Supplementary information

Nematic mesophase enhanced via lateral monofluorine substitution on benzoxazole-liquid crystals

Dingqian Shi^{1,2}, Kun Hu^{1,2}, Pei Chen^{*1,2}, Aiai Gao³, Weisong Du³, Ran Chen^{1,2}, Xinbing Chen^{*1,2}, Zhongwei An^{1,3}

¹Key Laboratory of Applied Surface and Colloid Chemistry of Ministry of Education, Shaanxi Normal University, Xi'an 710062, P R China

²School of Materials Science and Engineering, Shaanxi Normal University, Xi'an 710062, P R China

³Xi'an Modern Chemistry Research Institute, Xi'an 710065, P R China

Table s1. Nematic mesophase range for compounds nPPF(2)Bx and reference compounds I in heating process.*

x	n	Nematic mesophase rang (°C)	
		nPPF(2)Bx	Reference compounds I ^[19]
H	4	0	8.4
	5	12.4	0
	6	18.6	0
	7	27.6	0
	8	22.2	0
	10	21.4	0
CH ₃	4	55.7	73.7
	5	74.2	48.1
	6	96.9	34.8
	7	85.5	22.1
	8	77.1	14.8
	10	53.6	5.7
NO ₂	4	108.4	105.0
	5	107.0	54.7
	6	99.4	30.9
	7	100.8	10.3
	8	14.6	0
	10	0	0

* The onset and peak values are used for transition temperatures of nPPF(2)Bx and reference compounds I, respectively, where a heating and cooling rate of 5 °C min⁻¹ are adopted for DSC measurement.

Table s2. Maxima peaks of UV-vis and fluorescence spectra for nPPF(2)Bx and reference compounds I.

X	UV-vis (nm)		FL (nm)	
	nPPF(2)Bx	Reference compounds I	nPPF(2)Bx	Reference compounds I
H	323	327	395	398
CH ₃	327	329	395	397
NO ₂	331	336	—	—

Note: n=6 for all compounds.

Spectroscopic data for 4-alkoxy-(1,1'-biphenyl)-2'-fluoro-4'-carboxaldehyde (nPPF(2) CHO):

2PPF(2)CHO: White crystals, yield 36%; m.p. 64.3-65.5°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 9.99 (d, J = 1.5 Hz, 1H), 7.62 (m, 5H), 7.00 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.6 Hz, 2H), 1.42 (t, J = 7.2 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3083, 2991, 2941, 2892, 2835, 2745, 2413, 2285, 1930, 1697, 1603, 1512, 1458, 1394, 1308, 1218, 1163, 1101, 1035, 976, 893, 829, 706, 627, 573, 508. EI-MS m/z (rel. int.): 244.17 (M⁺, 67), 216.14 (56), 170.13 (7), 159.12 (16), 133.09 (12).

3PPF(2)CHO: White crystals, yield 51%; m.p. 51.7-52.4°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 9.99 (d, J = 1.5 Hz, 1H), 7.62 (m, 5H), 7.00 (d, J = 8.7 Hz, 2H), 3.98 (t, J = 6.6 Hz, 2H), 1.85 (m, 2H), 1.06 (t, J = 7.2 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3360, 3056, 2957, 2875, 2835, 2730, 2546, 2213, 1907, 1688, 1600, 1515, 1478, 1388, 1240, 1181, 1109, 1036, 1005, 942, 892, 823, 769, 685, 641, 571, 526. EI-MS m/z (rel. int.): 258.17 (M⁺, 39), 216.15 (100), 170.14 (7), 159.12 (9), 133.10 (8).

4PPF(2)CHO: White crystals, yield 46%; m.p. 47.3-48.6°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 9.99 (d, J = 1.5 Hz, 1H), 7.59 (m, 5H), 7.00 (d, J = 8.7 Hz, 2H), 4.02 (t, J = 6.3 Hz, 2H), 1.80 (m, 2H), 1.52 (m, 2H), 0.98 (d, J = 6.9 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3360, 3210, 3060, 2952, 2872, 2838, 2727, 1898, 1689, 1601, 1569, 1513, 1482, 1434, 1379, 1303, 1267, 1223, 1181, 111, 1059, 1019, 946, 889, 818, 769, 676, 634, 568, 509. EI-MS m/z (rel. int.): 272.22 (M⁺, 35), 216.16 (100), 170.14 (6), 159.12 (7), 133.10 (6).

5PPF(2)CHO: White crystals, yield 45%; m.p. 50.0-51.7°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 9.99 (d, J = 1.5 Hz, 1H), 7.63 (m, 5H), 7.00 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.6 Hz, 2H), 1.81 (m, 2H), 1.45 (m, 4H), 0.95 (d, J = 6.9 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3363, 3054, 2938, 2861, 1691, 1603, 1509, 1478, 1380, 1264, 1229, 1181, 1105, 1045, 991, 940, 894, 821, 766, 679, 639, 571, 531. EI-MS m/z (rel. int.): 286.25 (M⁺, 29), 216.15 (100), 170.14 (5), 159.12 (5), 133.10 (4).

6PPF(2)CHO: White crystals, yield 73%; m.p. 58.4-59.9°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 9.99 (d, J = 1.5 Hz, 1H), 7.63 (m, 5H), 6.99 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.6 Hz, 2H), 1.81 (m, 2H), 1.41 (m, 6H), 0.93 (d, J = 6.9 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3364, 3062, 2937, 2861, 2739, 1700, 1600, 1564, 1513, 1476, 1436, 1385, 1252, 1181, 1112, 1025, 939, 821, 741, 693, 630, 562, 528. EI-MS m/z (rel. int.): 300.25 (M⁺, 21), 216.14 (100), 170.13 (5), 159.12 (5), 133.10 (4).

7PPF(2)CHO: White crystals, yield 80%; m.p. 50.6-52.0°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 10.00 (d, J = 1.5 Hz, 1H), 7.62 (m, 5H), 7.00 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.6 Hz, 2H), 1.81 (m,

2H), 1.40 (m, 8H), 0.89 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3360, 3062, 2928, 2858, 1901, 1779, 1686, 1601, 1569, 1518, 1474, 1388, 1255, 1184, 1113, 1005, 971, 886, 818, 746, 634, 559, 531. EI-MS m/z (rel. int.): 314.28 (M^+ , 15), 216.15 (100), 170.14 (4), 159.12 (4), 133.10 (3).

8PPF(2)CHO: White crystals, yield 55%; m.p. 46.6-47.8°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 10.00 (d, $J = 1.5$ Hz, 1H), 7.62 (m, 5H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.01 (t, $J = 6.6$ Hz, 2H), 1.81 (m, 2H), 1.31 (m, 10H), 0.88 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3062, 2922, 2858, 1904, 1779, 1691, 1603, 1569, 1518, 1473, 1391, 1255, 1178, 1113, 1025, 997, 888, 821, 749, 698, 634, 562, 534. EI-MS m/z (rel. int.): 328.30 (M^+ , 18), 216.15 (100), 170.14 (4), 159.12 (3), 133.10 (2).

10PPF(2)CHO: White crystals, yield 53%; m.p. 52.1-53.2°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 10.00 (d, $J = 1.5$ Hz, 1H), 7.62 (m, 5H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.01 (t, $J = 6.3$ Hz, 2H), 1.81 (m, 2H), 1.28 (m, 14H), 0.87 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3063, 2923, 2858, 1904, 1777, 1685, 1600, 1566, 1518, 1470, 1391, 1254, 1183, 1112, 1015, 973, 885, 817, 747, 636, 534. EI-MS m/z (rel. int.): 356.36 (M^+ , 15), 216.17 (100), 170.15 (3), 159.13 (2), 133.11 (2).

Spectroscopic data for Schiff base compounds (nPPF(2)Sx):

2PPF(2)SH: White crystals, yield 76%; m.p. 163.4°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.69 (s, 1H), 7.72 (t, $J = 7.8$ Hz, 2H), 7.55 (d, $J = 8.1$ Hz, 3H), 7.33 (d, $J = 7.8$ Hz, 1H), 7.24 (m, 2H), 7.02 (t, $J = 9.0$ Hz, 3H), 6.92 (d, $J = 7.8$ Hz, 1H), 4.10 (t, $J = 6.9$ Hz, 2H), 1.46 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3289, 3042, 2983, 2923, 2875, 2736, 1689, 1617, 1575, 1481, 1380, 1311, 1237, 1206, 1158, 1098, 1036, 970, 889, 820, 738, 686, 622, 574, 505. EI-MS m/z (rel. int.): 335.29 (M^+ , 100), 188.17 (16), 120.08 (65).

3PPF(2)SH: White crystals, yield 66%; m.p. 162.8°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.69 (s, 1H), 7.72 (t, $J = 8.1$ Hz, 2H), 7.54 (d, $J = 7.2$ Hz, 3H), 7.33 (d, $J = 8.1$ Hz, 1H), 7.24 (m, 2H), 7.02 (t, $J = 8.4$ Hz, 3H), 6.93 (d, $J = 7.5$ Hz, 1H), 3.99 (t, $J = 6.6$ Hz, 2H), 1.85 (m, 2H), 1.07 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3315, 3040, 2937, 2869, 2750, 1893, 1602, 1482, 1420, 1382, 1289, 1241, 1167, 1116, 1017, 969, 891, 812, 744, 672, 619, 568, 525. EI-MS m/z (rel. int.): 349.33 (M^+ , 100), 306.27 (53), 188.18 (24), 120.08 (88).

4PPF(2)SH: White crystals, yield 57%; m.p. 143.0°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.69 (s, 1H), 7.72 (t, $J = 8.1$ Hz, 2H), 7.55 (d, $J = 6.9$ Hz, 3H), 7.33 (d, $J = 7.8$ Hz, 1H), 7.26 (d, $J = 6.0$ Hz, 2H), 7.02 (m, 3H), 6.92 (d, $J = 7.5$ Hz, 1H), 4.03 (t, $J = 6.9$ Hz, 2H), 1.80 (m, 2H), 1.52 (m, 2H),

1.01 (t, J = 7.2 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3320, 3048, 2943, 2866, 1896, 1672, 1604, 1479, 1426, 1382, 1286, 1244, 1170, 1127, 1039, 1000, 966, 889, 818, 744, 665, 617, 568, 526. EI-MS m/z (rel. int.): 363.37 (M⁺, 80), 306.27 (88), 188.19 (324), 120.10 (100).

5PPF(2)SH: White crystals, yield 88%; m.p. 144.3 °C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.69 (s, 1H), 7.72 (t, J = 7.8 Hz, 2H), 7.55 (d, J = 8.4 Hz, 3H), 7.33 (d, J = 7.8 Hz, 1H), 7.21 (d, J = 7.8 Hz, 2H), 7.02 (t, J = 9.0 Hz, 3H), 6.94 (d, J = 7.8 Hz, 1H), 4.02 (t, J = 6.6 Hz, 2H), 1.83 (m, 2H), 1.45 (m, 4H), 0.95 (t, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3326, 3051, 2932, 2862, 1677, 1603, 1482, 1430, 1380, 1287, 1240, 1176, 1133, 1062, 1014, 969, 889, 815, 741, 668, 616, 565, 528. EI-MS m/z (rel. int.): 377.38 (M⁺, 52), 306.26 (91), 188.17 (33), 120.11 (100).

6PPF(2)SH: White crystals, yield 72%; m.p. 127.0 °C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.69 (s, 1H), 7.72 (t, J = 7.2 Hz, 2H), 7.55 (d, J = 8.1 Hz, 3H), 7.33 (d, J = 7.2 Hz, 1H), 7.21 (d, J = 7.5 Hz, 2H), 7.02 (t, J = 9.0 Hz, 3H), 6.92 (t, J = 8.1 Hz, 1H), 4.02 (t, J = 6.6 Hz, 2H), 1.81 (m, 2H), 1.36 (m, 6H), 0.92 (t, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3323, 3053, 2926, 2855, 1686, 1610, 1519, 1482, 1431, 1382, 1289, 1240, 1173, 1125, 1028, 988, 889, 815, 744, 668, 616, 571, 529. EI-MS m/z (rel. int.): 391.36 (M⁺, 81), 306.23 (100), 188.15 (29), 120.07 (78).

7PPF(2)SH: White crystals, yield 46%; m.p. 130.7 °C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.69 (s, 1H), 7.72 (t, J = 7.2 Hz, 2H), 7.55 (d, J = 8.4 Hz, 3H), 7.33 (d, J = 7.2 Hz, 1H), 7.21 (d, J = 7.8 Hz, 2H), 7.01 (t, J = 8.7 Hz, 3H), 6.92 (t, J = 7.5 Hz, 1H), 4.02 (t, J = 6.3 Hz, 2H), 1.81 (m, 2H), 1.34 (m, 8H), 0.89 (d, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3326, 3057, 2924, 2855, 1674, 1603, 1482, 1424, 1382, 1288, 1240, 1175, 1033, 999, 888, 818, 741, 667, 616, 571, 525. EI-MS m/z (rel. int.): 405.37 (M⁺, 100), 306.24 (97), 188.17 (28), 120.08 (74).

8PPF(2)SH: White crystals, yield 78%; m.p. 120.5 °C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.69 (s, 1H), 7.72 (t, J = 8.1 Hz, 2H), 7.54 (t, J = 8.1 Hz, 3H), 7.33 (d, J = 8.1 Hz, 1H), 7.21 (d, J = 8.4 Hz, 2H), 7.01 (t, J = 8.7 Hz, 3H), 6.92 (t, J = 8.1 Hz, 1H), 4.02 (t, J = 6.6 Hz, 2H), 1.80 (m, 2H), 1.29 (m, 10H), 0.88 (d, J = 6.9 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3320, 3053, 2917, 2852, 1893, 1773, 1683, 1604, 1479, 1428, 1388, 1289, 1240, 1173, 1127, 1036, 991, 886, 815, 741, 665, 616, 571, 529. EI-MS m/z (rel. int.): 419.31 (M⁺, 67), 306.21 (100), 188.12 (25), 120.09 (57).

10PPF(2)SH: White crystals, yield 68%; m.p. 117.5 °C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.69 (s, 1H), 7.72 (t, J = 7.8 Hz, 2H), 7.55 (d, J = 8.4 Hz, 3H), 7.33 (d, J = 7.8 Hz, 1H), 7.21 (d, J = 8.1 Hz, 2H), 7.01 (t, J = 8.7 Hz, 3H), 6.92 (t, J = 8.1 Hz, 1H), 4.02 (t, J = 6.6 Hz, 2H), 1.80 (m, 2H),

1.28 (m, 14H), 0.88 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3324, 3053, 2914, 2849, 1677, 1604, 1482, 1428, 1388, 1286, 1240, 1175, 1030, 888, 818, 744, 667, 616, 571, 528. EI-MS m/z (rel. int.): 447.33 (M^+ , 67), 306.21 (100), 188.17 (24), 120.11 (53).

2PPF(2)SM: White crystals, yield 55%; m.p. 126.8°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.70 (t, $J = 8.1$ Hz, 2H), 7.54 (t, $J = 7.8$ Hz, 3H), 7.14 (s, 1H), 7.02 (t, $J = 8.7$ Hz, 4H), 6.92 (d, $J = 8.4$ Hz, 1H), 4.10 (t, $J = 6.9$ Hz, 2H), 2.33 (s, 3H), 1.46 (t, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3396, 3036, 2980, 2923, 2877, 2735, 1686, 1612, 1493, 1388, 1322, 1232, 1163, 1101, 1036, 976, 945, 894, 812, 744, 704, 579, 531. EI-MS m/z (rel. int.): 349.37 (M^+ , 100), 320.29 (6), 188.21 (12), 134.15 (75).

3PPF(2)SM: White crystals, yield 72%; m.p. 125.5°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.70 (t, $J = 7.8$ Hz, 2H), 7.54 (t, $J = 7.8$ Hz, 3H), 7.14 (s, 1H), 7.02 (t, $J = 8.7$ Hz, 4H), 6.92 (d, $J = 8.1$ Hz, 1H), 3.99 (t, $J = 6.6$ Hz, 2H), 2.33 (s, 3H), 1.84 (m, 2H), 1.07 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3329, 3034, 2951, 2866, 2753, 1887, 1603, 1561, 1499, 1420, 1373, 1286, 1238, 1167, 1116, 1011, 946, 894, 810, 735, 671, 571, 523. EI-MS m/z (rel. int.): 363.34 (M^+ , 89), 320.27 (53), 188.16 (22), 134.14 (100).

4PPF(2)SM: White crystals, yield 57%; m.p. 126.1°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.71 (t, $J = 8.1$ Hz, 2H), 7.53 (t, $J = 7.5$ Hz, 3H), 7.13 (s, 1H), 7.02 (t, $J = 9.0$ Hz, 4H), 6.92 (d, $J = 8.1$ Hz, 1H), 4.03 (t, $J = 6.3$ Hz, 2H), 2.33 (s, 3H), 1.82 (m, 2H), 1.52 (m, 2H), 1.00 (t, $J = 7.5$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3332, 3032, 2915, 2858, 2735, 1606, 1555, 1501, 1425, 1377, 1283, 1238, 1169, 1121, 1067, 1025, 965, 886, 814, 738, 672, 574, 519. EI-MS m/z (rel. int.): 377.40 (M^+ , 47), 320.31 (50), 188.20 (19), 134.13 (75).

5PPF(2)SM: White crystals, yield 71%; m.p. 110.3°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.66 (s, 1H), 7.70 (t, $J = 7.8$ Hz, 2H), 7.53 (t, $J = 7.8$ Hz, 3H), 7.13 (s, 1H), 7.02 (t, $J = 9.0$ Hz, 4H), 6.92 (d, $J = 8.1$ Hz, 1H), 4.02 (t, $J = 6.6$ Hz, 2H), 2.33 (s, 3H), 1.82 (m, 2H), 1.42 (m, 4H), 0.95 (t, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3335, 3033, 2920, 2858, 1678, 1602, 1555, 1499, 1426, 1377, 1280, 1238, 1167, 1115, 1042, 991, 950, 889, 814, 735, 676, 633, 574, 523. EI-MS m/z (rel. int.): 391.37 (M^+ , 84), 320.27 (80), 188.18 (21), 134.13 (100).

6PPF(2)SM: White crystals, yield 84%; m.p. 91.9°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.71 (t, $J = 7.8$ Hz, 2H), 7.53 (t, $J = 7.5$ Hz, 3H), 7.14 (s, 1H), 7.01 (t, $J = 9.0$ Hz, 4H), 6.92 (d,

$J = 8.1$ Hz, 1H), 4.02 (t, $J = 6.3$ Hz, 2H), 2.33 (s, 3H), 1.82 (m, 2H), 1.40 (m, 6H), 0.92 (t, $J = 6.3$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3324, 3032, 2918, 2852, 1689, 1603, 1558, 1498, 1424, 1379, 1288, 1243, 1169, 1124, 1073, 1047, 994, 940, 891, 815, 733, 670, 631, 570, 522. EI-MS m/z (rel. int.): 405.37 (M^+ , 100), 320.24 (75), 188.16 (19), 134.12 (77).

7PPF(2)SM: White crystals, yield 63%; m.p. 94.5°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.71 (t, $J = 7.5$ Hz, 2H), 7.53 (t, $J = 7.2$ Hz, 3H), 7.13 (s, 1H), 7.01 (t, $J = 9.0$ Hz, 4H), 6.92 (d, $J = 8.1$ Hz, 1H), 4.02 (t, $J = 6.6$ Hz, 2H), 2.34 (s, 3H), 1.81 (m, 2H), 1.35 (m, 8H), 0.90 (t, $J = 6.3$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3377, 3034, 2926, 2855, 1604, 1492, 1416, 1388, 1246, 1178, 1125, 1033, 1002, 883, 815, 730, 587, 526. EI-MS m/z (rel. int.): 419.23 (M^+ , 7), 320.31 (7), 134.13 (8).

8PPF(2)SM: White crystals, yield 64%; m.p. 101.2°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.71 (t, $J = 7.5$ Hz, 2H), 7.55 (d, $J = 8.1$ Hz, 3H), 7.14 (s, 1H), 7.00 (d, $J = 9.0$ Hz, 4H), 6.92 (d, $J = 8.1$ Hz, 1H), 4.02 (t, $J = 6.6$ Hz, 2H), 2.33 (s, 3H), 1.82 (m, 2H), 1.31 (m, 10H), 0.88 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3386, 3340, 3036, 2921, 2855, 1689, 1606, 1495, 1424, 1388, 1283, 1246, 1177, 1121, 1035, 993, 954, 880, 817, 732, 638, 585, 527. EI-MS m/z (rel. int.): 433.33 (M^+ , 93), 320.21 (100), 188.15 (22), 134.07 (74).

10PPF(2)SM: White crystals, yield 66%; m.p. 77.7°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (s, 1H), 7.71 (t, $J = 7.5$ Hz, 2H), 7.55 (d, $J = 8.1$ Hz, 3H), 7.14 (s, 1H), 7.02 (t, $J = 9.0$ Hz, 4H), 6.92 (d, $J = 8.7$ Hz, 1H), 4.02 (t, $J = 6.3$ Hz, 2H), 2.33 (s, 3H), 1.80 (m, 2H), 1.28 (m, 14H), 0.88 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3366, 3032, 2924, 2856, 1674, 1603, 1552, 1498, 1427, 1385, 1246, 1188, 1121, 1016, 871, 814, 727, 576, 531. EI-MS m/z (rel. int.): 461.47 (M^+ , 33), 320.31 (34), 188.18 (11), 134.13 (34).

2PPF(2)SN: Pale yellow crystals, yield 67%; m.p. 207.9°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.81 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.7$ Hz, $J_2 = 9.0$ Hz, 1H), 7.75 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 9.0$ Hz, 2H), 4.11 (t, $J = 6.6$ Hz, 2H), 1.46 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3209, 3085, 3042, 2985, 2918, 2872, 2554, 1617, 1578, 1493, 1444, 1396, 1332, 1271, 1215, 1156, 1109, 1048, 980, 872, 812, 738, 653, 579, 517.

3PPF(2)SN: Pale yellow crystals, yield 75%; m.p. 188.5°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.81 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m,

3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 3.99(t, $J = 6.6$ Hz, 2H), 1.85 (m, 2H), 1.07 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3270, 3077, 2963, 2929, 2872, 1898, 1783, 1592, 1504, 1442, 1391, 1334, 1257, 1161, 1076, 973, 894, 824, 744, 693, 585, 526.

4PPF(2)SN: Pale yellow crystals, yield 46%; m.p. 175.8°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.80 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.03 (t, $J = 6.3$ Hz, 2H), 1.81 (m, 2H), 1.54 (m, 2H), 1.00 (t, $J = 7.5$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3278, 3076, 2926, 2866, 1600, 1508, 1442, 1391, 1334, 1255, 1159, 1073, 1028, 968, 897, 825, 744, 689, 588, 528.

5PPF(2)SN: Pale yellow crystals, yield 62%; m.p. 161.8°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.80 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.83 (m, 2H), 1.45 (m, 4H), 0.93 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3263, 3076, 2934, 2861, 1592, 1503, 1442, 1394, 1334, 1255, 1161, 1024, 982, 892, 820, 741, 699, 627, 579, 523.

6PPF(2)SN: Pale yellow crystals, yield 76%; m.p. 146.7°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.81 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.03 (t, $J = 6.6$ Hz, 2H), 1.83 (m, 2H), 1.37 (m, 6H), 0.93 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3256, 3070, 2923, 2855, 1680, 1612, 1580, 1512, 1439, 1390, 1337, 1257, 1161, 1079, 1042, 988, 891, 827, 747, 704, 659, 588, 523.

7PPF(2)SN: Pale yellow crystals, yield 69%; m.p. 138.5°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.80 (s, 1H), 8.28 (d, $J = 2.4$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.4$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.81 (m, 2H), 1.34 (m, 8H), 0.89 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3261, 3071, 2921, 2852, 1686, 1607, 1504, 1442, 1394, 1337, 1264, 1158, 1039, 897, 827, 749, 710, 662, 588, 523.

8PPF(2)SN: Pale yellow crystals, yield 62%; m.p. 137.0°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.82 (s, 1H), 8.29 (d, $J = 2.7$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m, 3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.83 (m, 2H), 1.30 (m, 10H), 0.90 (t, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3275, 3068, 2915, 2855, 1694, 1604, 1502, 1437, 1391, 1342, 1257, 1156, 1042, 994, 900, 821, 747, 667, 582, 523.

10PPF(2)SN: Pale yellow crystals, yield 69%; m.p. 139.0°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.81 (s, 1H), 8.28 (d, $J = 2.7$ Hz, 1H), 8.17 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 7.76 (m, 3H), 7.58 (m,

3H), 7.12 (d, $J = 9.0$ Hz, 1H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.82 (m, 2H), 1.28 (m, 14H), 0.88 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3294, 3076, 2926, 2852, 1587, 1507, 1445, 1394, 1343, 1260, 1175, 1124, 1031, 985, 897, 820, 744, 644, 525. MS (MALDI-TOF) m/z calculated for $\text{C}_{29}\text{H}_{33}\text{FN}_2\text{O}_4$ (M^+): 492.58, Found: 492.43.

Spectroscopic data for benzoxazole compounds (**nPPF(2) Bx**):

2PPF(2)BH: White crystals, yield 70%; m.p. 158.9°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.42 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3056, 2980, 2931, 2889, 2568, 1924, 1609, 1566, 1478, 1444, 1396, 1286, 1229, 1163, 1112, 1042, 971, 931, 858, 806, 747, 624, 579, 519. EI-MS m/z (rel. int.): 333.22 (M^+ , 100), 305.19 (96), 276.18 (20), 157.09 (6). Elemental analysis: Calc. for $\text{C}_{21}\text{H}_{16}\text{FNO}_2$: C 75.66, H 4.84, N 4.20; Found: C 75.83, H 4.54, N 4.29.

3PPF(2)BH: White crystals, yield 66%; m.p. 119.3°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.01 (d, $J = 8.7$ Hz, 2H), 3.99 (t, $J = 6.6$ Hz, 2H), 1.84 (m, 2H), 1.07 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3069, 2966, 2932, 2864, 1942, 1785, 1689, 1607, 1555, 1476, 1397, 1351, 1303, 1246, 1176, 1119, 1062, 1014, 977, 937, 877, 824, 747, 639, 588, 540. EI-MS m/z (rel. int.): 347.23 (M^+ , 52), 305.18 (100), 276.18 (11), 157.09 (3). Elemental analysis: Calc. for $\text{C}_{22}\text{H}_{18}\text{FNO}_2$: C 76.07, H 5.22, N 4.03; Found: C 76.47, H 5.12, N 4.19.

4PPF(2)BH: White crystals, yield 84%; m.p. 129.5°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.03 (t, $J = 6.6$ Hz, 2H), 1.81 (m, 2H), 1.51 (m, 2H), 1.00 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3060, 2952, 2867, 1692, 1603, 1553, 1476, 1402, 1353, 1303, 1243, 1177, 1118, 1035, 996, 939, 882, 822, 740, 639, 582, 537. EI-MS m/z (rel. int.): 361.25 (M^+ , 33), 305.17 (100), 276.18 (10), 157.09 (3). Elemental analysis: Calc. for $\text{C}_{23}\text{H}_{20}\text{FNO}_2$: C 76.44, H 5.58, N 3.87; Found: C 76.63, H 5.14, N 3.98.

5PPF(2)BH: White crystals, yield 86%; m.p. 108.6°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 1H), 7.57 (m, 4H), 7.38 (dd, $J_1 = 3.0$ Hz, $J_2 = 5.7$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.83 (m, 2H), 1.44 (m, 4H), 0.95 (t, $J = 6.6$

Hz, 3H). IR (KBr, pellet, cm^{-1}): 3054, 2934, 2864, 1601, 1553, 1522, 1474, 1399, 1295, 1240, 1169, 1115, 1058, 1013, 937, 883, 823, 741, 641, 557, 522. EI-MS m/z (rel. int.): 375.38 (M^+ , 22), 305.27 (100), 276.26 (10), 157.14 (3).

6PPF(2)BH: White crystals, yield 87%; m.p. 108.2°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.6$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.82 (m, 2H), 1.41 (m, 6H), 0.92 (t, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3054, 2937, 2858, 1685, 1601, 1553, 1515, 1474, 1394, 1348, 1295, 1237, 1137, 1175, 1116, 1059, 1022, 991, 939, 883, 829, 738, 645, 554. EI-MS m/z (rel. int.): 389.33 (M^+ , 20), 305.21 (100), 276.20 (9), 157.11 (2). Elemental analysis: Calc. for $\text{C}_{25}\text{H}_{24}\text{FNO}_2$: C 77.10, H 6.21, N 3.60; Found: C 77.18, H 6.31, N 3.63.

7PPF(2)BH: White crystals, yield 93%; m.p. 89.5°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.0$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.0$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.82 (m, 2H), 1.34 (m, 8H), 0.89 (t, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3051, 2926, 2855, 1691, 1604, 1552, 1476, 1445, 1399, 1351, 1298, 1243, 1178, 1119, 1039, 1002, 935, 883, 821, 738, 636, 576, 534. EI-MS m/z (rel. int.): 403.29 (M^+ , 26), 305.17 (100), 276.15 (9), 157.08 (2). Elemental analysis: Calc. for $\text{C}_{26}\text{H}_{26}\text{FNO}_2$: C 77.39, H 6.49, N 3.47; Found: C 77.06, H 6.10, N 3.51.

8PPF(2)BH: White crystals, yield 94%; m.p. 100.3°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.05 (m, 2H), 7.79 (dd, $J_1 = 3.0$ Hz, $J_2 = 5.7$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.82 (m, 2H), 1.31 (m, 10H), 0.89 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3051, 2938, 2855, 1683, 1604, 1553, 1473, 1443, 1402, 1300, 1246, 1178, 1118, 1039, 996, 933, 883, 821, 741, 638, 576, 533. EI-MS m/z (rel. int.): 417.35 (M^+ , 29), 305.20 (100), 276.18 (9), 157.11 (1). Elemental analysis: Calc. for $\text{C}_{27}\text{H}_{28}\text{FNO}_2$: C 77.67, H 6.76, N 3.35; Found: C 77.67, H 6.93, N 3.30.

10PPF(2)BH: White crystals, yield 89%; m.p. 96.5°C. ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.04 (m, 2H), 7.79 (dd, $J_1 = 3.6$ Hz, $J_2 = 6.0$ Hz, 1H), 7.58 (m, 4H), 7.38 (dd, $J_1 = 3.3$ Hz, $J_2 = 6.0$ Hz, 2H), 7.00 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.82 (m, 2H), 1.28 (m, 14H), 0.88 (d, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3054, 2921, 2852, 1692, 1600, 1552, 1473, 1394, 1348, 1294, 1240, 1175, 1115, 1016, 939, 883, 825, 738, 644, 559. EI-MS m/z (rel. int.): 445.41 (M^+ , 24), 305.21 (100), 276.20 (10). Elemental analysis: Calc. for $\text{C}_{29}\text{H}_{32}\text{FNO}_2$: C 78.17, H 7.24, N 3.14;

Found: C 78.30, H 7.08, N 3.11.

2PPF(2)BM: White crystals, yield 80%; m.p. 177.3°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.02 (m, 2H), 7.57 (t, J = 8.1 Hz, 4H), 7.46 (d, J = 8.4 Hz, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 9.0 Hz, 2H), 4.01 (t, J = 6.3 Hz, 2H), 2.49 (s, 3H), 1.42 (t, J = 7.2 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3056, 2986, 2932, 2881, 2565, 2403, 2023, 1936, 1876, 1811, 1725, 1609, 1572, 1476, 1402, 1333, 1277, 1161, 1118, 1043, 971, 928, 860, 797, 750, 703, 630, 585, 528. EI-MS m/z (rel. int.): 347.23 (M⁺, 100), 319.21 (76), 290.20 (17), 213.13 (10), 78.10 (5). Elemental analysis: Calc. for C₂₂H₁₈FNO₂: C 76.06, H 5.22, N 4.03; Found: C 75.69, H 5.34, N 4.06.

3PPF(2)BM: White crystals, yield 88%; m.p. 143.8°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.02 (m, 2H), 7.57 (t, J = 7.2 Hz, 4H), 7.46 (d, J = 8.4 Hz, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.7 Hz, 2H), 3.98 (t, J = 6.3 Hz, 2H), 2.49 (s, 3H), 1.84 (m, 2H), 1.06 (t, J = 7.5 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3068, 3033, 2970, 2937, 2875, 1938, 1890, 1753, 1600, 1553, 1475, 1396, 1299, 1249, 1172, 1118, 1050, 948, 879, 806, 723, 638, 581, 530. EI-MS m/z (rel. int.): 361.25 (M⁺, 45), 319.20 (100), 290.19 (11), 213.11 (9), 78.06 (5). Elemental analysis: Calc. for C₂₃H₂₀FNO₂: C 76.44, H 5.58, N 3.87; Found: C 76.63, H 5.14, N 3.96.

4PPF(2)BM: White crystals, yield 78%; m.p. 144.3°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.02 (m, 2H), 7.56 (t, J = 8.1 Hz, 4H), 7.46 (d, J = 8.1 Hz, 1H), 7.18 (d, J = 7.5 Hz, 1H), 6.99 (d, J = 9.0 Hz, 2H), 4.02 (t, J = 6.3 Hz, 2H), 2.49 (s, 3H), 1.80 (m, 2H), 1.52 (m, 2H), 0.99 (t, J = 7.2 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3031, 2952, 2866, 2752, 1893, 1601, 1553, 1474, 1402, 1298, 1243, 1173, 1118, 1061, 1024, 948, 880, 800, 727, 641, 582, 544. EI-MS m/z (rel. int.): 375.36 (M⁺, 28), 319.27 (100), 290.26 (10), 213.18 (8), 78.10 (5). Elemental analysis: Calc. for C₂₄H₂₂FNO₂: C 76.78, H 5.91, N 3.73; Found: C 76.91, H 5.61, N 3.69.

5PPF(2)BM: White crystals, yield 88%; m.p. 111.8°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.03 (m, 2H), 7.57 (t, J = 8.4 Hz, 4H), 7.46 (d, J = 8.4 Hz, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.4 Hz, 2H), 4.01 (t, J = 6.3 Hz, 2H), 2.49 (s, 3H), 1.81 (m, 2H), 1.43 (m, 4H), 0.95 (t, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3028, 2938, 2866, 1676, 1601, 1553, 1478, 1405, 1340, 1294, 1249, 1170, 1115, 1056, 1008, 942, 875, 800, 721, 641, 579, 520. EI-MS m/z (rel. int.): 389.40 (M⁺, 25), 319.29 (100), 290.28 (10), 213.20 (7), 78.10 (4). Elemental analysis: Calc. for C₂₅H₂₄FNO₂: C 77.10, H 6.21, N 3.60; Found: C 76.95, H 6.40, N 3.58.

6PPF(2)BM: White crystals, yield 87%; m.p. 88.4°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.03 (m, 2H), 7.57 (t, J = 8.4 Hz, 4H), 7.47 (d, J = 8.1 Hz, 1H), 7.18 (d, J = 8.1 Hz, 1H), 7.00 (d, J = 8.4 Hz, 2H), 4.02 (t, J = 6.6 Hz, 2H), 2.50 (s, 3H), 1.82 (m, 2H), 1.39 (m, 6H), 0.92 (t, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3036, 2943, 2861, 1603, 1550, 1478, 1433, 1402, 1334, 1300, 1249, 1177, 1118, 1059, 1029, 996, 942, 883, 817, 721, 647, 579, 539. EI-MS m/z (rel. int.): 403.35 (M⁺, 30), 319.23 (100), 290.22 (10), 213.15 (6), 78.09 (3). Elemental analysis: Calc. for C₂₆H₁₈FNO₂: C 77.39, H 6.49, N 3.47; Found: C 77.40, H 6.88, N 3.49.

7PPF(2)BM: White crystals, yield 92%; m.p. 84.7°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.03 (m, 2H), 7.57 (t, J = 8.1 Hz, 4H), 7.46 (d, J = 8.4 Hz, 1H), 7.18 (d, J = 8.1 Hz, 1H), 7.00 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.3 Hz, 2H), 2.50 (s, 3H), 1.82 (m, 2H), 1.42 (m, 8H), 0.89 (d, J = 6.6 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3031, 2938, 2858, 1734, 1603, 1547, 1479, 1396, 1337, 1297, 1249, 1173, 1118, 1039, 1002, 945, 880, 817, 721, 647, 579, 534. EI-MS m/z (rel. int.): 417.32 (M⁺, 38), 319.19 (100), 290.17 (9), 213.11 (5), 78.06 (3). Elemental analysis: Calc. for C₂₇H₂₈FNO₂: C 77.67, H 6.76, N 3.35; Found: C 77.67, H 6.68, N 3.26.

8PPF(2)BM: White crystals, yield 87%; m.p. 88.7°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.03 (m, 2H), 7.57 (t, J = 7.5 Hz, 4H), 7.46 (d, J = 6.6 Hz, 1H), 7.18 (d, J = 8.4 Hz, 1H), 7.00 (d, J = 8.7 Hz, 2H), 4.01 (t, J = 6.6 Hz, 2H), 2.51 (s, 3H), 1.82 (m, 2H), 1.37 (m, 10H), 0.90 (t, J = 6.3 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3025, 2934, 2855, 1694, 1603, 1555, 1475, 1430, 1297, 1252, 1178, 1118, 1042, 996, 937, 880, 811, 721, 644, 582, 537. EI-MS m/z (rel. int.): 431.37 (M⁺, 38), 319.21 (100), 290.20 (10), 213.14 (5), 78.10 (3). Elemental analysis: Calc. for C₂₈H₃₀FNO₂: C 77.93, H 7.01, N 3.25; Found: C 77.74, H 7.27, N 3.11.

10PPF(2)BM: White crystals, yield 95%; m.p. 92.5°C. ¹H-NMR (300 MHz, CDCl₃, TMS): 8.03 (m, 2H), 7.58 (m, 4H), 7.46 (d, J = 8.4 Hz, 1H), 7.21 (m, 1H), 7.02 (t, J = 8.7 Hz, 2H), 4.03 (t, J = 6.6 Hz, 2H), 2.52 (s, 3H), 1.81 (m, 2H), 1.31 (m, 14H), 0.90 (d, J = 6.3 Hz, 3H). IR (KBr, pellet, cm⁻¹): 3045, 2923, 2852, 1728, 1603, 1550, 1476, 1399, 1343, 1299, 1252, 1178, 1118, 1022, 948, 883, 809, 724, 647, 579, 536. EI-MS m/z (rel. int.): 459.40 (M⁺, 24), 319.21 (100), 290.20 (9), 213.15 (5), 78.10 (2). Elemental analysis: Calc. for C₃₀H₃₄FNO₂: C 78.40, H 7.46, N 3.05; Found: C 78.52, H 7.61, N 3.01.

2PPF(2)BN: Pale yellow crystals, yield 91%; m.p. 179.9°C. ¹H-NMR (300 MHz, CDCl₃, TMS):

8.67(d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.1$ Hz, $J_2 = 9.0$ Hz, 1H), 8.07 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.11 (t, $J = 6.6$ Hz, 2H), 1.46 (t, $J = 7.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3088, 2991, 2940, 2887, 2569, 2032, 1894, 1887, 1770, 1606, 1566, 1518, 1478, 1399, 1334, 1288, 1226, 1163, 1113, 1038, 891, 854, 811, 738, 698, 632, 573. EI-MS m/z (rel. int.): 378.22 (M^+ , 60), 350.18 (100), 304.17 (29), 91.04 (31). Elemental analysis: Calc. for $C_{21}H_{15}FN_2O_4$: C 66.66, H 4.00, N 7.40; Found: C 66.82, H 4.34, N 7.69.

3PPF(2)BN: Pale yellow crystals, yield 93%; m.p. 161.0°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.67(d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.1$ Hz, $J_2 = 9.0$ Hz, 1H), 8.06 (m, 3H), 7.58 (m, 3H), 7.02 (d, $J = 8.1$ Hz, 2H), 3.99 (t, $J = 6.6$ Hz, 2H), 1.85 (m, 2H), 1.07 (t, $J = 7.5$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3101, 2965, 2934, 2872, 1898, 1765, 1609, 1522, 1476, 1436, 1340, 1302, 1249, 1181, 1118, 1059, 971, 940, 880, 821, 741, 690, 648, 585, 523. EI-MS m/z (rel. int.): 392.23 (M^+ , 28), 350.18 (100), 304.17 (20), 91.04 (17). Elemental analysis: Calc. for $C_{22}H_{17}FN_2O_4$: C 67.34, H 4.37, N 7.14; Found: C 67.52, H 4.66, N 7.24.

4PPF(2)BN: Pale yellow crystals, yield 74%; m.p. 128.8°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.67(d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.1$ Hz, $J_2 = 9.0$ Hz, 1H), 8.06 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.83 (m, 2H), 1.52 (m, 2H), 1.00 (t, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3099, 2934, 2866, 1901, 1771, 1606, 1530, 1476, 1402, 1339, 1302, 1252, 1181, 1122, 1039, 1000, 939, 888, 821, 738, 693, 648, 588, 565, 526. EI-MS m/z (rel. int.): 406.36 (M^+ , 26), 350.27 (100), 304.26 (17), 91.08 (17). Elemental analysis: Calc. for $C_{23}H_{19}FN_2O_4$: C 67.97, H 4.71, N 6.89; Found: C 68.21, H 4.80, N 6.96.

5PPF(2)BN: Pale yellow crystals, yield 90%; m.p. 119.7°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.67(d, $J = 1.8$ Hz, 1H), 8.35 (dd, $J_1 = 1.8$ Hz, $J_2 = 9.0$ Hz, 1H), 8.06 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.4$ Hz, 2H), 4.03 (t, $J = 6.3$ Hz, 2H), 1.83 (m, 2H), 1.42 (m, 4H), 0.95 (t, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3104, 2945, 2861, 1674, 1606, 1527, 1479, 1436, 1402, 1351, 1303, 1248, 1178, 1119, 1056, 1011, 939, 886, 818, 735, 687, 651, 571, 529. EI-MS m/z (rel. int.): 420.38 (M^+ , 24), 350.27 (100), 304.26 (15), 91.09 (13). Elemental analysis: Calc. for $C_{24}H_{21}FN_2O_4$: C 68.56, H 5.03, N 6.66; Found: C 68.49, H 5.65, N 6.57.

6PPF(2)BN: Pale yellow crystals, yield 91%; m.p. 124.8°C . $^1\text{H-NMR}$ (300 MHz, CDCl_3 , TMS): 8.67 (d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.1$ Hz, $J_2 = 9.0$ Hz, 1H), 8.06 (m, 3H), 7.57 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.03 (t, $J = 6.6$ Hz, 2H), 1.82 (m, 2H), 1.37 (m, 6H), 0.91 (d, $J = 6.9$ Hz, 3H).

IR (KBr, pellet, cm^{-1}): 3098, 2928, 2858, 1674, 1606, 1527, 1482, 1396, 1346, 1309, 1249, 1178, 1118, 1033, 996, 945, 883, 821, 735, 693, 651, 568, 531. EI-MS m/z (rel. int.): 434.33 (M^+ , 21), 350.22 (100), 304.20 (13), 91.07 (9). Elemental analysis: Calc. for $\text{C}_{24}\text{H}_{21}\text{FN}_2\text{O}_4$: C 69.11, H 5.34, N 6.45; Found: C 69.19, H 5.72, N 6.50.

7PPF(2)BN: Pale yellow crystals, yield 54%; m.p. 109.9°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (d, $J = 2.1$ Hz, 1H), 8.35 (d, $J = 9.0$ Hz, 1H), 8.07 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.6$ Hz, 2H), 1.82 (m, 2H), 1.33 (m, 8H), 0.90 (d, $J = 6.6$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3102, 2931, 2855, 1776, 1609, 1530, 1478, 1399, 1345, 1305, 1246, 1178, 1118, 1039, 945, 883, 820, 738, 690, 647, 568, 528. EI-MS m/z (rel. int.): 448.30 (M^+ , 14), 350.18 (100), 304.18 (12), 91.07 (10). Elemental analysis: Calc. for $\text{C}_{26}\text{H}_{25}\text{FN}_2\text{O}_4$: C 69.63, H 5.62, N 6.24; Found: C 69.65, H 5.66, N 6.12.

8PPF(2)BN: Pale yellow crystals, yield 67%; m.p. 103.3°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 8.07 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.1$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.82 (m, 2H), 1.32 (m, 10H), 0.89 (t, $J = 6.9$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3096, 2926, 2855, 1777, 1607, 1561, 1522, 1473, 1436, 1340, 1306, 1249, 1172, 1121, 1042, 1005, 934, 883, 824, 741, 693, 644, 599, 528. EI-MS m/z (rel. int.): 462.34 (M^+ , 11), 350.18 (100), 304.19 (11), 91.09 (9). Elemental analysis: Calc. for $\text{C}_{27}\text{H}_{27}\text{FN}_2\text{O}_4$: C 70.12, H 5.88, N 6.06; Found: C 69.77, H 6.14, N 5.95.

10PPF(2)BN: Pale yellow crystals, yield 80%; m.p. 97.2°C . ^1H -NMR (300 MHz, CDCl_3 , TMS): 8.67 (d, $J = 2.1$ Hz, 1H), 8.35 (dd, $J_1 = 2.4$ Hz, $J_2 = 9.0$ Hz, 1H), 8.08 (m, 3H), 7.58 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 4.02 (t, $J = 6.3$ Hz, 2H), 1.82 (m, 2H), 1.29 (m, 14H), 0.89 (t, $J = 4.2$ Hz, 3H). IR (KBr, pellet, cm^{-1}): 3105, 2921, 2852, 1694, 1609, 1533, 1479, 1433, 1340, 1303, 1249, 1175, 1121, 1036, 942, 883, 815, 735, 644, 587, 520. MS (MALDI-TOF) m/z calculated for $\text{C}_{29}\text{H}_{31}\text{FN}_2\text{O}_4$ (M^+): 490.57, Found: 490.17. Elemental analysis: Calc. for $\text{C}_{29}\text{H}_{31}\text{FN}_2\text{O}_4$: C 71.00, H 6.37, N 5.71; Found: C 71.17, H 6.42, N 5.58.