Electronic Supplementary Information

New 8-Hydroxy Quinoline-Polycyclic Aromatic Hydrocarbon (PAH) Conjugates and Their Sulfonated Derivatives: Effects of Sulfonation and PAH Size on Their Structural, Supramolecular and Cytotoxic Properties

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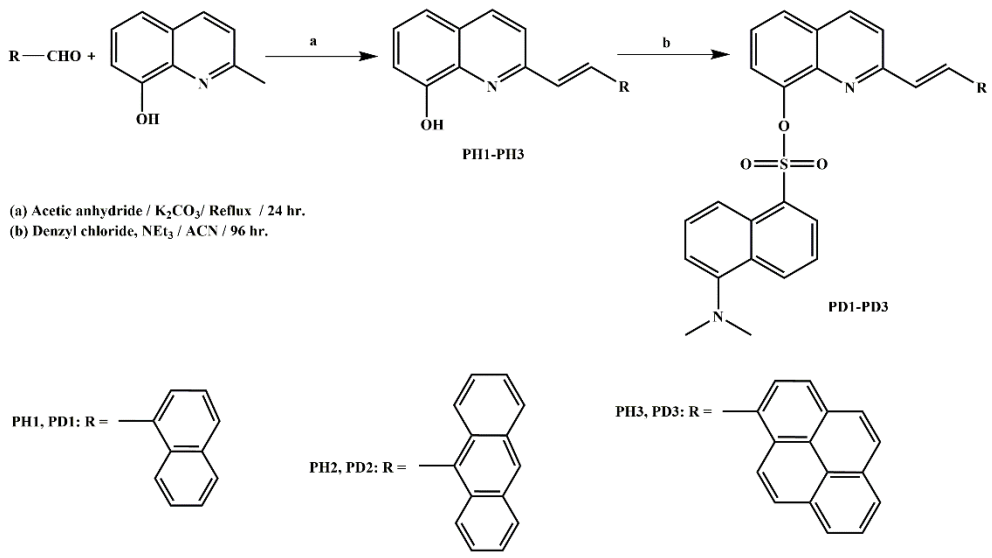
Experimental Section

Materials and Instrumentation: All the chemicals were purchased from Sigma Aldrich. Solvents used were of spectroscopic grade and were used without further treatment. ^{1}H and ^{13}C NMR spectra were recorded on a Jeol-JNM 500 MHz NMR spectrometer using DMSO-d_6 and $CDCl_3$ as solvents and TMS as internal standard. HR-MS data were recorded on Bruker HD compact instrument.

Single Crystal X-ray Diffraction Analysis: Single-crystal X-ray data were collected on an Agilent SuperNova diffractometer, equipped with a multilayer optics monochromated dual source (Cu and Mo) and an Eos CCD detector, using Cu-Ka radiation (1.54184 Å) at room temperature. Data acquisition, reduction, and absorption correction were performed by using CrysAlisPRO.[1] The structure was solved with ShelXS[2] program using direct methods and refined on F^2 by full-matrix least-squares techniques with ShelXL[2] through the Olex^2 (v.1.2) program package.[3] Anisotropic displacement parameters were applied for all the atoms except for hydrogen atoms. The hydrogen atoms were placed in calculated positions and refined as riding atoms using isotropic displacement parameters. CCDC Nos: 2325794 - 2325798 contain supplementary crystallographic data.

Cell Viability Assay: The viability of HepG2 cells under drug treatment was determined using MTT assay. Briefly, HepG2 cells were seeded at a density of 9×10^3 cells per well of a 96 well plate. The following day, cells were treated with samples, concentrations ranging from 0.5-100 µg/ml of different compounds for 24 hours. After the treatment, cells were incubated with 0.5mg/ml 3-(4,5-dimethylthiazol2-yl)-2,5-diphenyltetrazolium bromide (MTT) at 37°C for 4 hours. The media was removed, and the formazan crystals formed were dissolved in DMSO. Absorbance was measured at 570 nm using iTecan microplate reader. The IC_{50} values were calculated using GraphPad Prism 8 software.

Synthesis of PH and PD Series Compounds: The target PH and PD series compounds were synthesized starting from 4-substituted phenol *via* a reported procedure, as shown in Scheme S1.



Scheme S1. Overall synthetic scheme of compounds PH1-PH3 and PD1-PD3.

General Procedure for the Synthesis of PH1-PH3: A mixture of corresponding aldehyde (1 mmol), 2-methyl-8-hydroxyquinoline (1 mmol), and acetic anhydride was heated at 130° C under a nitrogen atmosphere for 24 h (TLC monitoring). After that, the reaction was quenched by pouring into an ice-water mixture with stirring. Thus, the separated crude compound was filtered, dried, and purified by recrystallization from ethyl acetate following a reported procedure.[4] To the product was added methanol and K_2CO_3 (1.5 mmol), and the reaction mixture was stirred at room temperature for 120 min. After completing the reaction, as monitored by TLC, the reaction mixture was poured into water and neutralized with HCl solution, and the precipitate was filtered and dried. The crude product thus obtained was purified by recrystallization from ethanol.

PH1 was obtained as dark brown solid. Yield: 0.89 mmol (89%). Melting point: 134 ºC. ^{1}H NMR (500 MHz, $CDCl_3$) δ ppm: 8.46 (d, *J* = 15.8 Hz, 1H), 8.24 (d, *J* = 8.95 Hz, 1H), 8.08 (d, *J* = 8.25 Hz, 1H), 7.79-7.84 (m, 3H), 7.64 (d, *J* = 8.9 Hz, 1H), 7.51-7.54 (m, 1H), 7.45-7.48 (m, 2H), 7.32-7.36 (m, 2H), 7.24-7.26 (m, 1H), 7.12 (d, *J* = 7.6 Hz, 1H). ^{13}C NMR (125 MHz) δ ppm: 153.6, 152.0, 138.0, 136.5, 133.9, 133.7, 131.4, 131.3, 130.8, 129.1, 128.7, 127.5, 127.4, 126.4, 126.0, 125.6, 124.2, 123.6, 120.6, 117.7, 110.2. HRMS: *m/z* calculated for $C_{21}H_{15}ON$ $[M+H]^+$ = 298.1154; found = 298.1203.

PH2 was obtained as a yellow solid. Yield: 0.86 mmol (86%). Melting point: 202 ºC. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm: 9.07 (d, *J* = 16.5 Hz, 1H), 8.62 (s, 1H), 8.46 (d, *J* = 8.95 Hz, 2H), 8.37 (d, *J* = 8.25 Hz, 1H), 8.13-8.15 (m, 2H), 7.98 (d, *J* = 8.95 Hz, 1H), 7.54-60(m, 4H), 7.40-7.45(m, 2H), 7.26 (d, *J* = 15.8 Hz, 1H), 7.14 (dd, *J* = 8.9 Hz, 1H), ^{13}C NMR (125 MHz) δ ppm: 153.4, 153.0, 138.3, 136.8, 136.7, 132.0, 131.1, 130.7, 129.1, 128.8, 128.0, 127.4, 126.9, 126.1, 125.8, 125.5, 121.2, 117.5, 111.4. HRMS: *m/z* calculated for $C_{25}H_{14}ON$ $[M+H]^+$ = 348.1310; found = 348.1065.

PH3 was obtained as a yellow solid. Yield: 0.82 mmol (82%). Melting point: 169 ºC. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm: 9.28 (d, *J* = 15.8 Hz, 1H), 9.00 (d, *J* = 8.95 Hz, 1H), 8.64 (d, *J* = 8.25 Hz, 1H), 8.32-8.37 (m, 5H), 8.22 (s, 2H), 8.09 (m, 1H), 7.97 (d, *J* = 8.25 Hz, 1H), 7.81 (d, *J* = 15.8 Hz, 1H), 7.36-7.43 (m, 2H), 7.13 (d, *J* = 6.9 Hz, 1H). ^{13}C NMR (125 MHz) δ ppm: 153.6, 153.4, 138.5, 136.6, 131.0, 130.9, 130.5, 130.3, 128.6, 127.9, 127.8, 127.7, 127.4, 127.3, 126.5, 125.6, 125.4, 125.4, 124.3, 124.0, 123.7, 121.8, 117.2, 111.4. HRMS: *m/z* calculated for $C_{27}H_{17}ON$ $[M+H]^+$ = 372.1310; found = 372.1750.

General Procedure for the Synthesis of PD1-PD3: Compound PH1/PH2/PH3 (1 eq.; 2 mmol) was dissolved in acetonitrile (ACN) with continuous stirring followed by the addition of the base triethylamine (NEt_3) (1.2 eq.). The reaction mixture was stirred for 20 minutes. Dansyl chloride (1.5 eq., 3 mmol) was added under N_2 atmosphere with vigorous stirring to the reaction mixture and kept at room temperature for 96 hours. A yellow precipitate was formed, which was filtered and extracted with chloroform. The organic layer was collected and evaporated. The crude product thus obtained was purified by recrystallization from ethanol.[5]

PD1 was obtained as light yellow solid. Yield: 1.76 mmol (88%). Melting point: 178 ºC. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm: 8.58 (d, *J* = 8.95 Hz, 1H), 8.42 (d, *J* = 8.95 Hz, 1H), 8.32-8.38 (m, 3H), 8.08 (d, *J* = 8.95 Hz, 1H), 7.99-8.02 (m, 3H), 7.92 (dd, *J* = 9.6 Hz, 1H), 7.68-7.76 (m, 3H), 7.56-7.62 (m, 4H), 7.45-7.48 (m, 1H), 7.13 (d, *J* = 6.9 Hz, 1H), 6.42 (d, *J* = 16.5 Hz, 1H), 2.54 (s, 6H). ^{13}C NMR (125 MHz) δ ppm: 156.6, 151.7, 145.4, 141.0, 136.8, 134.0, 133.5, 132.5, 132.1, 131.9, 131.5, 131.4, 130.8, 130.6, 129.7, 129.4, 129.1, 128.8, 127.8, 127.1, 126.7, 126.4, 126.4, 124.6, 124.2, 124.0, 123.8, 120.6, 120.0, 115.8, 45.2. HRMS: *m/z* calculated for $C_{33}H_{26}O_3N_2S$ $[M+H]^+$ = 531.1664; found 531.2079.

PD2 was obtained as yellow solid. Yield: 1.66 mmol (83%). Melting point: 160 ºC. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm: 8.64 (s, 1H), 8.50 (d, *J* = 8.95 Hz, 1H), 8.39 (d, *J* = 8.25 Hz, 1H), 8.28 (d, *J* = 16.5 Hz, 1H), 8.09-8.18 (m, 6H), 8.00 (d, *J* = 7.55 Hz, 1H), 7.95 (d, *J* = 7.55 Hz, 1H), 7.70 (d, *J* = 7.55 Hz, 1H), 7.56-7.63 (m, 5H), 7.46 (d, *J* = 16.5 Hz, 1H), 7.35 (d, *J* = 15.8 Hz, 1H), 6.44 (d, *J* = 7.55 Hz, 1H), 6.11 (d, *J* = 8.95 Hz, 1H), 2.07 (s, 6H). ^{13}C NMR (125 MHz) δ ppm: 155.6, 150.9, 145.0, 140.4, 136.8, 136.5, 132.1, 131.4, 131.3, 131.2, 131.1, 129.8, 128.9, 128.7, 128.6, 128.5, 127.3, 127.1, 126.1, 125.6, 125.5, 123.8, 123.1, 120.2, 119.3, 114.7, 44.1. HRMS: *m/z* calculated for $C_{37}H_{28}O_3N_2S$ $[M+H]^+$ = 581.1821; found 581.1706.

PD3 was obtained as yellow solid. Yield: 1.62 mmol (81%). Melting point: 204 ºC. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm: 8.68-8.74 (m, 2H), 8.62 (d, *J* = 8.95 Hz, 1H), 8.44-8.48 (m, 2H), 8.34-8.38 (m, 4H), 8.25-8.32 (m, 3H), 8.18 (d, *J* = 8.9 Hz, 1H), 8.10-8.13 (m, 1H), 8.04 (d, *J* = 7.55 Hz, 1H), 7.94 (d, *J* = 9.65 Hz, 1H), 7.78-7.81 (m, 1H), 7.56-7.62 (m, 2H), 7.48-7.51 (m, 1H), 7.18 (d, *J* = 6.9 Hz, 1H), 6.72 (d, *J* = 15.8 Hz, 1H), 2.52 (s, 6H). ^{13}C NMR (125 MHz) δ ppm: 156.2, 151.2, 144.8, 140.6, 136.3, 131.8, 131.6, 131.2, 131.0, 130.4, 130.3, 130.1, 128.6, 128.5, 128.3, 128.0, 127.9, 127.5, 127.2, 126.6, 125.9, 125.8, 125.5, 125.4, 124.2, 124.0, 124.0, 123.4, 123.3, 123.1, 120.3, 119.5, 115.4, 44.6. HRMS: *m/z* calculated for $C_{39}H_{28}O_3N_2S$ $[M+H]^+$ = 605.1821; found 605.1729.

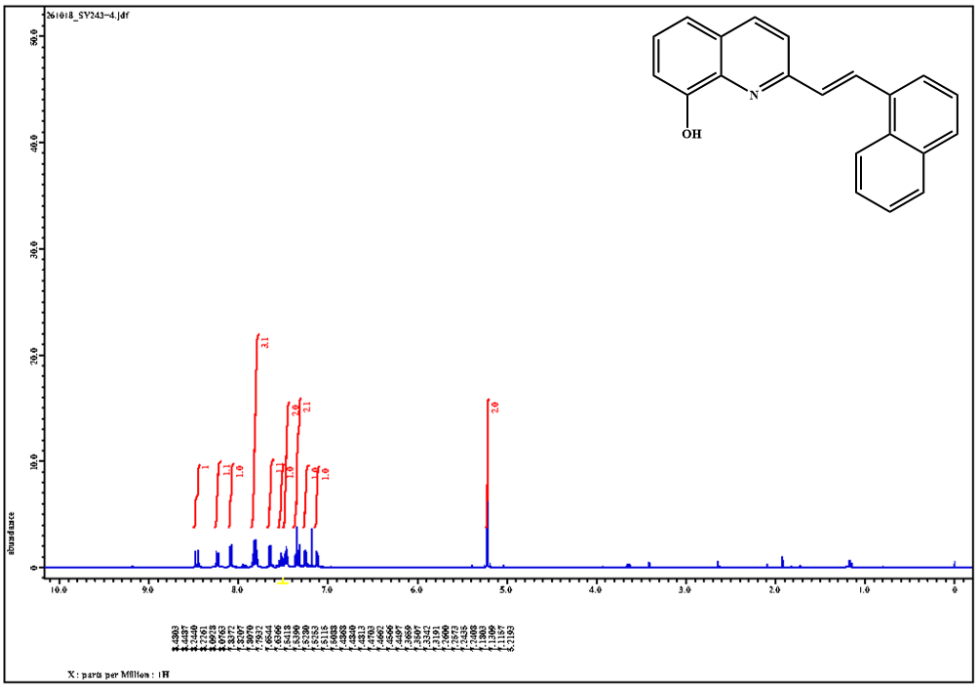


Fig. S1 ^{1}H NMR spectrum of PH1.

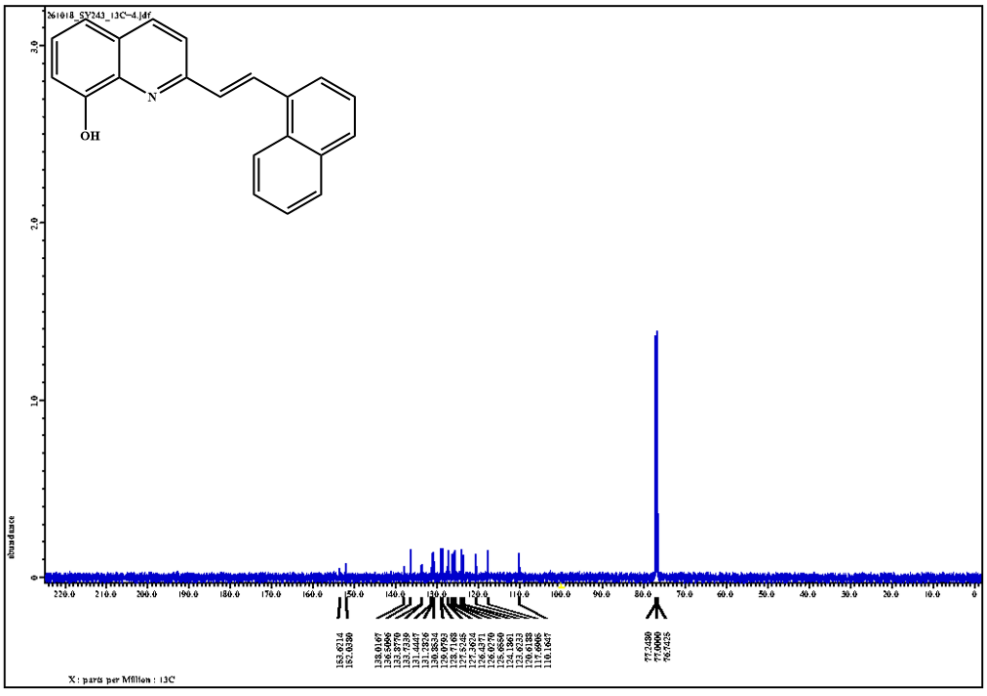


Fig. S2 ^{13}C NMR spectrum of PH1.

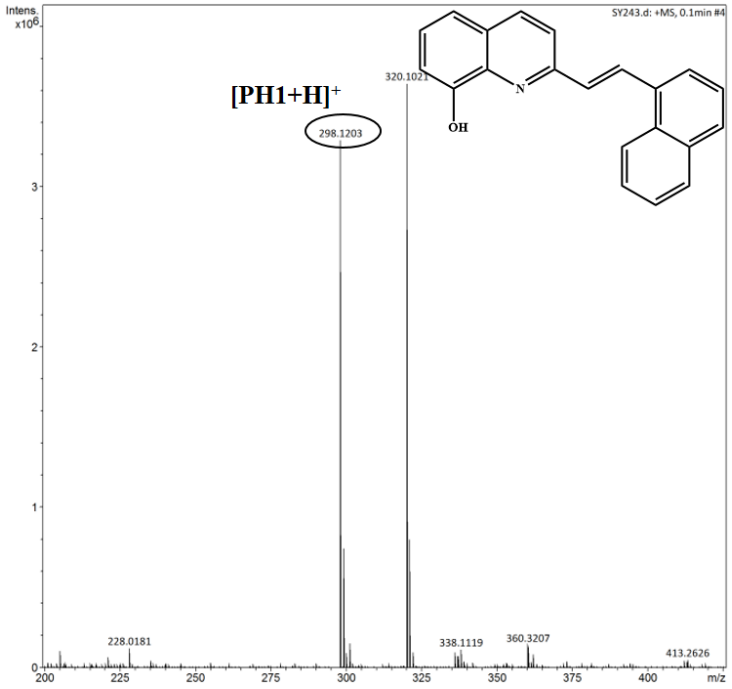


Fig. S3 HR-MS of PH1.

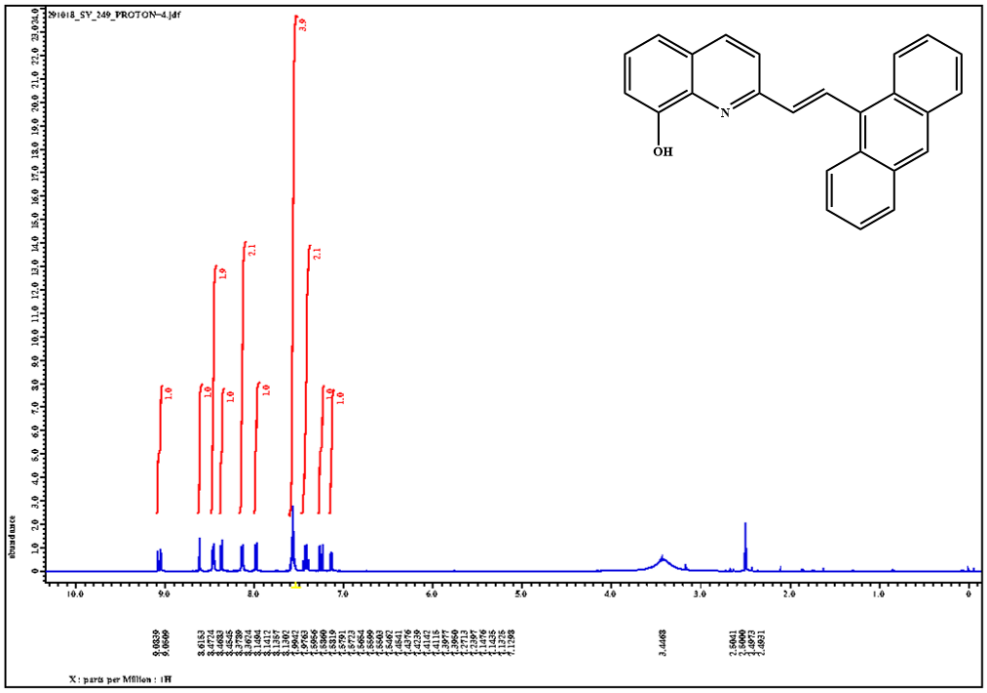


Fig. S4 ^{1}H NMR spectrum of PH2.

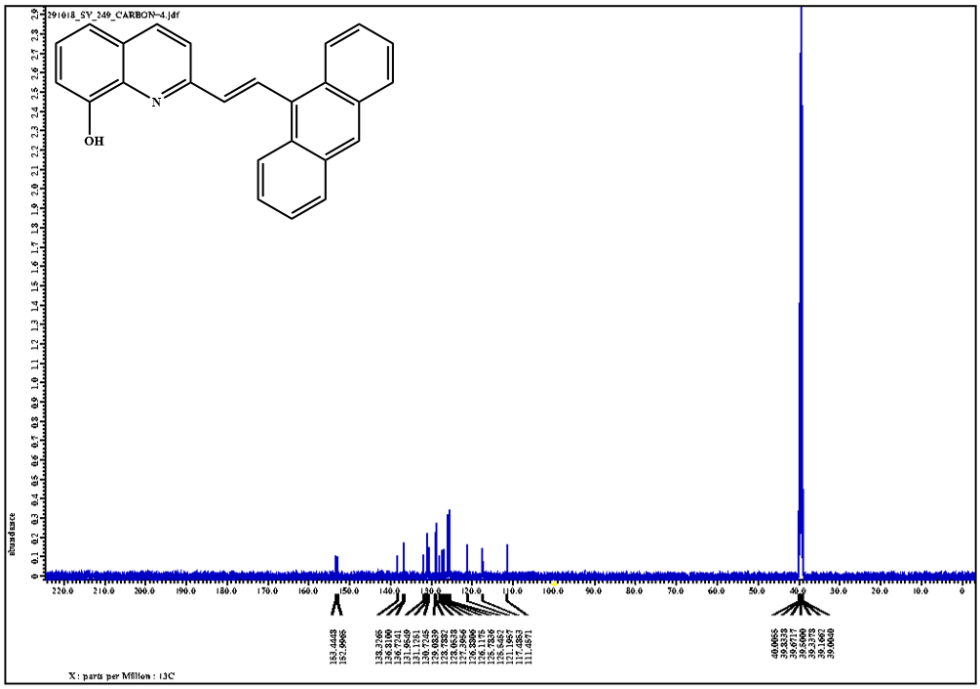


Fig. S5 ^{13}C NMR spectrum of PH2.

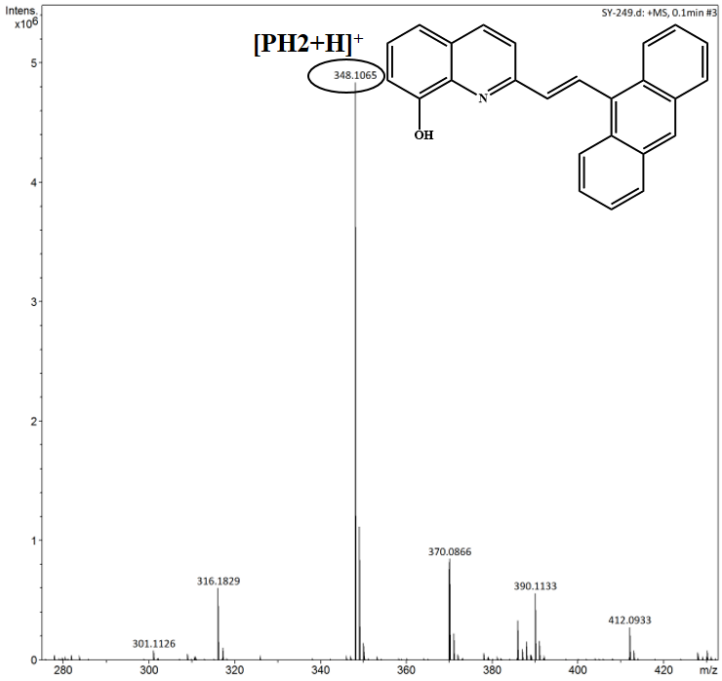


Fig. S6 HR-MS of PH2.

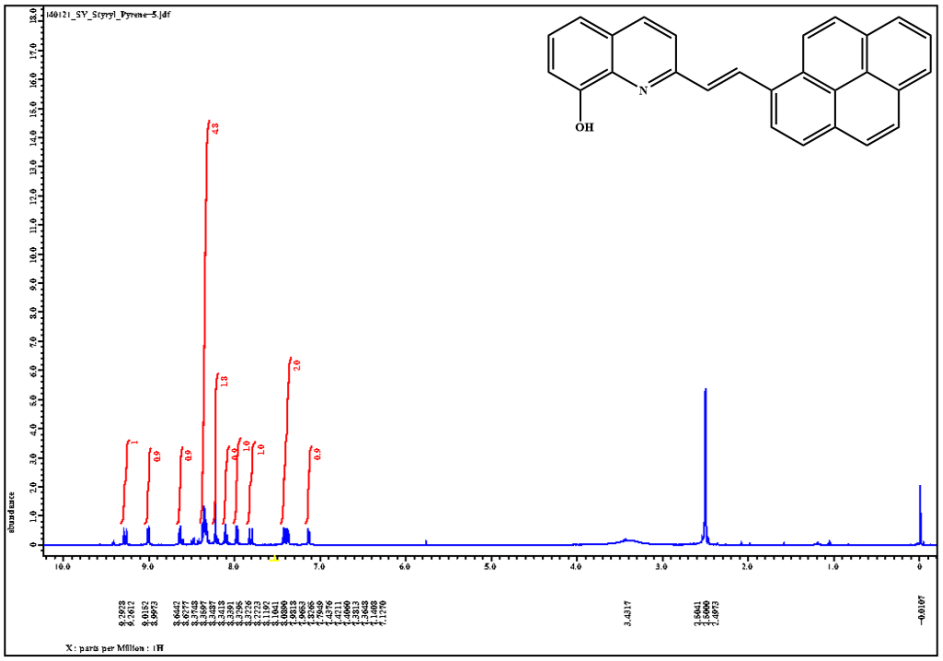


Fig. S7 ^{1}H NMR spectrum of PH3.

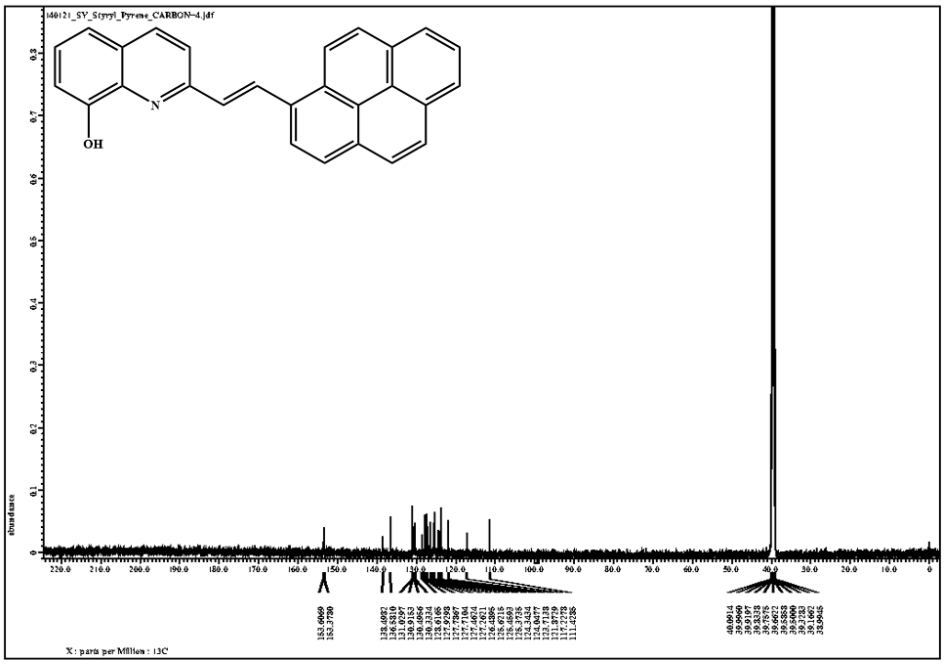


Fig. S8 ^{13}C NMR spectrum of PH3.

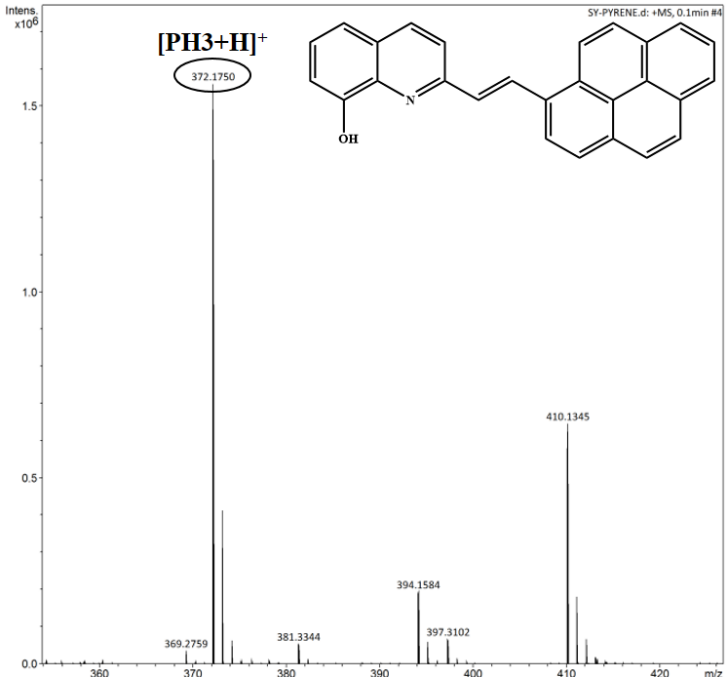


Fig. S9 HR-MS spectrum of PH3.

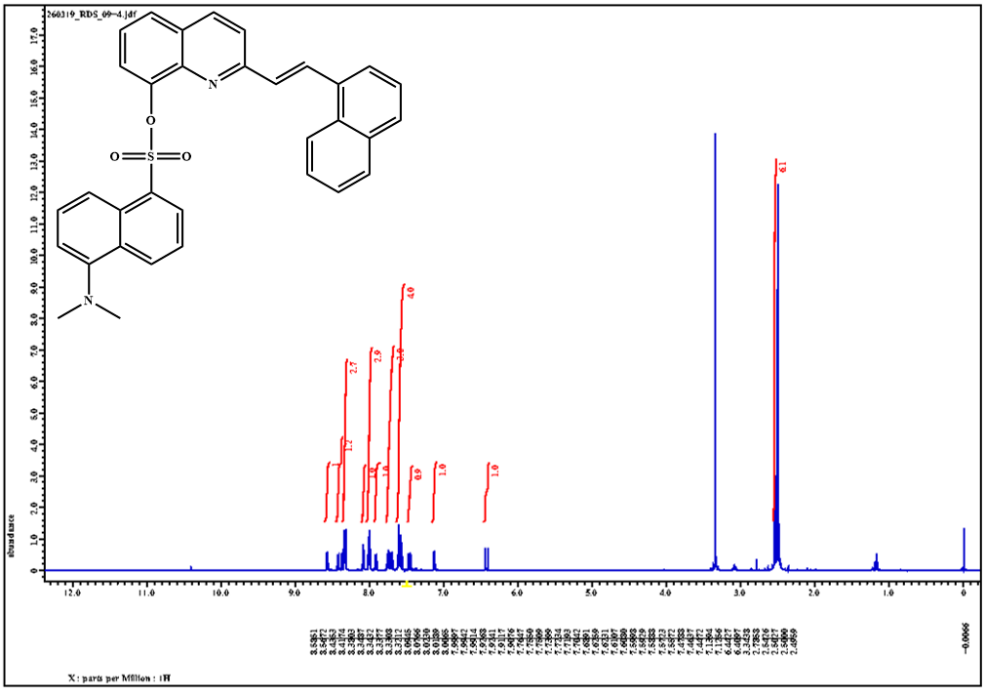


Fig. S10 ^{1}H NMR spectrum of PD1.

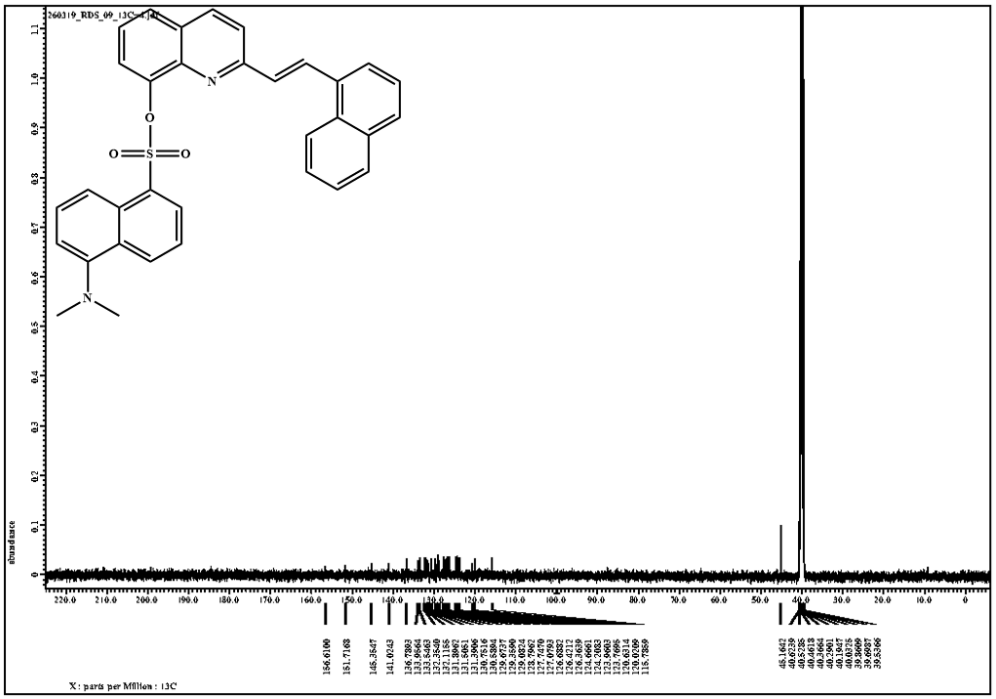


Fig. S11 ^{13}C NMR spectrum of PD1.

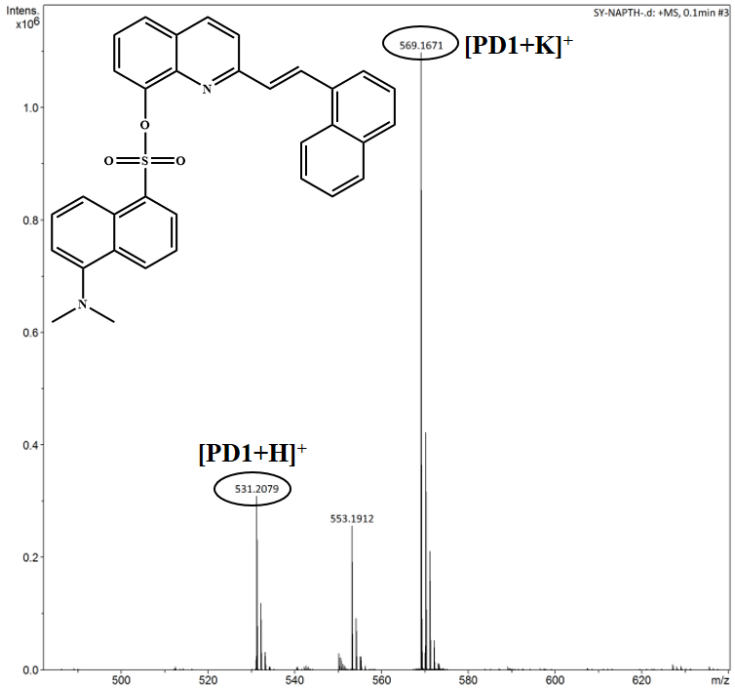


Fig. S12 HR-MS of PD1.

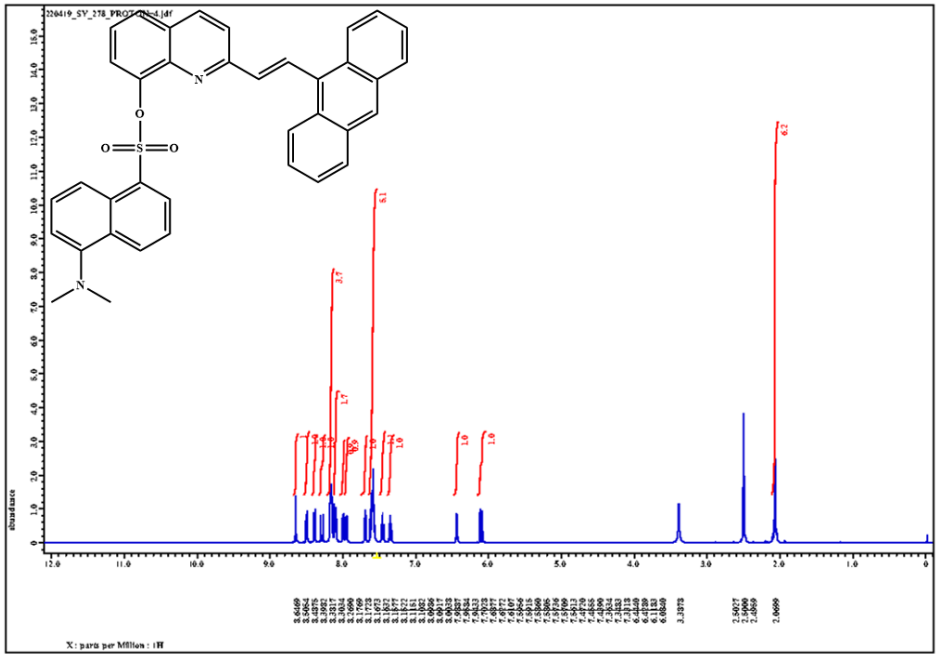


Fig. S13 ^{1}H NMR spectrum of PD2.

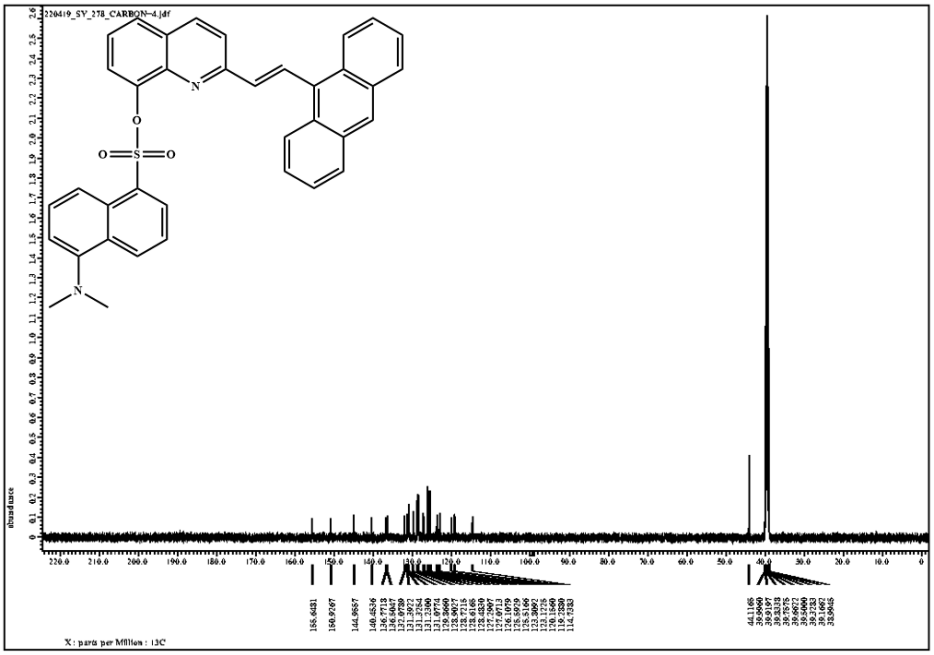


Fig. S14 ^{13}C NMR spectrum of PD2.

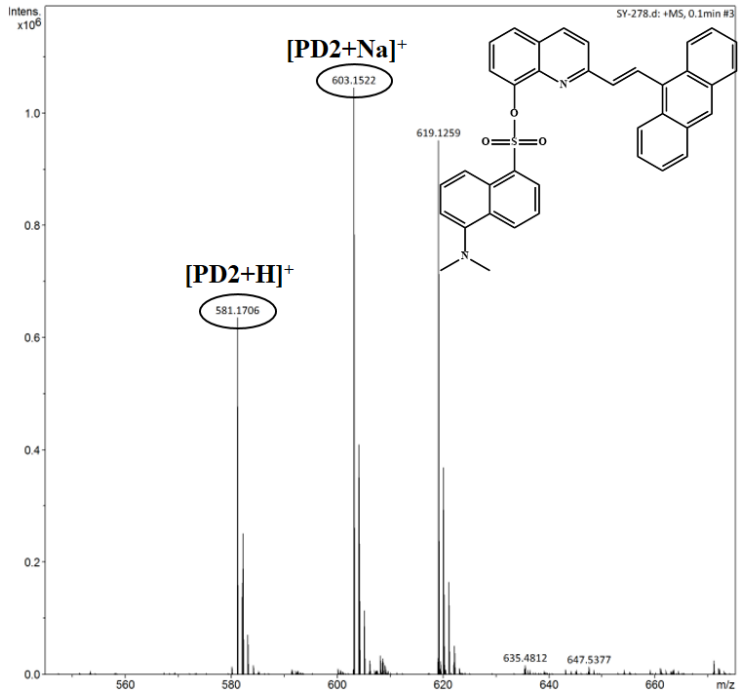


Fig. S15 HR-MS of PD2.

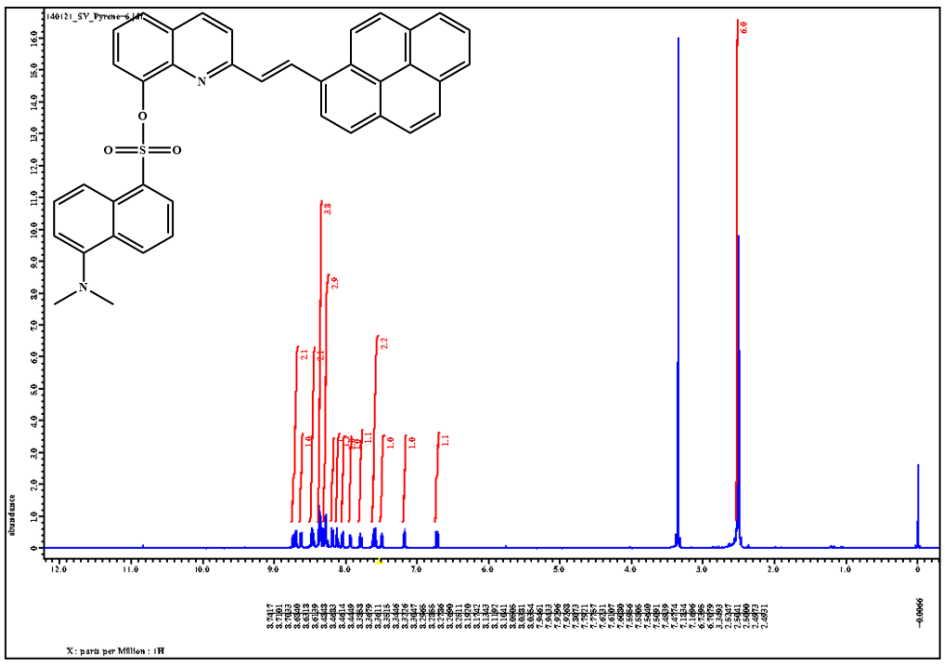


Fig. S16 ^{1}H NMR spectrum of PD3.

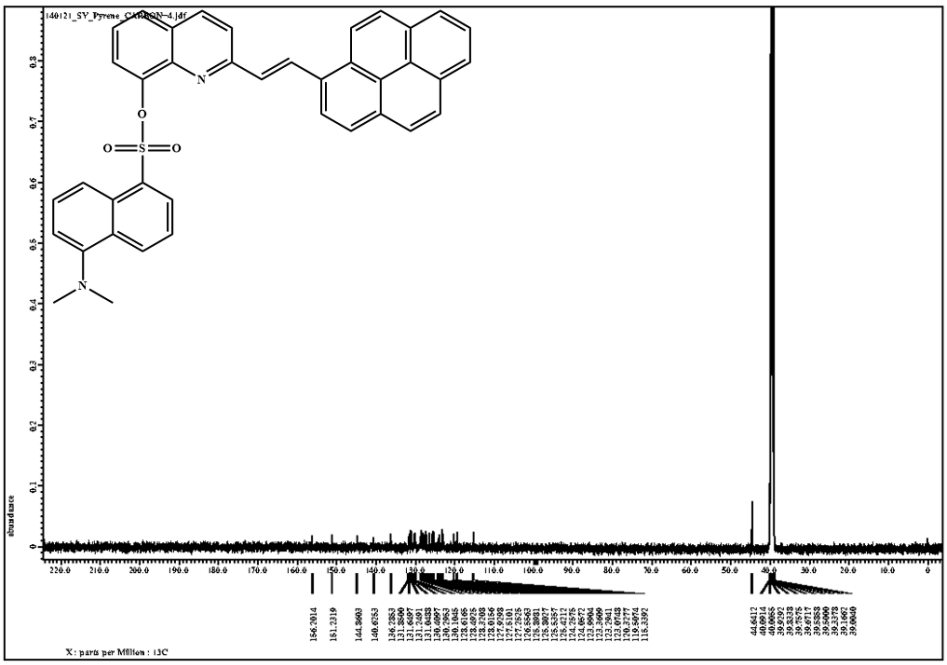


Fig. S17 ^{13}C NMR spectrum of PD3.

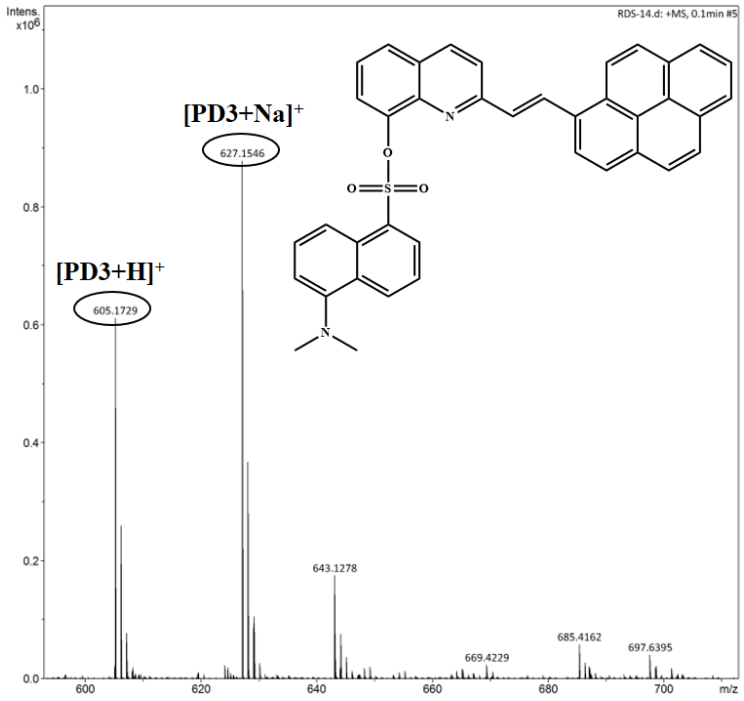


Fig. S18 HR-MS of PD3.

Crystal Structure Analyses of PH & PD Series Compounds

Table S1. Crystal and structure refinement data for PH1, PH3, and PD1-PD3.

	PH1	**PH3**	**PD1**	**PD2**	**PD3**
Crystallization solvents	Methanol & dichloromethane	Methanol & dichloromethane	Methanol & dichloromethane	Methanol & dichloromethane	Methanol & dichloromethane
Empirical formula	$C_{21}H_{15}NO$	$C_{27}H_{17}NO$	$C_{33}H_{26}N_2O_3S$	$C_{37}H_{28}N_2O_3S$	$C_{39}H_{28}N_2O_3S$
Formula weight	297.359	371.442	530.65	580.712	604.73
Crystal system	Orthorhombic	Monoclinic	Monoclinic	Triclinic	Triclinic
Space group	*Pca2₁*	*P2₁/n*	*P2₁/n*	*P-1*	*P-1*
a (Å)	15.9480(6)	15.5838(15)	7.4377(3)	10.5913(7)	8.0458(5)
b (Å)	6.6074(3)	6.6875(6)	14.7657(4)	11.8069(7)	13.1703(9)
c (Å)	14.6479(6)	18.8389(19)	23.7592(7)	12.2854(7)	14.8309(13)
α (°)	90.00	90	90.00	103.279(5)	74.204(7)
β (°)	90.00	107.494(11)	93.154(3)	103.085(5)	74.975(6)
γ (°)	90.00	90	90.00	96.474(5)	86.981(5)
V (Å^3)	1543.52(11)	1872.5(3)	2605.36(14)	1434.23(16)	1460.25(18)
Z	4	4	4	2	2
ρ (g/cm^3)	1.280	1.318	1.353	1.345	1.375
μ (mm^{-1})	0.079	0.623	1.414	1.335	1.336
F (000)	624.0	778.3	1268.0	610.0	722.0
T	N/A	N/A	N/A	N/A	N/A
Reflections collected	3419	5854	8875	8716	8600
Independent reflections	2471 [R_{int} = 0.0231, R_{sigma} = 0.0390]	3275 [R_{int} = 0.0200, R_{sigma} = 0.0277]	4575 [R_{int} = 0.0194]	5036 [R_{int} = 0.0248, R_{sigma} = 0.0327]	4393 [R_{int} = 0.0602]
Data/ restraints/parameters	2471/1/209	3275/0/263	4575/0/354	5036/0/390	4393/0/407
Final R indices [I>2sigma(I)]	R_1 = 0.0480, wR_2 = 0.1070	R_1 = 0.0432, wR_2 = 0.1143	R_1 = 0.0403, wR_2 = 0.1101	R_1 = 0.0415, wR_2 = 0.1079	R_1 = 0.0554, wR_2 = N/A
R indices (all data)	R_1 = 0.0623, wR_2 = 0.1198	R_1 = 0.0631, wR_2 = 0.1357	R_1 = 0.0513, wR_2 = N/A	R_1 = 0.0521, wR_2 = 0.1172	R_1 = 0.0740, wR_2 = 0.1360
GOF	1.090	1.049	1.080	1.058	0.979

$R_1 = F_o - F_c / F_o$. $wR_2 = [w (F_o^2 - F_c^2)^2 / w (F_o)^2]^{1/2}$.

Table S2. Details of the weak bonding interactions in PH1 and PH3.

D	H	A	d(D-H)/Å	d(H-A)/Å	d(D-A)/Å	D-H-A/°
				PH1		
C2	H2	O1[1]	0.9300	2.802(4)	3.609(4)	145.67(8)
C11	H11	O1[1]	0.9300	2.545(4)	3.318(4)	140.79(9)
C20	H20	O1[1]	0.9300	2.808(4)	3.459(4)	128.03(9)
C5	H5	N1[2]	0.9300	3.189(4)	3.762(4)	121.69(8)
C17	H17	O1[3]	0.9300	2.817(4)	3.620(5)	145.29(12)
C17	H17	N1[3]	0.9300	3.247(5)	3.804(5)	120.41(9)
Symmetry codes: [1]3/2-X,+Y,-1/2+Z; [2]+X,-1+Y,+Z; [3]1-X,2-Y,-1/2+Z						
				PH3		
C23	H23	O1[1]	0.9300	2.940(3)	3.585(3)	127.64(5)
C21	H21	O1[2]	0.9300	2.625(3)	3.348(3)	135.07(7)
C17	H17	O1[3]	0.9300	3.057(3)	3.780(3)	135.84(6)
C5	H5	N1[4]	0.9300	2.996(3)	3.616(3)	125.42(6)
C16	H16	O1[3]	0.9300	3.389(3)	3.946(3)	120.77(5)
C6	H6	O1[4]	0.9300	2.977(3)	3.585(3)	124.41(5)
Symmetry codes: [1]1/2-X,1/2+Y,1/2-Z; [2]1/2+X,3/2-Y,-1/2+Z; [3]1-X,2-Y,1-Z; [4]+X,-1+Y,+Z						

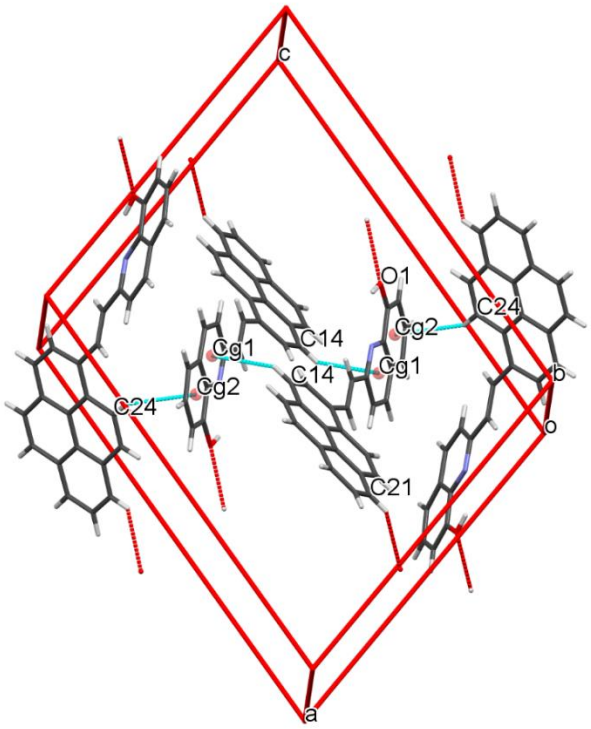
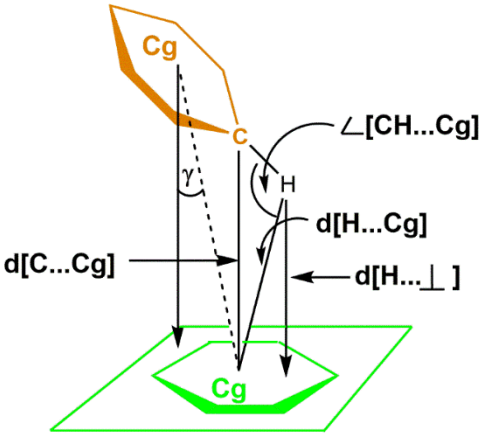


Fig. S19 Unit cell of PH3. Each molecule is part of supramolecular infinite 1D chains formed by C–H···O interactions, shown as hanging contacts in red. The interconnection of molecules through certain C–H···π interactions are also shown.

Analysis of Supramolecular C–H···π Interactions in PH series Compounds.[6]



Scheme S2. Graphical presentation of the parameters used for the description of C–H···π stacking interactions in the present study. See Reference 6 for details.

Table S3. Analyses of possible C–H···π interactions in PH1 and PH3.

X–H(I)	Cg(J)	[ARU(J]	H···Cg	H-Perp	γ (o)	X–H···Cg	X···Cg	X–H,π
PH1								
C5-H5[1]	Cg3	4565.01	2.65	2.63	5.68	133	3.3510(2)	49
C5-H5[1]	Cg6	4565.01	2.87	-2.63	23.75	128	3.5211(2)	49
C7-H7[1]	Cg3	3565.01	2.98	-2.92	11.34	152	3.8298(2)	61
C15-H15[1]	Cg1	4455.01	2.86	2.83	8.53	130	3.5308(2)	48
[4565] = 1/2+X,1-Y,Z; [3565] = 1/2-X,1+Y,1/2+Z; [4455] = -1/2+X,-Y,Z. Where, CgX = Ring Center-of-Gravity of ring X. Ring 1 = N1-C1-C2-C3-C4-C9; Ring 3 = C12-C13-C14-C15-C16-C21; Ring 6 = C12-C13-C14-C15-C16-C17-C18-C19-C20-C21; see Figure 1 of main manuscript.								
PH3								
C2-H2[1]	Cg9	1545.01	2.90	2.88	7.35	135	3.6232(4)	39
C2-H2[1]	Cg13	1545.01	2.97	2.88	14.19	140	3.7309(4)	39
C14-H14[1]	Cg1	3555.01	2.82	-2.78	9.09	133	3.5131(4)	39
C14-H14[1]	Cg7	3555.01	2.85	-2.76	14.34	127	3.4951(4)	39
C19-H19[1]	Cg5	2455.01	2.68	-2.67	4.78	149	3.5150(4)	58
C19-H19[1]	Cg10	2455.01	2.84	-2.67	20.09	137	3.5795(4)	58
C19-H19[1]	Cg12	2455.01	2.92	-2.67	23.68	125	3.5372(4)	59
C19-H19[1]	Cg14	2455.01	2.94	-2.67	24.87	126	3.5725(4)	59
C24-H24[1]	Cg2	2555.01	2.97	2.95	7.67	143	3.7548(4)	48
[1545] = X,-1+Y,Z; [3555] = -X,-Y,-Z; [2455] = -1/2-X,1/2+Y,1/2-Z; [2555] = 1/2-X,1/2+Y,1/2-Z. Where, CgX = Ring Center-of-Gravity of ring X. Ring 1 = N1-C1-C2-C3-C4-C9; Ring 2 = C4-C5-C6-C7-C8-C9; Ring 5 = C18-C19-C20-C21-C22-C27; Ring 7 = N1-C1-C2-C3-C4-C5-C6-C7-C8-C9; Ring 9 = C12-C13-C14-C15-C26-C27-C22-C23-C24-C25; Ring 10 = C15-C16-C17-C18-C19-C20-C21-C22-C27-C26; Ring 12 = C18-C19-C20-C21-C22-C23-C24-C25-C26-C27; Ring 13 = C12-C13-C14-C15-C16-C17-C18-C27-C22-C23-C24-C25; Ring 14 = C15-C16-C17-C18-C19-C20-C21-C22-C23-C24-C25-C26, see Figure 1 of main manuscript.								

Table S4. Details of weak bonding interactions in PD1-PD3.

D	H	A	d(D-H)/Å	d(H-A)/Å	d(D-A)/Å	D-H-A/°
			PD1			
C28	H28	O2[1]	0.9300	2.729(3)	3.630(3)	163.47(6)
C30	H30	O2	0.9300	2.432(3)	3.030(3)	122.07(6)
C3	H3	N2[2]	0.9300	2.938(3)	3.848(3)	166.24(6)
C6	H6	O3[3]	0.9300	2.650(3)	3.384(3)	136.33(6)
C15	H15	O3[2]	0.9300	2.837(3)	3.634(3)	144.42(6)
C16	H16	O1[4]	0.9300	2.849(3)	3.678(3)	149.08(6)
C20	H20	O2[1]	0.9300	3.018(3)	3.793(3)	141.83(6)
C33	H33c	S1[5]	0.9600	3.306(13)	3.943(2)	125.6(11)
C33	H33c	O2[5]	0.9600	2.895(5)	3.711(3)	143.5(6)
C32	H32b	O2[1]	0.9600	2.735(12)	3.577(3)	146.7(17)
Symmetry codes: [1]3/2-X,1/2+Y,1/2-Z; [2]1-X,1-Y,1-Z; [3]1-X,-Y,1-Z; [4]+X,1+Y,+Z; [5]1/2-X,1/2+Y,1/2-Z.						
			PD2			
C11	H11	O2[1]	0.9300	2.922(2)	3.843(2)	170.71(5)
C2	H2	O2[1]	0.9300	2.846(2)	3.765(2)	170.15(5)
C19	H19	O3[2]	0.9300	3.066(3)	3.925(3)	154.30(5)
C14	H14	O2[1]	0.9300	3.171(3)	3.844(3)	130.82(5)
C21	H21	O3[2]	0.9300	3.022(3)	3.886(3)	155.11(5)
C22	H22	O2[3]	0.9300	2.679(3)	3.565(3)	159.57(6)
Symmetry codes: [1]-1+X,+Y,+Z; [2]-1+X,+Y,-1+Z; [3]1-X,-Y,-Z.						
			PD3			
C36	H36	O3	0.9300	2.330(4)	2.996(4)	128.29(8)
C7	H7	O2[1]	0.9300	2.517(3)	3.320(3)	144.73(8)
C7	H7	O3[1]	0.9300	3.364(3)	3.978(3)	125.57(6)
C6	H6	O3[1]	0.9300	3.214(4)	3.906(4)	132.80(7)
C38	H38b	O1[2]	0.9600	2.928(18)	3.681(4)	136.2(19)
C38	H38c	N1[2]	0.9600	3.01(2)	3.732(4)	133(2)
C16	H16	O3[3]	0.9300	2.543(4)	3.466(4)	171.77(10)
C3	H3	N2[4]	0.9300	2.744(4)	3.667(4)	171.72(9)
Symmetry codes: [1]2-X,2-Y,1-Z; [2]-1+X,+Y,+Z; [3]1-X,1-Y,2-Z; [4]1-X,1-Y,1-Z.						

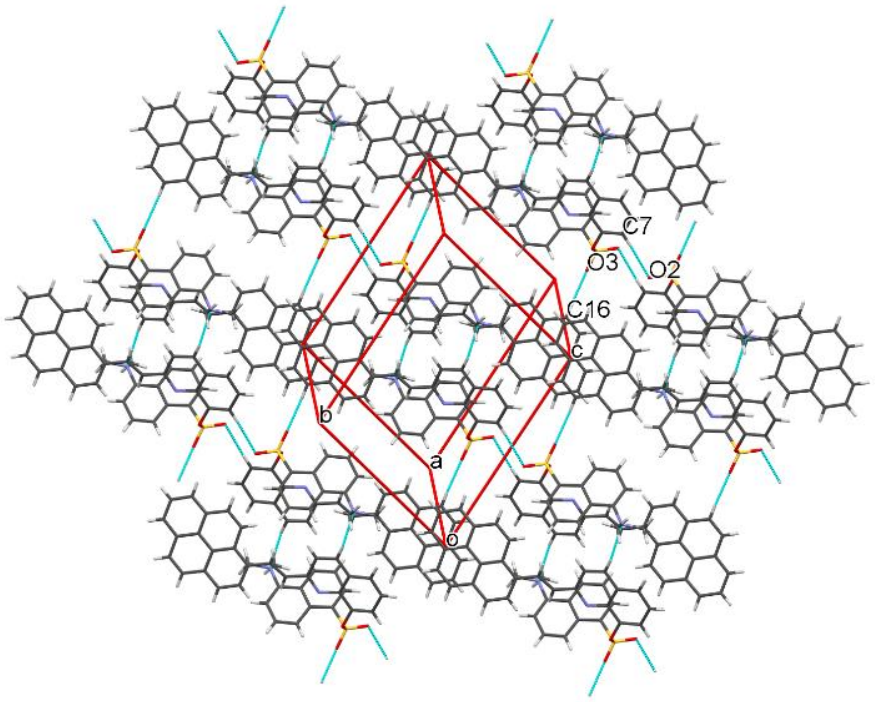
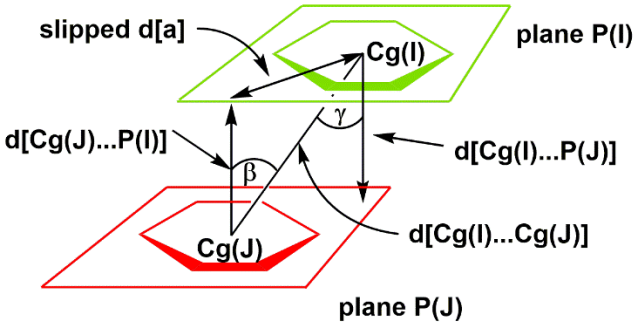


Fig. S20 The extension of 1D chains into 2D sheets through π-π stacking and C–H···O interactions in PD3. The short contacts are shown in turquoise color.

Analysis of Supramolecular π-Stacking and C−H···π Interactions in PD series Compounds.

The 'Analysis of short ring interactions' obtained using the CALC ALL option of PLATON[7,8] were used. Out of the several such interactions listed, only the strong interactions characterized by short centroid-centroid contacts (< 3.8 Å), near parallel ring planes ($\alpha < 10^o$ to ~0^o), small slip angles ($\beta, \gamma < 25^o$) and vertical displacements (slippage < 1.5 Å), which denote sizable overlap of the aryl plane areas, were considered.[9,10]



Scheme S3. Graphical presentation of the parameters used for the description of π-π stacking interactions in the present study.

- Cg(I) = Ring Center-of-Gravity (Plane number I)
- α = Dihedral Angle between Planes I and J (°)
- β = Angle Cg(I)-->Cg(J) vector and normal to plane I (°)
- γ = Angle Cg(I)-->Cg(J) vector and normal to plane J (°)
- d[Cg(I)···Cg(J)] = Distance between ring Centriods (Å)
- d[Cg(I) ···P(J)] = Perpendicular distance of Cg(I) on ring J (Å)
- d[Cg(J) ···P(I)] = Perpendicular distance of Cg(J) on ring I (Å)
- Slippage d[a] = Distance between Cg(I) and Perpendicular Projection of Cg(J) on Ring I (Å).

Table S5 Analyses of possible π-π interactions in PD2 and PD3.

Cg(I)	Cg(J)	[ARU(J)]	d[Cg-Cg] (Å)	α (o)	β (o)	γ (o)	d[Cg(I)···P(J)] Å	d[Cg(J)···P(I)] Å	Slippage d[a] (Å)
PD2									
Cg5[1]	Cg5	2555.01	3.8296(3)	0	28.4	28.4	3.3687	3.3687	1.821
Cg5[1]	Cg10	2555.01	3.6900(2)	1	25.2	24.7	3.3531	3.3399	1.569
Cg10[1]	Cg5	2555.01	3.6900(2)	1	24.7	25.2	3.3399	3.3531	1.540
Where, CgX = Ring Center-of-Gravity of ring X. Ring 5 = C20-C21-C22-C23-C24-C25; Ring 10 = C12-C13-C18-C19-C20-C21-C22-C23-C24-C25; see Figure 7 of main manuscript.									
PD3									
Cg4[1]	Cg4	2675.01	3.8544(3)	0	26.9	26.9	3.4359	3.4359	1.747
Cg4[1]	Cg5	2775.01	3.9059(3)	1	27.8	27.7	3.4589	3.4560	1.820
Cg4[1]	Cg10	2675.01	3.8841(3)	0	28.1	27.9	3.4319	3.4250	1.832
Cg5[1]	Cg4	2775.01	3.9059(3)	1	27.7	27.8	3.4560	3.4589	1.814
Cg10[1]	Cg4	2675.01	3.8841(3)	0	27.9	28.1	3.4250	3.4319	1.819

Cg12[1]	Cg12	2775.01	3.9047(3)	0	27.7	27.7	3.4574	3.4574	1.815
Where, CgX = Ring Center-of-Gravity of ring X. Ring 4 = C15-C16-C17-C18-C27-C26; Ring 5 = C18-C19-C20-C21-C22-C27; Ring 10 = C12-C13-C14-C15-C16-C17-C18-C27-C26-C25; Ring 12 = C15-C16-C17-C18-C19-C20-C21-C22-C27-C26; see Figure 10 of main manuscript.									

Table S6. Analyses for possible C–H···π interactions in and PD1-PD3.

X–H(I)	Cg(J)	[ARU(J)]	H···Cg	H-Perp	Gamma	X–H···Cg	X···Cg	X–H,π
PD1								
C19-H19[1]	Cg6	2655.01	2.66	-2.65	4.57	144	3.4562(1)	55
Where, Cg6 = Ring Center-of-Gravity of ring 6. Ring 6 = C26-C27-C28-C29-C30-C31; see Figure 5 of main manuscript.								
PD2								
C10-H10[1]	Cg7	1555.01	2.82	-2.77	10.71	155	3.6815(2)	76
C15-H15[1]	Cg6	1455.01	2.81	2.76	10.75	125	3.4339(2)	43
C37-H37A[1]	Cg9	1555.01	2.99	2.88	15.15	171	3.9374(3)	81
[1555] = X,Y,Z; [1455] = -1+X,Y,Z. Where, CgX = Ring Center-of-Gravity of ring X. Ring 6 = C26-C27-C28-C29-C30-C35; Ring 7 = C30-C31-C32-C33-C34-C35; Ring 9 = C12-C13-C14-C15-C16-C17-C18-C19-C20-C25; see Figure 7 of main manuscript.								
PD3								
C10-H10[1]	Cg8	1555.01	2.88	2.87	5.10	142	3.6530(3)	54
C21-H21[1]	Cg7	1565.01	2.96	-2.95	3.79	122	3.5387(3)	29
[1555] = X,Y,Z; [1565] = X,1+Y,Z. Where, CgX = Ring Center-of-Gravity of ring X. Ring 7 = C28-C29-C30-C31-C32-C37; Ring 8 = C32-C33-C34-C35-C36-C37; see Figure 10 of main manuscript.								

Cytotoxicity Study of PD1-PD3.

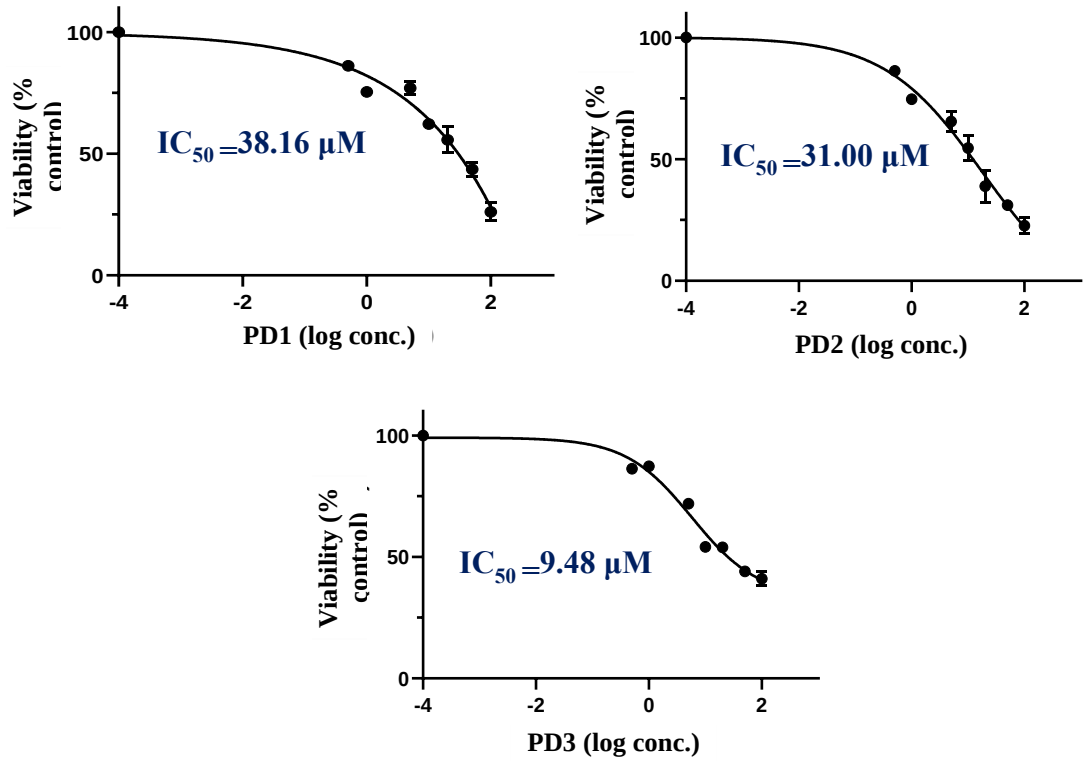
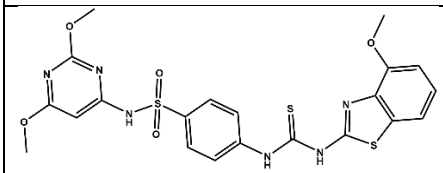
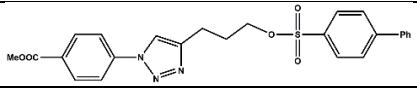
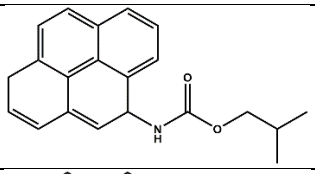
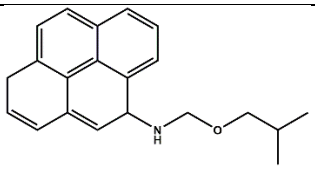
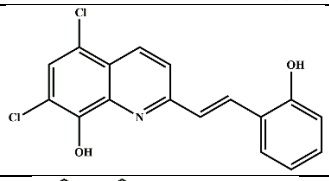
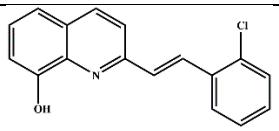
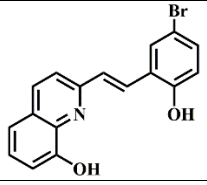
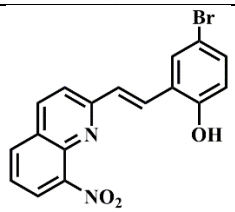
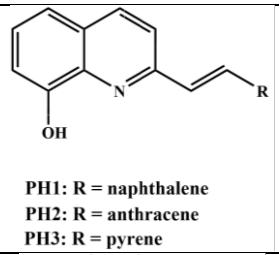
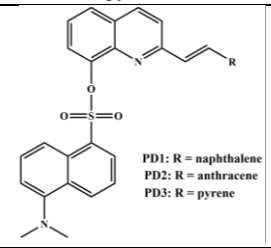


Fig. S21 Growth inhibitory response of PD1-PD3.

Table S7 A comparison of the cytotoxic activities of PH and PD series compounds with similar styryl quinoline and sulfonate derivatives reported in the literature.

Structure	Cell Line; IC_{50}	References
	MCF-7; 47.6 (µg/ml)	11
	HepG2; 46.2 (µM)	12

		HepG2; 31.8 (μM)	13
		HepG2; 39.6 (μM)	
		HeLa; 11.9 (μM)	14
		HCT 116; 9.8 (μM)	15
		HeLa; 2.5 (μM)	16
		HeLa; 2.9 (μM)	16
 PH1: R = naphthalene PH2: R = anthracene PH3: R = pyrene	**PH1**	HepG2; 8.2 (μM)	**Current Work**
	PH2	HepG2; 11.7 (μM)	
	PH3	HepG2; 8.0 (μM)	
 PD1: R = naphthalene PD2: R = anthracene PD3: R = pyrene	**PD1**	HepG2; 38.2 (μM)	
	PD2	HepG2; 31.0 (μM)	
	PD3	HepG2; 9.5 (μM)	

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