Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Controllable growth of organic nanostructures from 0D to 1D with different optical properties

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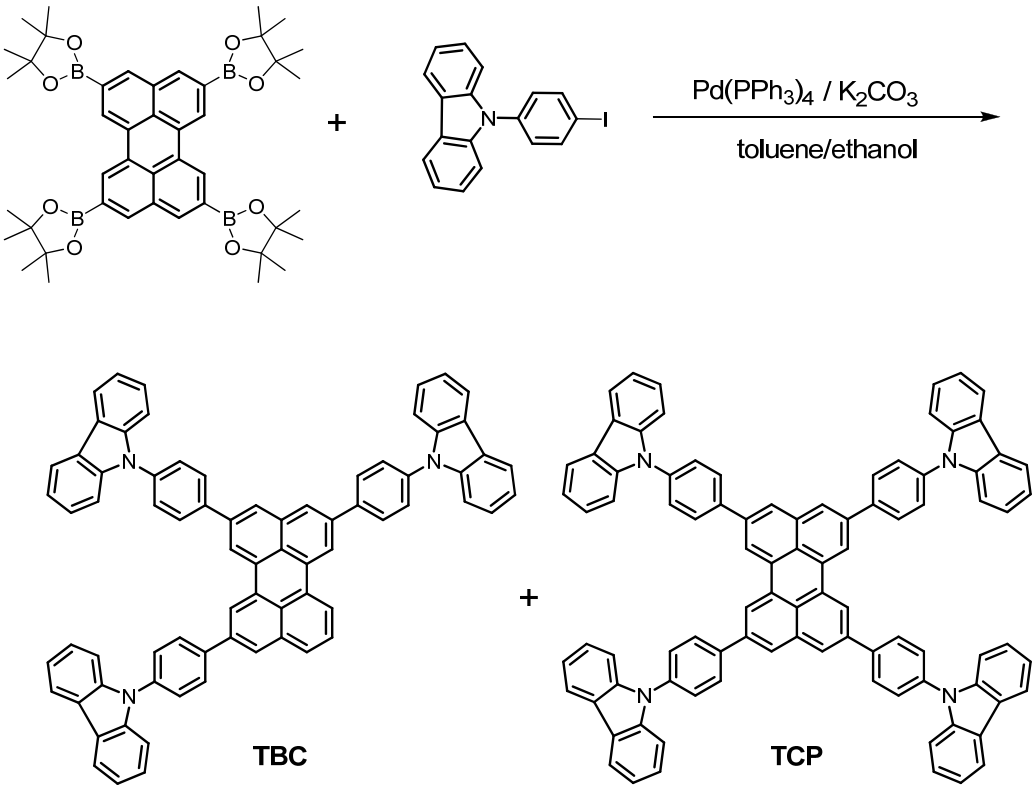


Scheme S1. Synthetic route of the target compounds **TBC** and **TCP**.

Materials

All chemical reagents were purchased from Alfa Aesar or Aldrich Chemicals and used without further purification. Column chromatography was performed on silica gel (size 200–300 mesh). 2,5,8,11-tetrakis(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)perylene (**1**)[1] and 9-(4-iodophenyl)-9H-carbazole (**2**)[2] were prepared according to the literature methods.

2,5,8,11-tetrakis(4-(9H-carbazol-9-yl)phenyl)perylene (TCP). To a solution of **1** (100 mg, 0.13 mmol) in toluene/ethanol (54 mL/ 18 mL) was added **2** (280 mg, 0.76 mmol), the resulting solution was stirred under N_2 at room temperature for 30 min. Subsequently, $Pd(PPh_3)_4$ (36 mg, 0.03 mmol) and K_2CO_3 (200mg, 1.45 mmol, dissolved in distilled water) were added and the

reaction vessel was placed in an oil bath at 70℃ for 48 h. After that, the solvent was evaporated in vacuo and the crude product was purified by column chromatography silica gel with CH_2Cl_2 / petroleum ether (1:2) to afford **TCP** as yellow solids (87 mg, 54%). IR (ν, cm^{-1}) 1601.1, 1516.5, 1478.9, 1448.6, 1355.2, 1334.2, 1313.8, 1226.0, 1169.3, 831.7, 746.1, 720.6. ^{1}H NMR (500 MHz, $CDCl_2CDCl_2$) δ 8.78 (s, 1H), 8.74 (s, 2H), 8.66 (s, 1H), 8.55 (d, *J* = 7.9 Hz, 1H), 8.31 (s, 1H), 8.24 – 8.14 (m, 8H), 8.14 – 7.98 (m, 8H), 7.93 (s, 1H), 7.91 (s, 1H), 7.84 – 7.69 (m, 8H), 7.57 (ddd, *J* = 28.3, 20.1, 8.1 Hz, 8H), 7.45 (ddd, *J* = 20.2, 13.5, 7.4 Hz, 8H), 7.37 – 7.24 (m, 8H). Due to its poor solubility, the ^{13}C NMR is not available. Hires-MS (MALDI-TOF): calcd for $C_{92}H_{56}N_4$: 1216.4505; found: 1216.4524. Anal. Calcd for $C_{92}H_{56}N_4$, C, 90.76; H, 4.64; N, 4.60; Found C, 90.79; H, 4.60; N,4.58.

9,9',9''-(perylene-2,5,8-triyltris(benzene-4,1-diyl))tris(9H-carbazole) (TBC). Compound **1** could easily loss one boric acid ester during the synthesis of compound **TCP**. Thus **TBC** was obtained as a by-product with 30 mg (yellow). IR (ν, cm^{-1}) 1602.2, 1518.2, 1479.2, 1449.8, 1336.6, 1315.3, 1228.4, 1170.8, 833.3, 747.7, 722.8. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.70 (d, J = 6.1 Hz, 2H), 8.61 (s, 1H), 8.45 (d, J = 7.6 Hz, 1H), 8.19 (t, J = 7.1 Hz, 6H), 8.13 (s, 2H), 8.12 - 8.04 (m, 7H), 7.90 (d, J = 8.2 Hz, 1H), 7.78 (m, J = 8.2, 5.2 Hz, 6H), 7.65 (t, J = 7.8 Hz, 1H), 7.58 - 7.51 (m, 6H), 7.47 (m, J = 8.1 Hz, 6H), 7.34 (m, J = 7.4 Hz, 6H). Due to its poor solubility, the ^{13}C NMR is not available. MS (MALDI-TOF): calcd for $C_{74}H_{45}N_3$: 975.3613; found: 975.36180. Anal. Calcd for $C_{74}H_{45}N_3$, C, 91.05; H, 4.65; N, 4.30; Found C, 91.11; H, 4.61 N, 4.27.

Characterization

^{1}H NMR spectra were obtained at Bruker ARX400 spectrometer using tetramethylsilane (TMS) as the internal standard. High resolution mass spectrometric measurements were obtained on the Bruker Biflex Ⅲ MALDI-TOF. SEM images were taken from Hitachi S-4800 microscopes at an accelerating voltage of 15 kV. TEM images were taken from a JEOL JEM-1011 microscope at an accelerating voltage of 100 kV. UV-Vis spectra were measured on a Hitachi U-3010 spectrometer. The fluorescence spectra were measured on a Hitachi F-4500 spectrometer. Fluorescence images of the microstructures were taken by using a laser-based fluorescence microscope (Olympus IX81) and an intensified charge-coupled device (CCD, Olympus DP71) detection system. Cyclic voltammograms (CVs) and differential pulse voltammetric curves (DPVs) were recorded on a

CHI660D electrochemical workstation using glassy carbon discs as the working electrode, Pt wire as the counter electrode and calomel electrode as the reference. 0.1 M Tetrabutylammonium hexafluorophosphate (Bu_4NPF_6) dissolved in chromatographically pure CH_2Cl_2 was employed as the supporting electrolyte.

References:

1. Y. Chen, G. Huang, C. Hsiao and S. Chen, *J. Am. Chem. Soc.*, 2006, **128**, 8549-8558.
2. D. Coventry, A. Batsanov, A. Goeta, J. Howard, T. Marder and R. Perutz, *Chem. Commun.*, 2005, 16, 2172-2174.

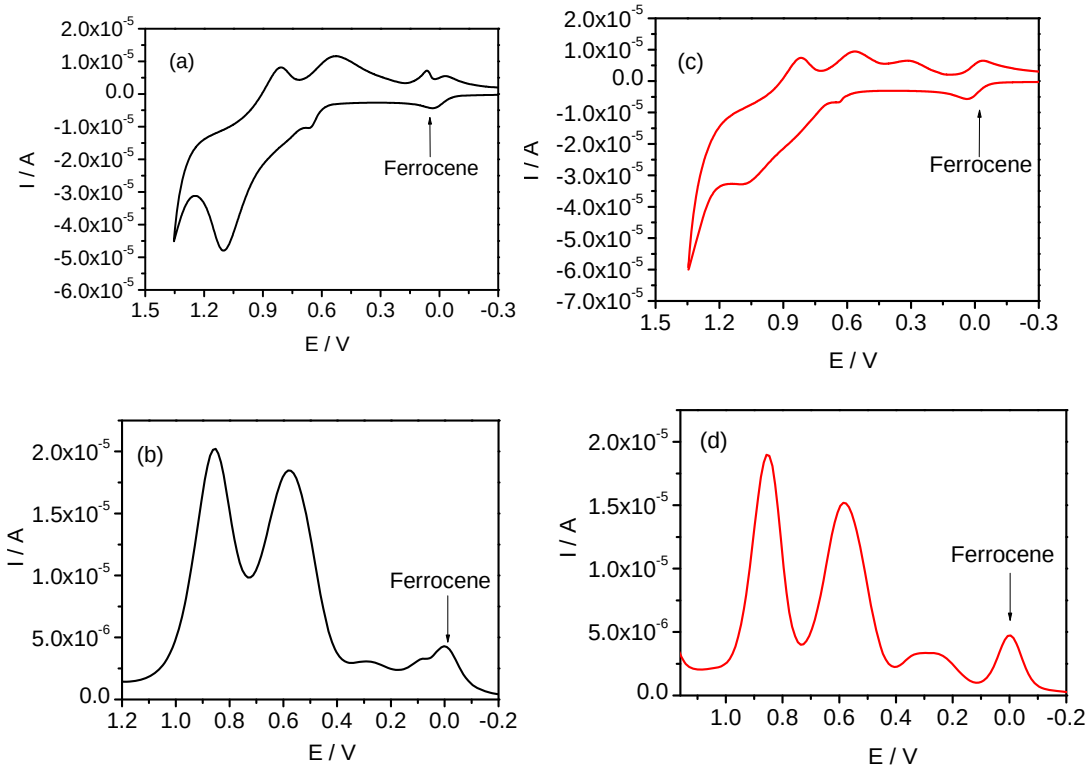


Figure S1. Cyclic voltammetry curves of **TBC** (a) and **TCP** (c) and differential pulse voltammetry curves of **TBC** (b) and **TCP** (d).

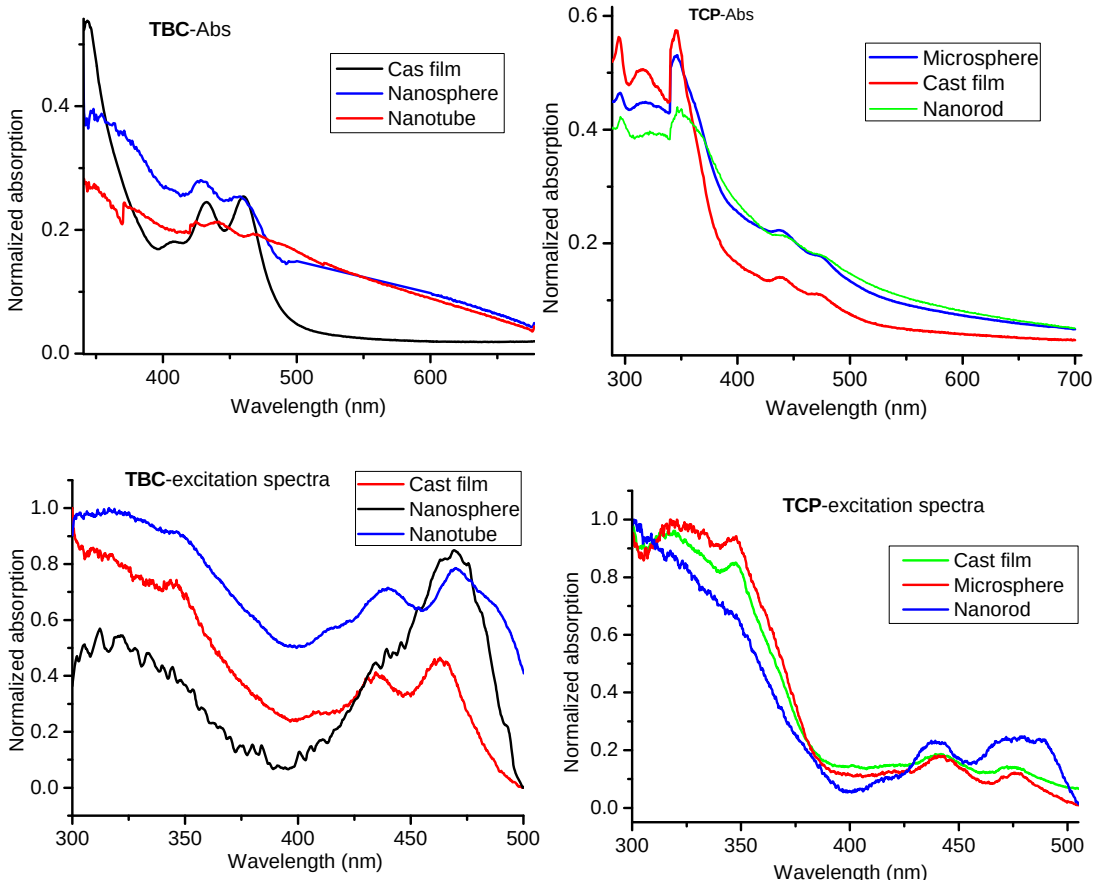


Figure S2. Normalized UV-Vis absorption and excitation spectra of the spin-casting film, nanosphere, nanotube/nanorod of **TBC** and **TCP**.

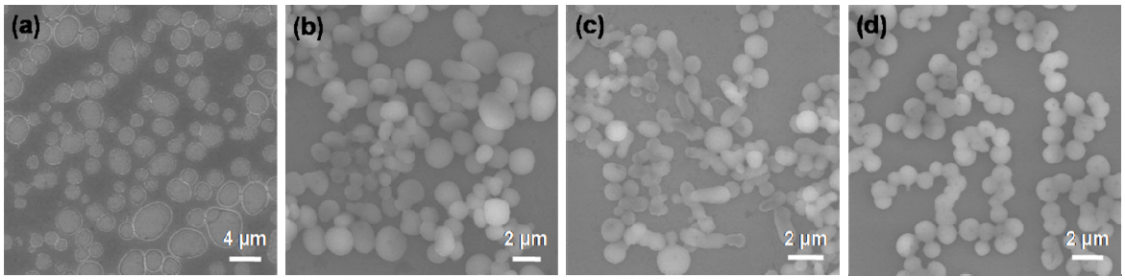
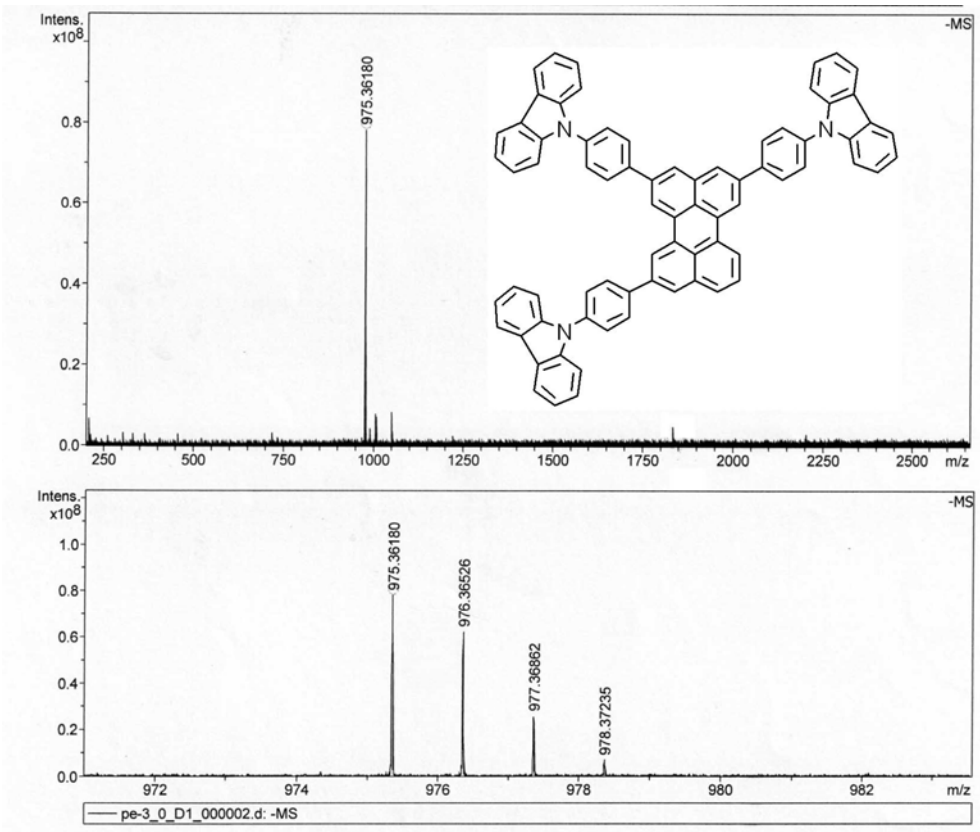
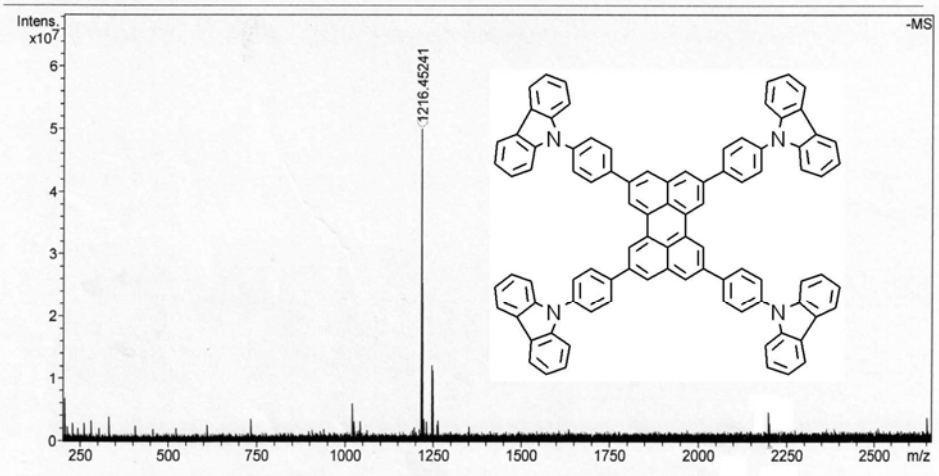
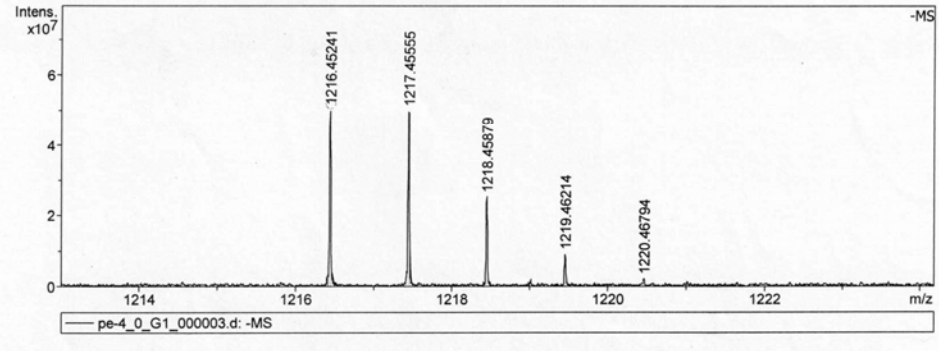


Figure S3. SEM images of **TBC** prepared in CH_2Cl_2 / acetone with different volume ratio (v/v) by solvent vapor technique. (a) v/v = 40:0, (b) v/v = 40:3, (c) v/v = 40:10 and (d) v/v = 40:40.

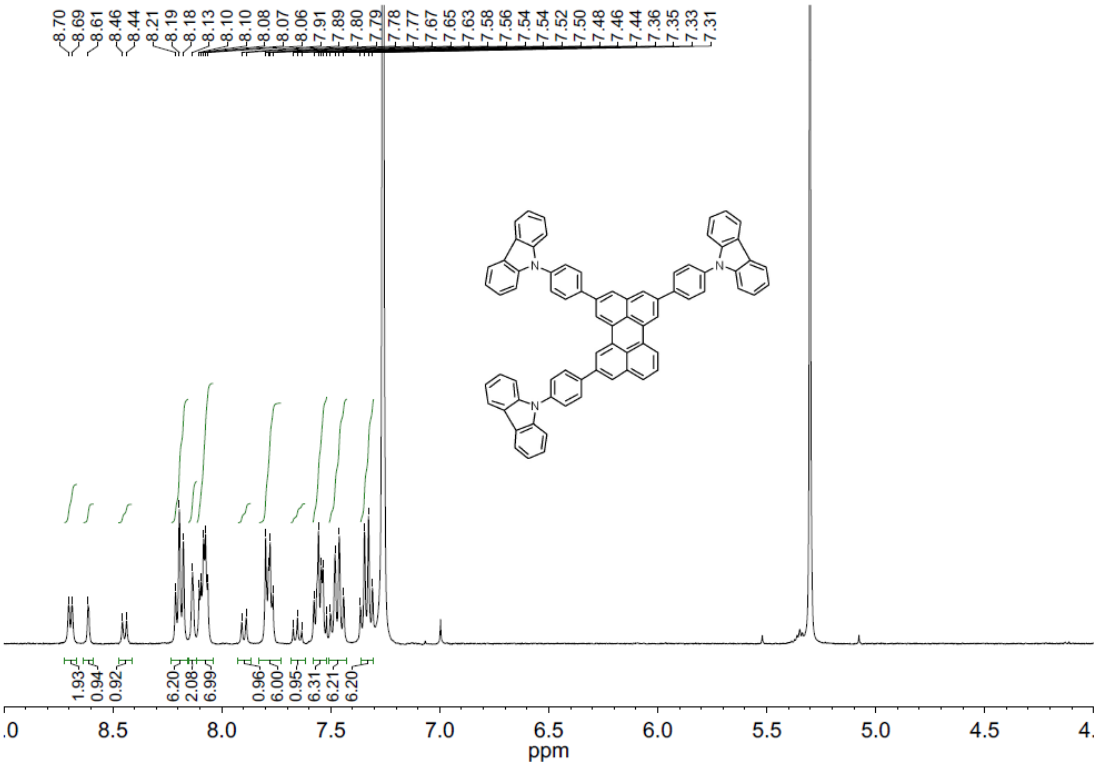


Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
975.361800	1	C74H45N3	100.00	975.361897	0.1	-0.0	11.7	54.0	odd	ok





Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
1216.452410	1	C92H56N4	100.00	1216.451046	1.1	-1.1	9.9	67.0	odd	ok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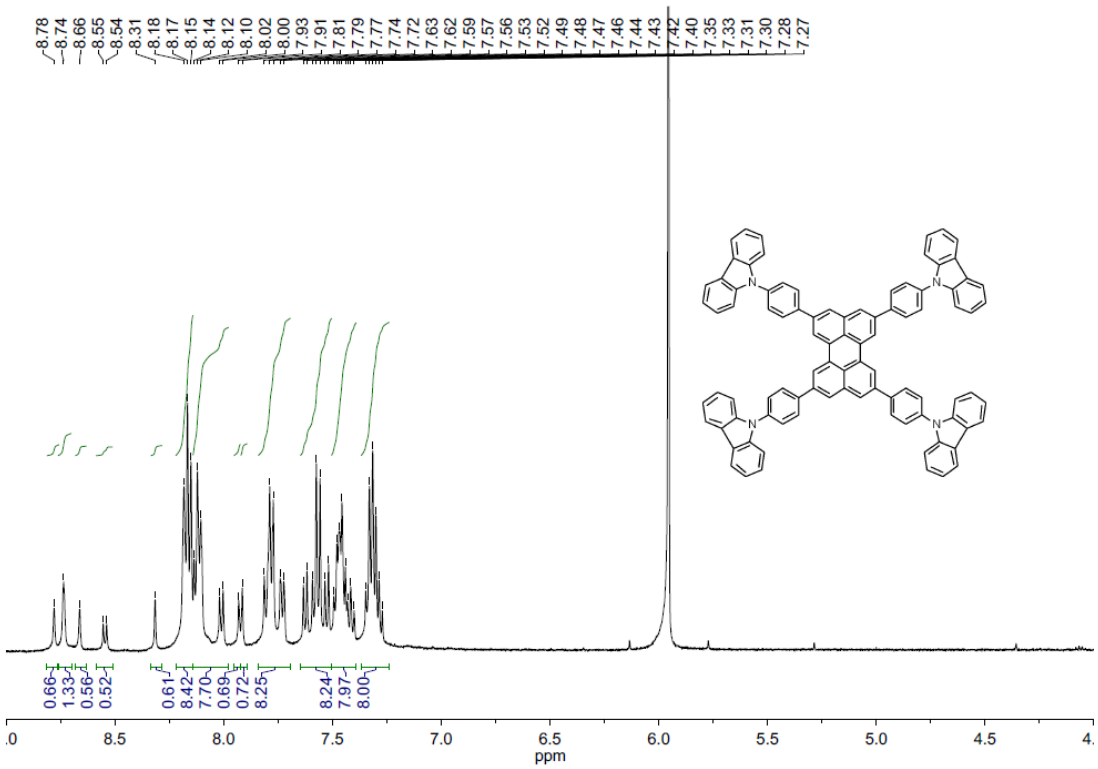
8.69
8.61
8.46
8.44
8.21
8.19
8.18
8.13
8.10
8.10
8.08
8.07
8.06
7.91
7.89
7.80
7.79
7.78
7.77
7.67
7.65
7.63
7.58
7.56
7.54
7.54
7.52
7.50
7.48
7.46
7.44
7.36
7.35
7.33
7.31
1.93
0.94
0.92
6.20
2.08
6.99
0.96
6.00
0.95
6.31
6.21
6.20
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
ppm


8.78
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8.55
8.54
8.31
8.18
8.17
8.15
8.14
8.12
8.10
8.02
8.00
7.93
7.91
7.81
7.79
7.77
7.74
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7.63
7.62
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7.52
7.49
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7.43
7.42
7.40
7.35
7.33
7.31
7.30
7.28
7.27
0.66
1.33
0.56
0.52
0.61
8.42
7.70
0.69
0.72
8.25
8.24
7.97
8.00
8.5
8.0
7.5
7.0
6.5
6.0
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4.5
ppm