Supplementary material (ESI) for Journal of Materials Chemistry

Supplementary data

A new family of bis-DCM based dopants for red OLEDs

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[2,6-Bis-(2-{4-(diethylamino)-2-butoxyphenyl}vinyl)-4H-pyran-4-ylidene]propanedinitrile (bis-DCMNEtOBu, 7) A solution of (2,6-dimetyl-4H-pyran-4-ylidine)propanedinitrile (0.94g, 5.5 mmol), 4-(diethylamino)-2-butoxybenzaldehyde (**1)** (3.0 g, 12 mmol), piperidine (0.6 mL) and n-buthanol (30 mL), was refluxed for 1 day. After completing the reaction, the reactant was cooled to room temperature and excess methanol was added to obtain a red solid. Then, reprecipitation in methanol/methylene chloride yielded the red solid of **7** (2.7 g, 77 %). ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.65 (d, *J*=15.8 Hz, 2H), 7.28 (d, *J*=8.8 Hz, 2H), 6.67 (d, *J*=15.8 Hz, 2H), 6.36 (s, 2H), 6.25 (dd, *J*=8.8, 2.2 Hz, 2H), 6.11 (s, 2H), 4.03 (t, *J*=6.6 Hz, 4H), 3.41 (q, *J*=7.1 Hz, 8H), 1.85 (m, 4H), 1.54 (m, 4H), 1.20 (t, *J*=7.1 Hz, 12H), 0.96 (t, *J*=7.4 Hz, 6H). ^{13}C-NMR (100 MHz): δ 160.3, 160.0, 156.3, 150.6, 134.5, 131.4, 117.0, 113.4, 111.8, 104.7, 104.4, 94.7, 67.7, 54.0, 44.6, 31.3, 19.4, 13.9, 12.7. Anal. calcd. for $C_{40}H_{50}N_4O_3$: C, 75.68; H, 7.94; N, 8.83. Found: C, 75.67; H, 8.34; N, 9.36.

[2,6-Bis-(2-{4-(diethylamino)-2-methylphenyl}vinyl)-4H-pyran-4-ylidene]propanedinitrile (bis-DCMNEtMe, 8) Compound **8** was prepared by analogy to **7** using **4**-(diethylamino)-2-methylbenzaldehyde (**2**) instead of 4-(diethylamino)-2-butoxybenzaldehyde (**1**) in 66 % yield. ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.73 (d, *J*=15.7 Hz, 2H), 7.49 (d, *J*=8.9 Hz, 2H), 6.54 (d, *J*=8.8 Hz, 2H), 6.43 (s, 2H), 6.40 (s, 2H), 6.38 (d, *J*=15.7 Hz,

2H), 3.40 (q, *J*=7.1 Hz, 8H), 2.41 (s, 6H), 1.20 (t, *J*=7.1 Hz, 12H). ^{13}C-NMR (100 MHz): δ 159.3, 156.0, 149.2, 139.4, 134.7, 127.5, 120.3, 116.4, 112.7, 112.5, 110.0, 105.2, 56.1, 44.4, 20.3, 12.7. Anal. calcd. for $C_{34}H_{38}N_4O$: C, 78.73; H, 7.38; N, 10.80. Found: C, 79.21; H, 7.83; N, 11.51.

[2,6-Bis-(2-{1-(4-methylphenyl)-1,2,3,4-tetrahydroquinoline-6-yl}vinyl)-4H-pyran-4-ylidene]propanedinitrile (bis-DCMQPhMe, 9) Compound **9** was prepared by analogy to **7** using 1-(4-methylphenyl)-1,2,3,4-tetrahydroquinoline-6-carbaldehyde (**4**) instead of 4-(diethylamino)-2-butoxybenzaldehyde (**1**) in 78 % yield. ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.36 (d, *J*=15.8 Hz, 2H), 7.21 (d, *J*=8.3 Hz, 6H), 7.13 (d, *J*=8.3 Hz, 4H), 7.08 (dd, *J*=8.7, 2.1 Hz, 2H), 6.52 (d, *J*=6.4 Hz, 2H), 6.51 (s, 2H), 6.46 (d, *J*=15.8 Hz, 2H), 3.64 (t, *J*=5.6, 4H), 2.89 (t, *J*=6.3, 4H), 2.37 (s, 6H), 2.08 (m, 4H). ^{13}C-NMR (100 MHz) 159.3, 156.0, 147.4, 144.1, 138.1, 135.4, 130.4, 129.3, 127.1, 126.2, 123.5, 123.0, 116.3, 114.1, 113.1, 105.3, 56.0, 51.6, 27.8, 22.1, 21.0. Anal. calcd. for $C_{44}H_{38}N_4O$: C, 82.73; H, 6.00; N, 8.77. Found: C, 82.96; H, 6.29; N, 9.34.

[2,6-Bis-(2-{1-hexyl-1,2,3,4-tetrahydroquinoline-6-yl}vinyl)-4H-pyran-4-ylidene]propanedinitrile (bis-DCMQHex, 10) Compound **10** was prepared by analogy to **7** using 1-hexyl-1,2,3,4-tetrahydroquinoline-6-carbaldehyde **(6)** instead of 4-(diethylamino)-2-butoxybenzaldehyde (**1**) in 59 % yield. ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.34 (d, *J*=15.8 Hz 2H), 7.23 (dd, *J*=8.6, 1.9 Hz 2H), 7.15 (s, 2H), 6.53 (d, *J*=8.7 Hz, 2H), 6.46 (s, 2H), 6.40 (d, *J*=15.7 Hz, 2H), 3.35 (t, *J*=5.5 Hz, 4H), 3.28 (t, *J*=7.5 Hz, 4H), 2.76 (t, *J*=6.1 Hz, 4H), 1.95 (m, 4H), 1.60 (m, 4H), 1.37 - 1.32 (br, 12H), 0.89 (t, *J*=6.8 Hz, 6H). ^{13}C-NMR (100 MHz): δ 159.5, 156.1, 147.4, 138.3, 128.7, 128.4, 122.3, 121.7, 116.5, 112.1, 110.2, 104.9, 56.0, 51.4, 49.6, 31.7, 28.1, 26.8, 26.4, 22.6, 21.8, 14.0. Anal. calcd. for $C_{42}H_{50}N_4O$: C, 80.47; H, 8.04; N, 8.94. Found: C, 79.04; H, 7.99; N, 9.34.