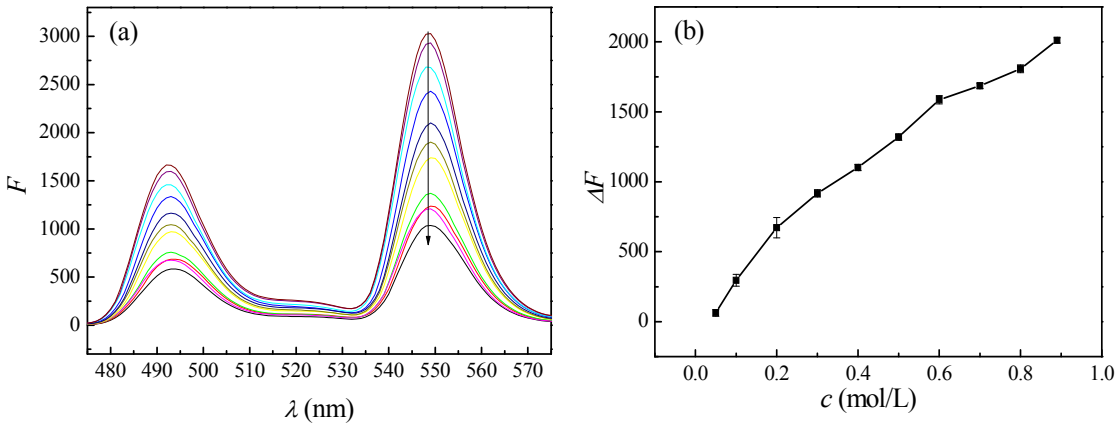

Fig. S5 The effects of formaldehyde on the fluorescence of $Tb_2(BDC)_3(H_2O)_n$. (a) The fluorescence spectral changes of $Tb_2(BDC)_3(H_2O)_n$ in the presence of different amounts of formaldehyde; (b) The plot of the quenching degree of the fluorescence at 549 nm against the concentration of formaldehyde. λ_{ex} = 254 nm, λ_{em} = 549 nm, $c_{formaldehyde}$, from top to bottom, 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 mol/L.

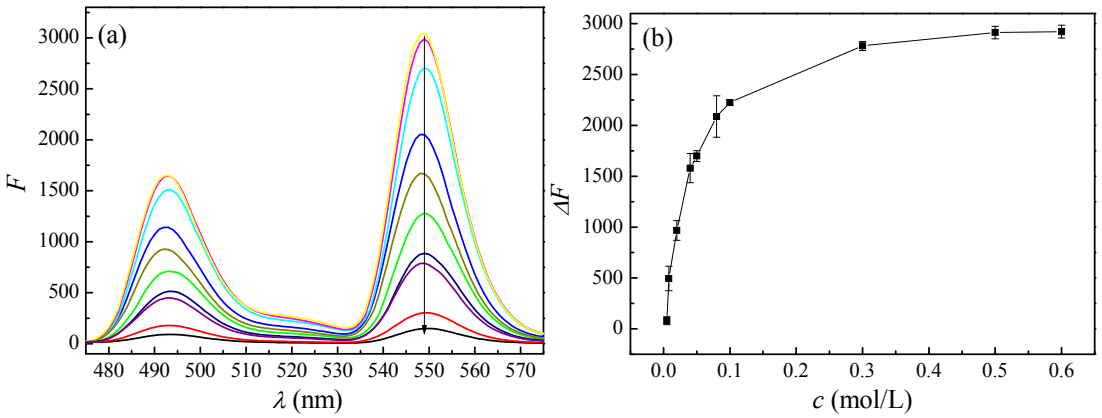

Fig. S6 The effects of acetaldehyde on the fluorescence of $Tb_2(BDC)_3(H_2O)_n$. (a) The fluorescence spectral changes of $Tb_2(BDC)_3(H_2O)_n$ in the presence of different amounts of acetaldehyde; (b) The plot of the quenching degree of the fluorescence at 549 nm against the concentration of acetaldehyde. λ_{ex} = 254 nm, λ_{em} = 549 nm, $c_{acetaldehyde}$, from top to bottom, 0, 0.005, 0.008, 0.02, 0.04, 0.05, 0.08, 0.1, 0.3, 0.5 and 0.6 mol/L.

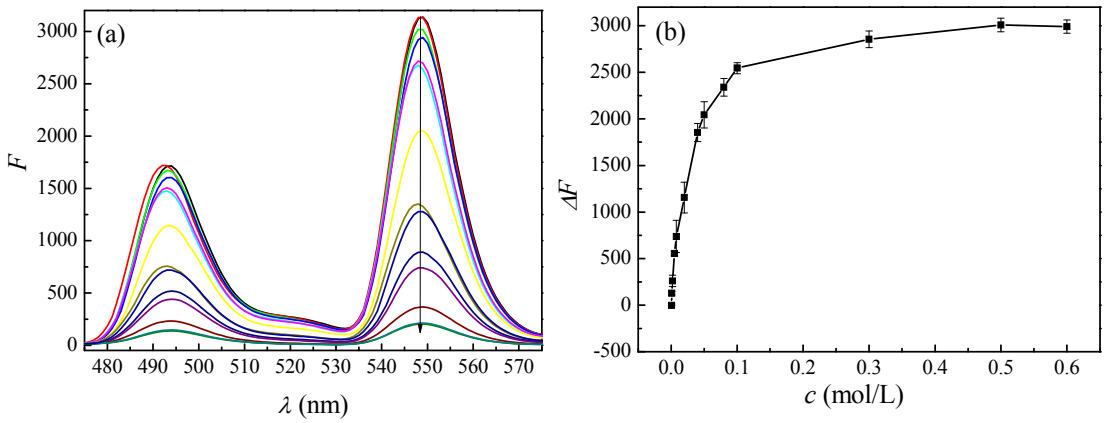

Fig. S7 The effects of propionaldehyde on the fluorescence of $Tb_2(BDC)_3(H_2O)_n$. (a) The fluorescence spectral changes of $Tb_2(BDC)_3(H_2O)_n$ in the presence of different amounts of propionaldehyde; (b) The plot of the quenching degree of the fluorescence at 549 nm against the concentration of propionaldehyde. λ_{ex} = 254 nm, λ_{em} = 549 nm, $c_{propionaldehyde}$, from top to bottom, 0, 0.0005, 0.001, 0002, 0.005, 0.008, 0.02, 0.04, 0.05, 0.08, 0.1, 0.3, 0.5, 0.6 mol/L.