

## Supplementary Information

# Luminescence Emission -Modulated based on specific two-photon compound of triazole- conjugated pyrene derivative

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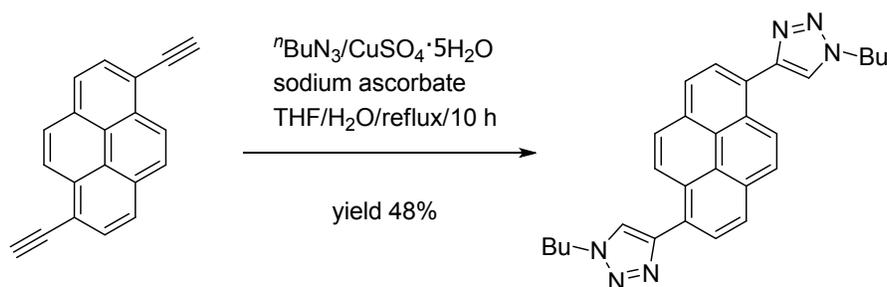
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## 1. Synthesis of 1,6-di(1-butyl-1*H*-1,2,3-triazol-4-yl)pyrene (DTP).

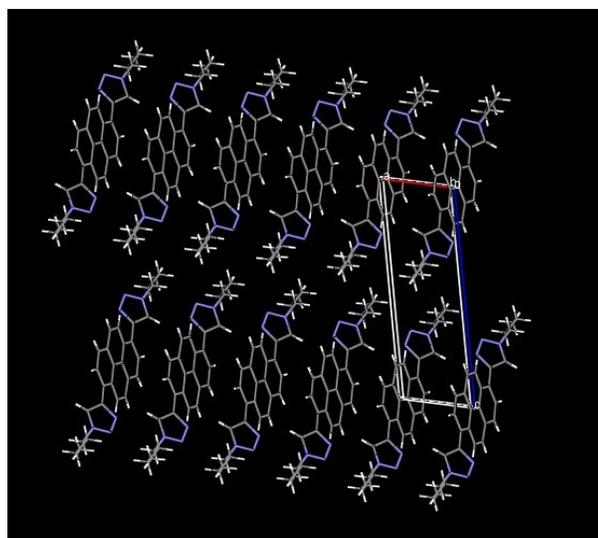


**Scheme S1** Synthesis of DTP via CuAAC reaction.

The solution of THF (5 mL) and H<sub>2</sub>O (2 mL) were added a flask of 58 mg of 1,6-diethynylpyrene (0.232 mmol), 92 mg of  $n\text{BuN}_3$  (0.93 mmol), 9 mg of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  (0.036 mmol) and 14 mg of sodium ascorbate (0.071 mmol) under N<sub>2</sub> atmosphere. The mixture was heated to 70 °C with vigorous stirring for 12 h. Then the solution was extracted with CH<sub>2</sub>Cl<sub>2</sub>, and the combined organic phase was dried with anhydrous MgSO<sub>4</sub>. After the solvent was removed, the residue was purified by column chromatography on a silica gel using CH<sub>2</sub>Cl<sub>2</sub>/EtOAc (v/v) 10:1 as eluent. The product was obtained as yellowish solid (50 mg, 48% yield). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  8.73 (d,  $J$  = 5.6 Hz, 2H), 8.25 (m, 4H), 8.13 (d,  $J$  = 5.6 Hz, 2H), 7.96 (s, 2H), 4.55 (t,  $J$  = 3.6 Hz, 4H), 2.06 (m, 4H), 1.51 (m, 4H), 1.04 (t,  $J$  = 5.4 Hz, 6H). EI-MS:  $m/z$  calcd for C<sub>28</sub>H<sub>28</sub>N<sub>6</sub> 448.2, found 488. EI-HRMS: calcd 448.2375 for C<sub>28</sub>H<sub>28</sub>N<sub>6</sub>, found 448.2380.

## 2. Single crystal X-ray diffraction data of DTP

Single crystal of DTP was prepared by slow diffusion of toluene to the THF solution at room temperature. The diffraction experiments were carried out on a Bruker SMART CCD diffractometer equipped with a graphite-monochromated Mo-K $\alpha$  radiation ( $\lambda$  = 0.71073 Å). The data were collected at 173(2) K. Empirical absorption correlations were applied automatically. The structure was solved with direct method and refined with a full-matrix least-squares technique using the SHELXL-97 program. The space group was determined from the systematic absence and its correctness was confirmed by successful solution and refinement of structure. Anisotropic thermal parameters were refined for all the non-hydrogen atoms. The hydrogen atoms were added in idealized position and refined with isotropic displacement. Crystal data refinement conditions and experimental details were tabulated in Table. S1.

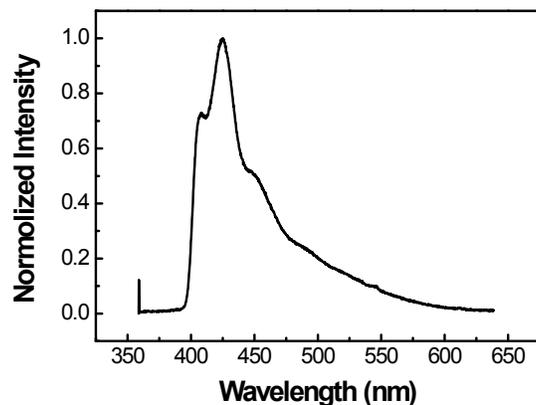


**Figure S1** Molecular packing mode in the ac plane of the DTP crystal.

**Table. S1** Crystal data and structure refinement for DTP

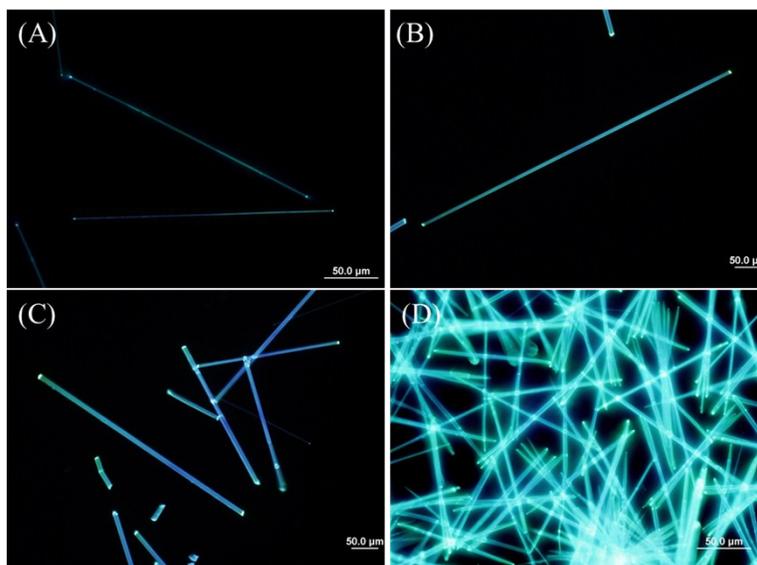
Identification code	DTP
Empirical formula	C <sub>28</sub> H <sub>28</sub> N <sub>6</sub>
Formula weight	448.56
Temperature	173(2) K
Wavelength	0.71073 Å
Crystal system, space group	Triclinic, P-1
Unit cell dimensions	a = 5.4723(11) Å    alpha = 95.14(3) deg. b = 7.4854(15) Å    beta = 99.93(3) deg. c = 15.507(3) Å    gamma = 110.92(3) deg.
Volume	576.5(2) Å <sup>3</sup>
Z, Calculated density	1, 1.292 Mg/m <sup>3</sup>
Absorption coefficient	0.079 mm <sup>-1</sup>
F(000)	238
Crystal size	0.30 x 0.20 x 0.09 mm
Theta range for data collection	2.70 to 27.48 deg.
Limiting indices	-7<=h<=7, -9<=k<=9, -20<=l<=20
Reflections collected / unique	7497 / 2612 [R(int) = 0.0697]
Completeness to theta = 27.48	99.2 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	1.0000 and 0.4294
Refinement method	Full-matrix least-squares on F <sup>2</sup>
Data / restraints / parameters	2612 / 0 / 155
Goodness-of-fit on F <sup>2</sup>	1.077
Final R indices [I>2sigma(I)]	R1 = 0.0603, wR2 = 0.1367
R indices (all data)	R1 = 0.0752, wR2 = 0.1450
Largest diff. peak and hole	0.271d -0.225 e. Å <sup>-3</sup>

### 3. Two-photon-excited fluorescence spectra



**Figure. S2** Normalized two-photon-excited fluorescence spectra of DTP in CH<sub>2</sub>Cl<sub>2</sub>. The excited wavelength is 740 nm.

### 4. Representative PL image of DTP nanowires prepared using different anti-solvent.



**Figure. S3** Representative PL image of DTP nanowires prepared using different anti-solvent.

(A) toluene; (B) MeOH; (C) EtOH; (D) MeCN.

### 5. General characterization method of the DTP molecule and DTP nanowires

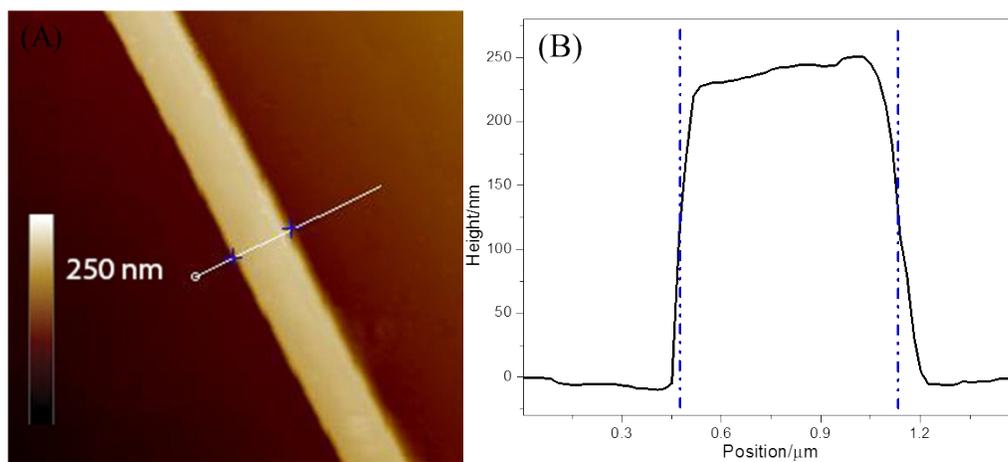
NMR spectra were recorded in the designated solvent on a Bruker Avance 400 MHz spectrometer. Spectra are reported in ppm values from residual protons of deuterated solvent for <sup>1</sup>H NMR ( $\delta$  7.26 ppm for CDCl<sub>3</sub>). MS data were obtained with a Bruker Daltonics Inc. ApexII FT-ICR mass spectrometer. 1,6-diethynylpyrene<sup>1</sup> and n-butyl azide<sup>2</sup> were prepared

according to known procedures. UV-Vis spectra were obtained using a TU-1810DSPC spectrometer of Beijing Purkinje General Instrument Co. Ltd. at room temperature in denoted solvents with a conventional 1.0 cm quartz cell.

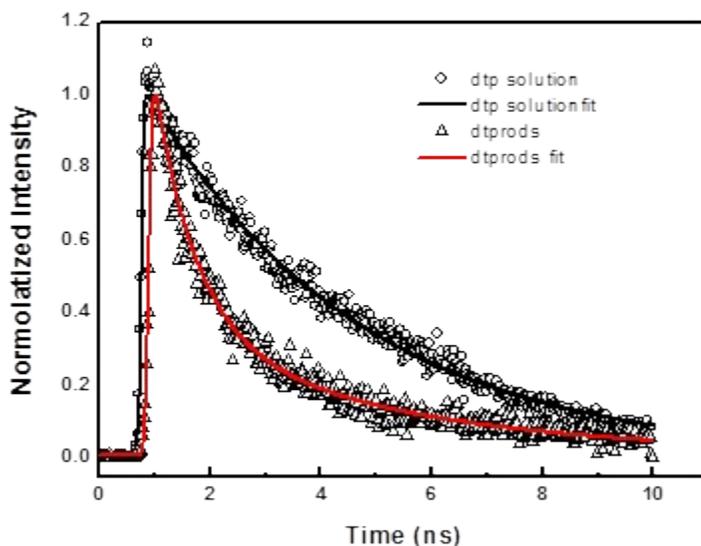
The DTP nanowires were characterized by SEM (HITACHI S-4300), TEM (Tecnai G2 F20 U-TWIN), and photoluminescence (PL) spectra (HITACHI F-4500). AFM images and cross section profiles were taken on a Bruker Peak Force QNM atom force microscopy. PL images were taken with an Olympus F-1000 inverted microscope by exciting the samples with the UV band (330-380 nm) of a mercury lamp. The XRD patterns were obtained using ESCALAB220i-XL X-ray diffraction photometer.

To measure the micro-area PL spectra of single nanowires, the nanowires on a glass substrate were excited with a focused laser ( $\lambda=408$  nm). The laser was focused down to the diffraction limit to excite the nanowire locally. A confocal microscopy setup was used to selectively collect the emission from the end of the nanowire with a 100  $\mu\text{m}$  pinhole. The excitation laser was filtered with a 400 nm short pass filter. The PL lifetimes of single wires were taken with a Hamamatsu streak camera (C5680, Hamamatsu Photonics).

TPA cross section was determined from two-photon-induced fluorescence with Rhodamine B as a reference. A regenerative amplifier (Spitfire, Spectra Physics) seeded with a mode-locked Ti:sapphire laser (Tsunami, Spectra Physics) generated laser pulses of about 120 fs at a wavelength of 795 nm, which were used to drive an optical parametric amplifier (OPA-800CF, Spectra Physics) to obtain a tunable laser in the range of ca. 690–850 nm. The laser beam was focused into a quartz cuvette having an optical path length of 10 mm. The two-photon-induced fluorescence was collected with a right-angle geometry and detected with a liquid-nitrogen-cooled charge coupled device (CCD) detector (SPEC-10-400B/LbN, Roper Scientific) attached to a polychromator (Spectropro-550i, Acton).



**Figure. S4** Atomic force microscopy image (A) and the corresponding cross section profile (B) of a single DTP nanowire.



DTP	$\Phi_f$	$\tau$	$K_f$
Solution	0.99	3.85	$2.6 \times 10^8$
Wires	0.21	1.39	$1.4 \times 10^8$

**Figure. S5** PL decay profiles of DTP single crystal nanowires at 430 nm under different pumping energies, solution in CH<sub>2</sub>Cl<sub>2</sub> (black circle) and wires (black triangle), respectively. The excitation wavelength is 400 nm. The curve of solution in CH<sub>2</sub>Cl<sub>2</sub> can be fitted by a single exponential function, giving rise to  $\tau = 3.85$  ns. The nanowire curves can be fitted by a double-exponential function, giving rise to  $\tau_1 = 0.75$  ns (67.9%) and  $\tau_2 = 4.02$  ns (22.1%) ( $\tau_{\text{average}} = 1.39$  ns )

## Reference

1. Venkataramana, G.; Sankararaman, S. *Eur. J. Org. Chem.* 2005, 4162.
2. Boyer, J. H.; Hamer, J. *J. Am. Chem. Soc.* 1955, **77**, 951.