Electronic Supplementary Information

for

Metallophosphors of platinum with distinct main-group elements: A versatile approach towards color tuning and white-light emission with superior efficiency/color quality/brightness trade-offs

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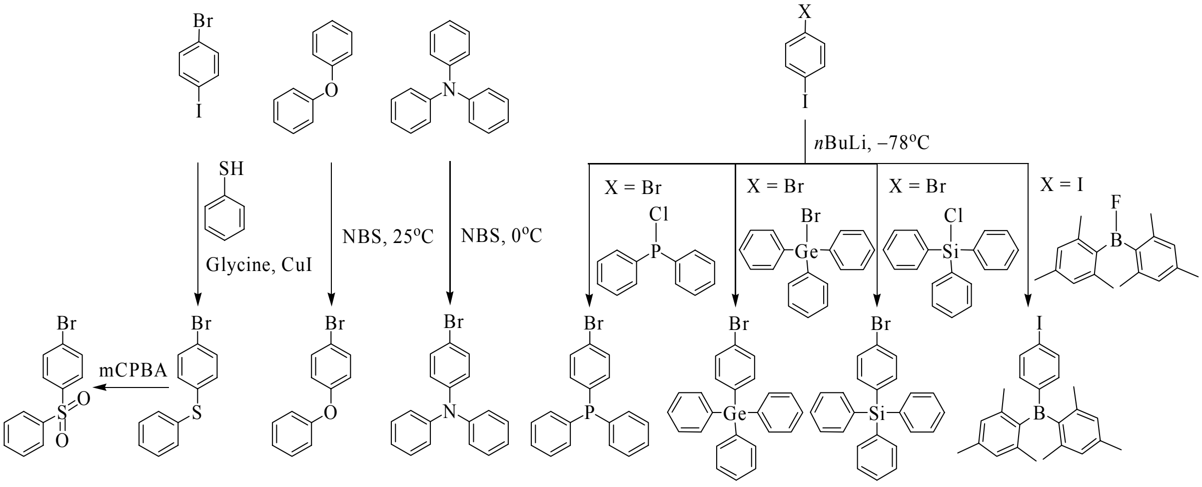
Synthesis details

The compounds (4-bromophenyl)diphenylamine,[S1] 1-bromo-4-phenoxybenzene,[S2] 1-bromo-4-phenylsulfanylbenzene,[S3] and (4-iodophenyl)-bis(2,4,6-trimethylphenyl)borane[S4] were synthesized following the literature methods and the synthetic routes are shown in Scheme S1.



Scheme S1. The synthesis of the main-group element-bridged aryl halides.

Synthesis of (4-bromophenyl)diphenylphosphine. Under a N_2 atmosphere, *n*-butyllithium (1.6 M in hexane) (8.12 mL, 12.99 mmol) was added slowly to a solution of 1-bromo-4-iodobenzene (3.50 g, 12.37 mmol) in dry ether (50 mL) at −78 °C. After the addition, the reaction mixture was maintained at −78 °C for 45 min. Then, chlorodiphenylphosphine (2.73 g, 12.37 mmol) was added to the reaction flask with a syringe at the same temperature. The reaction mixture was allowed to warm to room temperature (rt) and was stirred overnight. Water (20 mL) was added and the mixture was stirred for 30 min. The mixture was subsequently extracted with CH_2Cl_2 (3 × 50 mL). The combined organic phase was washed with water (3 × 100 mL). The organic phase was separated and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by column chromatography eluting with hexane. The product was obtained as a white crystalline solid (3.21 g, 76%). Further purification can be achieved by recrystallization from hexane. ^{1}H NMR (400 MHz, CDCl$_3$): δ (ppm) 7.48–7.46 (m, 2H, Ar), 7.38–7.29 (m, 10H, Ar), 7.19–7.15 (m, 2H, Ar); ^{31}P NMR (161.9 MHz, CDCl$_3$): δ (ppm) −5.51. FAB-MS (m/z): 341 [M]$^+$; elemental analysis calcd (%) for $C_{18}H_{14}BrP$: C 63.37, H 4.14; found: C 63.10, H 3.99.

Synthesis of (4-bromophenyl)triphenylsilane. To a solution of 1-bromo-4-iodobenzene (4.00 g, 14.14 mmol) in dry ether (80 mL), *n*-butyllithium (1.6 M in hexane, 9.28 mL, 14.85 mmol) was added slowly at −78 °C under N_2 atmosphere. After the addition, the reaction mixture was kept at −78 °C for 45 min. Then, chlorotriphenylsilane (4.17 g, 14.14 mmol) was added to the reaction flask in one portion at the same temperature. The reaction mixture was allowed to warm to rt slowly and stirred overnight. Water (20 mL) was added and the mixture was stirred for 45 min. The mixture was then extracted with CH_2Cl_2 (3 × 60 mL). The combined organic phase was washed with water (3 × 150 mL). The organic phase was separated and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by column chromatography using hexane/CH_2Cl_2 (15:1, v/v) as eluent. The product was obtained as white crystals (3.52 g, 60%). ^{1}H NMR (400 MHz, CDCl$_3$): δ (ppm) 7.56–7.50 (m, 8H, Ar), 7.47–7.36 (m, 11H, Ar); ^{13}C NMR (67.5 MHz, CDCl$_3$): δ (ppm) 137.80, 136.19, 133.49, 133.16, 130.98, 129.69, 127.88, 124.64 (Ar); FAB-MS (m/z): 415 [M]$^+$; elemental analysis calcd (%) for $C_{24}H_{19}BrSi$: C 69.39, H 4.61; found: C 69.20, H 4.48.

Synthesis of (4-bromophenyl)triphenylgermanium. Under a N_2 atmosphere, *n*-butyllithium (1.6 M in hexane) (6.96 mL, 11.13 mmol) was added slowly at −78 °C to a solution of 1-bromo-4-iodobenzene (3.00 g, 10.60 mmol) in dry ether (50 mL). After the addition, the reaction mixture was kept at −78 °C for 45 min. Chlorotriphenylgermanium (4.07 g, 10.60 mmol) was then added to the reaction flask in one portion at the same temperature. The reaction mixture was allowed to warm to rt slowly and stirred overnight. Water (40 mL) was added and the mixture was stirred for 45 min. After the mixture was extracted with CH_2Cl_2 (3 × 60 mL), the combined organic phase was washed with water (3 × 150 mL). The organic phase was separated and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by column chromatography with hexane/CH_2Cl_2 (12:1, v/v) as the eluent. The product was obtained as white crystals (3.75 g, 77%). ^{1}H NMR (270 MHz, $CDCl_3$): δ (ppm) 7.54–7.51 (m, 8H, Ar), 7.43–7.24 (m, 11H, Ar); ^{13}C NMR (67.5 MHz, $CDCl_3$): δ (ppm) 136.82, 135.78, 135.17, 135.04, 131.31, 129.20, 128.28, 123.99 (Ar); FAB-MS (m/z): 460 $[M]^+$; elemental analysis calcd (%) for $C_{24}H_{19}BrGe$: C 62.68, H 4.16; found: C 62.55, H 4.20.

Synthesis of 1-benzenesulfonyl-4-bromobenzene. *m*-Chloroperoxybenzoic acid (1.47 g, 8.51 mmol) was added slowly to a solution of 1-bromo-4-phenylsulfanylbenzene (0.50 g, 1.89 mmol) in chloroform (50 mL) at 0 °C. After the addition, the reaction mixture was warmed to rt slowly and stirred for 2 days to ensure completion of the reaction. Chloroform (50 mL) was added and the mixture was washed with 2 M sodium thiosulfate solution (3 × 100 mL) and water (3 × 100 mL) successively. The organic phase was separated and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by column chromatography using CH_2Cl_2 as eluent. The product was obtained as white crystals (0.45 g, 80%). ^{1}H NMR (270 MHz, $CDCl_3$): δ (ppm) 7.93–7.91 (m, 2H, Ar), 7.80–7.78 (m, 2H, Ar), 7.63−7.48 (m, 5H, Ar); ^{13}C NMR (67.5 MHz, $CDCl_3$): δ (ppm) 140.98, 140.53, 133.40, 132.50, 129.34, 129.09, 128.36, 127.54 (Ar); FAB-MS (m/z): 297 $[M]^+$; elemental analysis calcd (%) for $C_{12}H_9BrSO_2$: C 48.50, H 3.05; found: C 48.24, H 2.96.

Synthesis of 2-(4-diphenylphosphinophenyl)pyridine. (4-Bromophenyl)diphenyl-phosphine (0.50 g, 1.47 mmol) and 2-(tributylstannyl)pyridine (0.60 g, 1.62 mmol) were mixed in dry toluene (50 mL) under a N_2 atmosphere, and $Pd(PPh_3)_4$ (85 mg, 0.074 mmol) was then added to the solution. The resulting mixture was stirred at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (200 mL) was added followed by washing with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (3:1, v/v). The title product was obtained as a white semi-solid (0.33 g, 65%). ^{1}H NMR (270 MHz, $CDCl_3$): δ (ppm) 8.59 (d, *J* = 3.8 Hz, 1H, Ar), 7.86 (d, *J* = 8.6 Hz, 2H, Ar), 7.65–7.59 (m, 2H, Ar), 7.34–7.12 (m, 13H, Ar); ^{31}P NMR (161.9 MHz, $CDCl_3$): δ (ppm) –4.96; FAB-MS (m/z): 339 $[M]^+$; elemental analysis calcd (%) for $C_{23}H_{18}NP$: C 81.40, H 5.35, N 4.13; found: C 81.22, H 5.18, N 4.08.

Synthesis of L-PO. 2-(4-Diphenylphosphinophenyl)pyridine (0.57 g, 1.68 mmol) was dissolved in CH_2Cl_2 (20 mL). Then, 30% H_2O_2 (0.25 mL) was added. The reaction mixture was stirred vigorously for 10 min and water (20 mL) was poured into the reaction flask. After the mixture was extracted with CH_2Cl_2 (3 × 50 mL), the combined organic phase was dried over $MgSO_4$. The solvent was removed under vacuum and the desired product was obtained as a viscous oil which gradually crystallized on standing (0.58 g, 97%). ^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.64–8.62 (m, 1H, Ar), 8.05–8.02 (m, 2H, Ar), 7.76–7.62 (m, 8H, Ar), 7.51–7.38 (m, 6H, Ar), 7.21–7.18 (m, 1H, Ar); ^{31}P NMR (161.9 MHz, $CDCl_3$): δ (ppm) 30.10; FAB-MS (m/z): 355 $[M]^+$; elemental analysis calcd (%) for $C_{23}H_{18}NOP$: C 77.74, H 5.11, N 3.94; found: C 77.60, H 5.15, N 3.77.

Synthesis of L-SO$_2$. Under an inert atmosphere, 1-benzenesulfonyl-4-bromobenzene (0.53 g, 1.78 mmol) and 2-(tributylstannyl)pyridine (0.72 g, 1.96 mmol) were mixed in dry toluene (30 mL). Pd(PPh$_3$)$_4$ (100 mg, 0.087 mmol) was added as a catalyst for the Stille coupling reaction. The reaction was then allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (100 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/ethyl acetate (30:1, v/v). The title product was obtained as a white solid (0.44 g, 83%). ^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.71 (d, *J* = 4.8 Hz, 1H, Ar), 8.13 (d, *J* = 8.4 Hz, 2H, Ar), 8.04 (d, *J* = 8.8 Hz, 2H, Ar), 7.98–7.96 (m, 2H, Ar), 7.81–7.74 (m, 2H, Ar), 7.59–7.49 (m, 3H, Ar), 7.32–7.29 (m, 1H, Ar); ^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 155.28, 149.99, 143.97, 141.55, 141.49, 137.02, 133.21, 129.28, 128.14, 127.71, 127.61, 123.26, 121.05 (Ar); FAB-MS (m/z): 295 $[M]^+$; elemental analysis calcd (%) for $C_{17}H_{13}NO_2S$: C 69.13, H 4.44, N 4.74; found: C 69.20, H 4.29, N 4.56.

Synthesis of L-S. Under an inert atmosphere, 1-bromo-4-phenylsulfanylbenzene (0.55 g, 2.07 mmol) and 2-(tributylstannyl)pyridine (0.84 g, 2.28 mmol) were mixed in dry toluene (35 mL). Pd(PPh$_3$)$_4$ (116 mg, 0.10 mmol) was added as a catalyst for the Stille coupling reaction. The reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (5:1, v/v). The title product was obtained as a white solid (0.37 g, 67%). ^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.69–8.67 (m, 1H, Ar), 7.92 (d, *J* = 8.0 Hz, 2H, Ar), 7.77–7.69 (m, 2H, Ar), 7.42–7.39 (m, 4H, Ar), 7.35–7.21 (m, 4H, Ar); ^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 156.58, 149.68, 137.89, 137.24, 136.79, 135.07, 131.47, 130.69, 129.27, 127.54, 127.34, 122.19, 120.33 (Ar); FAB-MS (m/z): 263 $[M]^+$; elemental analysis calcd (%) for $C_{17}H_{13}NS$: C 77.53, H 4.98, N 5.32; found: C 77.39, H 5.03, N 5.10.

Synthesis of L-O. Under an inert atmosphere, 1-bromo-4-phenoxybenzene (0.60 g, 2.41 mmol) and 2-(tributylstannyl)pyridine (0.98 g, 2.65 mmol) were mixed in dry toluene (40 mL). $Pd(PPh_3)_4$ (139 mg, 0.12 mmol) was added and the reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (4:1, v/v). The title product was obtained as a white solid (0.45 g, 76%). ^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.68–8.67 (m, 1H, Ar), 7.93 (m, 2H, Ar), 7.76–7.68 (m, 2H, Ar), 7.37 (t, J = 8.0 Hz, 2H, Ar), 7.22–7.06 (m, 6H, Ar); ^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 158.19, 156.78, 149.58, 136.71, 134.36, 129.78, 128.37, 126.86, 123.51, 121.74, 120.07, 119.13, 118.77 (Ar); FAB-MS (m/z): 247 $[M]^+$; elemental analysis calcd (%) for $C_{17}H_{13}NO$: C 82.57, H 5.30, N 5.66; found: C 82.44, H 5.19, N 5.70.

Synthesis of L-N. Under a N_2 atmosphere, (4-bromophenyl)diphenylamine (0.65 g, 2.00 mmol) and 2-(tributylstannyl)pyridine (0.81 g, 2.20 mmol) were added in dry toluene (35 mL) in the presence of $Pd(PPh_3)_4$ (116 mg, 0.10 mmol). The reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL) and the organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (3:1, v/v). The title product was obtained as a white solid (0.48 g, 75%). ^{1}H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.66–8.64 (m, 1H, Ar), 7.88–7.85 (m, 2H, Ar), 7.73–7.65 (m, 2H, Ar), 7.30–7.25 (m, 4H, Ar), 7.19–7.12 (m, 7H, Ar), 7.07–7.03 (m, 2H, Ar); ^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 157.05, 149.56, 148.66, 147.45, 136.62, 133.09, 129.28, 127.70, 124.70, 123.19, 121.44, 119.84 (Ar); FAB-MS (m/z): 322 $[M]^+$; elemental analysis calcd (%) for $C_{23}H_{18}N_2$: C 85.68, H 5.63, N 8.69; found: C 85.52, H 5.47, N 8.65.

Synthesis of L-Ge. Under a N_2 atmosphere, (4-bromophenyl)triphenylgermanium (0.50 g, 1.09 mmol) and 2-(tributylstannyl)pyridine (0.44 g, 1.20 mmol) were added in dry toluene (35 mL) in the presence of $Pd(PPh_3)_4$ (64 mg, 0.055 mmol). The reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (3:1, v/v). The title product was obtained as a white solid (0.40 g, 81%). ^{1}H NMR (270 MHz, $CDCl_3$): δ (ppm) 8.70 (d, J = 4.6 Hz, 1H, Ar), 8.00 (d, J = 7.8 Hz, 2H, Ar), 7.75–7.54 (m, 10H, Ar), 7.45–7.36 (m, 9H, Ar), 7.25–7.20 (m, 1H, Ar);. ^{13}C NMR (67.5 MHz, $CDCl_3$): δ (ppm) 157.23, 149.61, 140.02, 136.99, 136.62, 135.84, 135.73, 135.27, 129.05, 128.19, 126.54, 122.14, 120.55 (Ar); FAB-MS (m/z): 459 $[M]^+$; elemental analysis calcd (%) for $C_{29}H_{23}NGe$: C 76.04, H 5.06, N 3.06; found: C 75.88, H 5.12, N 2.95.

Synthesis of L-Si. Under a N_2 atmosphere, (4-bromophenyl)triphenylsilane (0.45 g, 1.08 mmol) and 2-(tributylstannyl)pyridine (0.44 g, 1.20 mmol) were added in dry toluene (30 mL) in the presence of $Pd(PPh_3)_4$ (64 mg, 0.055 mmol). The reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and

CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (3:1, v/v). The title product was obtained as a white solid (0.29 g, 65%). ^1H NMR (270 MHz, $CDCl_3$): δ (ppm) 8.70 (d, *J* = 4.6 Hz, 1H, Ar), 8.00 (d, *J* = 8.1 Hz, 2H, Ar), 7.74–7.59 (m, 10H, Ar), 7.48–7.35 (m, 9H, Ar), 7.25–7.20 (m, 1H, Ar); ^{13}C NMR (67.6 MHz, $CDCl_3$): δ (ppm) 157.19, 149.62, 140.38, 136.75, 136.61, 136.27, 134.99, 133.94, 129.53, 127.80, 126.17, 122.19, 120.61 (Ar); FAB-MS (m/z): 413 $[M]^+$; elemental analysis calcd (%) for $C_{29}H_{23}NSi$: C 84.22, H 5.61, N 3.39; found: C 84.02, H 5.48, N 3.30.

Synthesis of L-B. Under a N_2 atmosphere, (4-iodophenyl) -bis(2,4,6-trimethylphenyl)borane (0.55 g, 1.22 mmol) and 2-(tributylstannyl)pyridine (0.49 g, 1.34 mmol) were added in dry toluene (35 mL) in the presence of $Pd(PPh_3)_4$ (70 mg, 0.061 mmol). The reaction was allowed to proceed at 110 °C for 24 h. After cooling to rt, the reaction mixture was poured into a separating funnel and CH_2Cl_2 (150 mL) was added. The mixture was washed with water (3 × 100 mL). The organic phase was dried over $MgSO_4$. The solvent was then removed and the residue was purified by column chromatography eluting with CH_2Cl_2/hexane (3:1, v/v). The title product was obtained as a white solid (0.33 g, 68%). ^1H NMR (400 MHz, $CDCl_3$): δ (ppm) 8.72–8.70 (m, 1H, Ar), 7.97 (d, *J* = 8.4 Hz, 2H, Ar), 7.78–7.76 (m, 2H, Ar), 7.64–7.62 (m, 2H, Ar), 7.27–7.24 (m, 1H, Ar), 6.84 (s, 4H, Ar), 2.32 (s, 6H, Mes), 2.03 (s, 12H, Mes); ^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 157.17, 149.76, 146.36, 142.31, 141.69, 140.85, 138.71, 136.78, 128.17, 126.39, 122.47, 121.02 (Ar), 23.45, 21.22 (Mes); FAB-MS (m/z): 403 $[M]^+$; elemental analysis calcd (%) for $C_{29}H_{30}NB$: C 86.35, H 7.50, N 3.47; found: C 86.11, H 7.60, N 3.29.

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Table S1 The performance of all electrophosphorescent OLEDs based on our Pt$^{\text{II}}$ phosphors.

Device	Phosphor dopant	$V_{\text{turn-on}}$ /V	Luminance L /cd m^{-2}	η_{ext} /%	η_{L} /cd A^{-1}	η_{p} /lm W^{-1}	λ_{max} /nm [d]
A1	**Pt-B** (4 wt.-%)	6.5	34721 (19.5)[a]	9.52 (12.1)	30.00 (12.1)	8.36 (10.9)	542, 580
			4451[b]	7.06	22.24	4.55	(0.46, 0.53)
			14004[c]	4.46	14.03	2.51	
A2	**Pt-B** (6 wt.-%)	6.9	27482 (20.0)	8.71 (12.5)	27.43 (12.5)	7.30 (11.5)	542, 580
			4216	6.70	21.10	4.11	(0.46, 0.53)
			13781	4.38	13.80	2.33	
A3	**Pt-B** (8 wt.-%)	7.5	22741 (19.9)	4.66 (13.3)	14.68 (13.3)	3.70 (11.5)	542, 580
			2688	4.27	13.46	2.79	(0.46, 0.53)
			9793	3.12	9.81	1.76	
A4	**Pt-B** (10 wt.-%)	6.7	23754 (15.3)	4.90 (13.3)	15.44 (13.3)	3.94 (11.9)	542, 580
			2876	4.55	14.34	3.02	(0.46, 0.53)
			10220	3.25	10.24	1.88	
B1	**Pt-Si** (4 wt.-%)	4.7	14366 (13.9)	2.99 (6.7)	7.74 (6.7)	3.63 (6.7)	448, 496, 532,
			1332	2.58	6.67	2.18	572
			4928	1.91	4.93	1.34	(0.28, 0.44)
B2	**Pt-Si** (6 wt.-%)	4.7	16720 (14.5)	3.43 (7.5)	8.27 (7.5)	3.79 (5.9)	446, 496, 532,
			1425	2.95	7.11	2.16	584, 610
			5433	2.25	5.43	1.43	(0.39, 0.44)
B3	**Pt-Si** (8 wt.-%)	4.5	14957 (14.3)	3.16 (7.1)	7.62 (7.1)	3.41 (5.7)	448, 496, 532,
			1307	2.72	6.56	2.09	586, 607
			4964	2.06	4.97	1.33	(0.39, 0.45)
B4	**Pt-Si** (10 wt.-%)	4.3	18156 (13.9)	3.51 (5.7)	8.47 (5.7)	4.79 (5.3)	446, 496, 532,
			1407	2.92	7.04	2.30	585, 604
			5383	2.24	5.39	1.46	(0.40, 0.46)
C1	**Pt-Ge** (4 wt.-%)	4.3	12540 (13.5)	2.64 (5.9)	5.98 (5.9)	3.71 (4.9)	450, 492, 528,
			1024	2.27	5.13	1.72	572, 604
			3968	1.75	3.97	1.12	(0.35, 0.41)
C2	**Pt-Ge** (6 wt.-%)	4.5	12350 (13.7)	2.60 (5.7)	6.18 (5.7)	3.64 (5.1)	453, 492, 528,
			1050	2.21	5.26	1.77	576, 601
			4071	1.72	4.08	1.16	(0.36, 0.42)
C3	**Pt-Ge** (8 wt.-%)	4.5	17153 (14.3)	4.02 (5.1)	8.49 (5.1)	5.23 (5.1)	450, 492, 531,
			1258	2.97	6.29	2.01	612
			4921	2.33	4.92	1.33	(0.46, 0.43)
C4	**Pt-Ge** (10 wt.-%)	4.1	15264 (12.7)	4.13 (4.9)	8.27 (4.9)	5.48 (4.7)	448, 492, 531,
			1178	2.95	5.91	2.14	609
			4562	2.28	4.57	1.38	(0.47, 0.43)
D1	**Pt-N** (4 wt.-%)	3.5	11720 (13.9)	8.50 (5.3)	29.74 (5.3)	19.73 (4.3)	542, 572
			2526	3.62	12.65	4.26	(0.44, 0.55)

			6265	1.79	6.27	1.74	
D2	**Pt-N** (6 wt.-%)	3.5	12607 (13.9)	7.61 (5.3)	26.62 (5.3)	17.76 (4.5)	542, 572
			2499	3.58	12.54	4.30	(0.44, 0.55)
			6407	1.84	6.42	1.81	
D3	**Pt-N** (8 wt.-%)	3.5	10494 (13.1)	6.67 (5.7)	23.35 (5.7)	14.03 (5.1)	542, 572
			2213	3.17	11.09	3.86	(0.44, 0.55)
			5671	1.62	5.68	1.64	
D4	**Pt-N** (10 wt.-%)	3.5	12355 (12.9)	6.83 (5.3)	23.88 (5.3)	20.01 (3.7)	542, 572
			2378	3.40	11.88	4.50	(0.44, 0.55)
			5986	1.71	6.00	1.82	
E1	**Pt-PO** (4 wt.-%)	3.9	23361 (14.1)	7.92 (6.1)	22.06 (6.1)	13.64 (3.9)	502, 540, 576
			3149	5.67	15.81	4.78	(0.38, 0.54)
			10145	3.66	10.18	2.66	
E2	**Pt-PO** (6 wt.-%)	4.1	26359 (14.3)	6.86 (7.1)	19.07 (7.1)	9.41 (5.5)	502, 540, 576
			2964	5.35	14.88	4.49	(0.38, 0.54)
			10197	3.67	10.21	2.61	
E3	**Pt-PO** (8 wt.-%)	3.9	26448 (14.3)	5.12 (7.9)	14.27 (7.9)	8.00 (4.7)	502, 540, 576
			2508	4.51	12.55	3.78	(0.38, 0.54)
			9122	3.28	9.11	2.33	
E4	**Pt-PO** (10 wt.-%)	3.9	28038 (13.7)	4.51 (8.5)	12.55 (8.5)	6.20 (5.3)	502, 540, 576
			2362	4.24	11.80	3.58	(0.38, 0.54)
			9147	3.29	9.15	2.33	
F1	**Pt-O** (4 wt.-%)	7.7	3510 (16.7)	1.31 (10.9)	2.58 (10.9)	0.82 (8.3)	451, 484, 519,
			480	1.21	2.40	0.63	555
			1733	0.88	1.74	0.38	(0.26, 0.33)
F2	**Pt-O** (6 wt.-%)	4.9	5450 (14.1)	4.14 (4.9)	8.78 (4.9)	5.63 (4.9)	444, 484, 520,
			836	1.98	4.19	1.13	570
			2937	1.39	2.94	0.66	(0.32, 0.34)
F3	**Pt-O** (8 wt.-%)	5.7	4512 (14.7)	2.52 (5.9)	5.35 (5.9)	2.93 (5.7)	444, 484, 520,
			670	1.58	3.36	0.90	564
			2399	1.13	2.40	0.55	(0.30, 0.34)
F4	**Pt-O** (10 wt.-%)	4.9	7466 (14.7)	5.09 (4.9)	11.42 (4.9)	7.32 (4.9)	448, 487, 524,
			989	2.21	4.94	1.37	587
			3445	1.54	3.44	0.80	(0.40, 0.42)
G1	**Pt-S** (4 wt.-%)	4.3	14593 (14.3)	4.01 (6.9)	11.20 (6.9)	6.40 (5.1)	450, 508, 540
			1718	3.08	8.58	2.78	(0.33, 0.51)
			5795	2.07	5.81	1.52	
G2	**Pt-S** (6 wt.-%)	4.1	21490 (14.3)	6.66 (5.7)	16.77 (5.7)	10.08 (4.5)	455, 508, 544,
			2351	4.67	11.77	3.70	585
			8023	3.19	8.03	2.13	(0.39, 0.50)
G3	**Pt-S** (8 wt.-%)	4.3	20418 (14.9)	4.94 (6.7)	13.85 (6.7)	8.16 (4.9)	450, 508, 544,
			2186	3.90	10.95	3.25	584

			7584	2.70	7.58	1.86	(0.40, 0.52)
G4	**Pt-S** (10 wt.-%)	3.9	30593 (14.7)	5.92 (7.3)	13.80 (7.3)	6.58 (6.5)	452, 508, 550,
			2474	5,31	12.40	3.81	597
			9593	4.11	9.58	2.46	(0.46, 0.48)
H1	**Pt-SO$_2$** (4 wt.-%)	4.7	27121 (17.5)	8.35 (8.7)	19.59 (8.7)	7.83 (7.1)	507, 545, 589
			3162	6.74	15.81	3.88	(0.43, 0.51)
			10746	4.57	10.75	2.17	
H2	**Pt-SO$_2$** (6 wt.-%)	4.9	26234 (16.7)	4.63 (11.1)	10.87 (11.1)	3.63 (8.1)	509, 545, 590
			2085	4.43	10.41	2.63	(0.43, 0.51)
			8316	3.55	8.34	1.79	
H3	**Pt-SO$_2$** (8 wt.-%)	4.7	26840 (16.1)	4.67 (10.5)	10.96 (10.5)	3.38 (9.7)	504, 541, 584
			2146	4.56	10.72	2.84	(0.43, 0.50)
			8636	3.68	8.66	1.92	
H4	**Pt-SO$_2$** (10 wt.-%)	4.9	18120 (16.1)	2.83 (11.1)	5.05 (11.1)	1.55 (9.7)	510, 547, 631
			992	2.80	5.00	1.32	(0.47, 0.48)
			4290	2.41	4.29	0.96	

[a] Maximum values of the devices. Values in parentheses are the voltages at which they were obtained. [b] Values collected at 20 mA cm^{-2}. [c] Values collected at 100 mA cm^{-2}. [d] Values were collected at 5-6 V and CIE coordinates (x, y) are shown in parentheses.

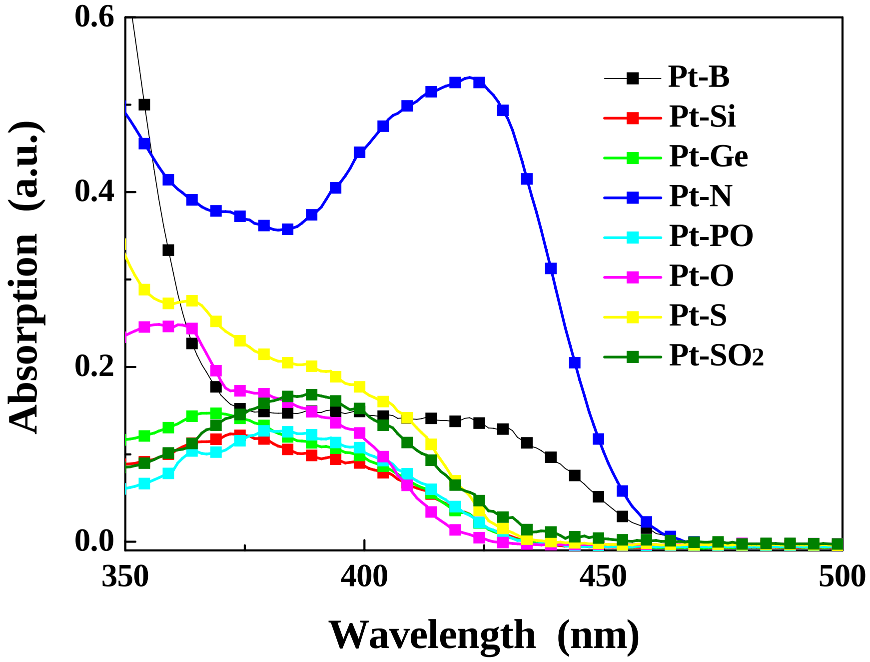

Fig. S1 An expanded view of the UV/Vis spectra in the visible region for the new platinum complexes at 293 K.

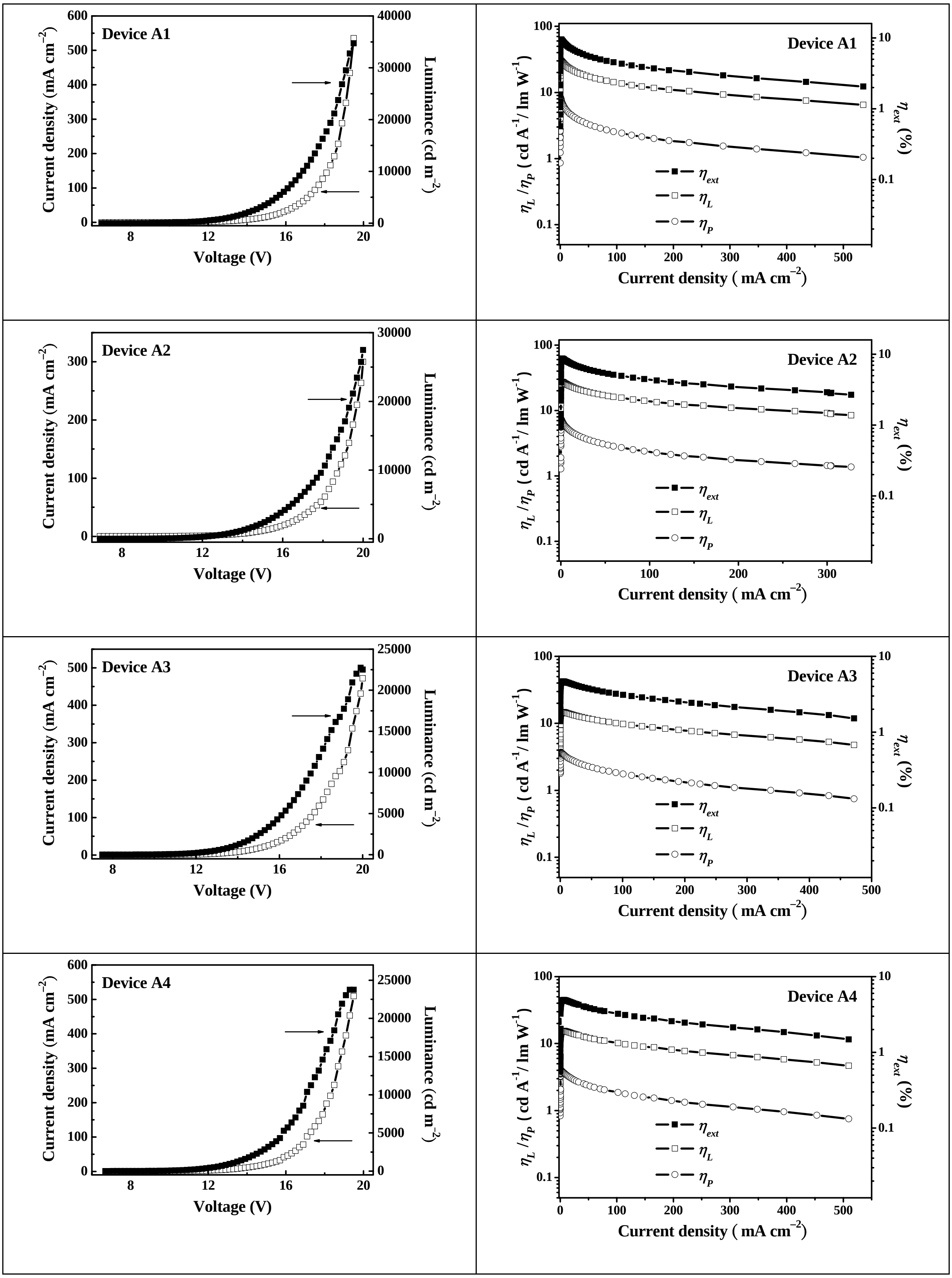

Fig. S2 The *J*–*V*–*L* curves and the efficiency versus current density relationship for devices **A1**−**A4** with **Pt-B** as emitter.

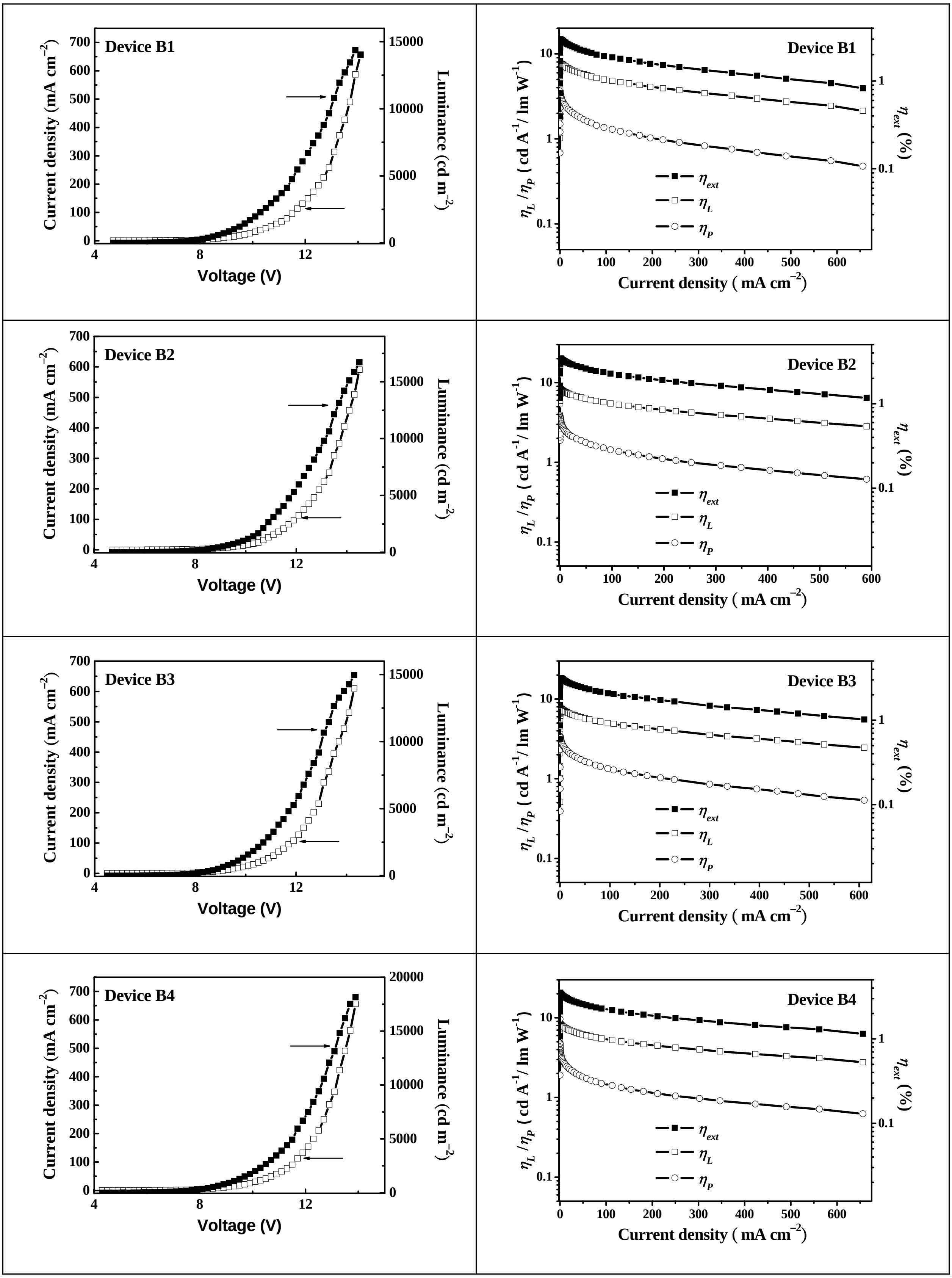

Fig. S3 The *J–V–L* curves and the efficiency versus current density relationship for devices **B1**−**B4** with **Pt-Si** as emitter.

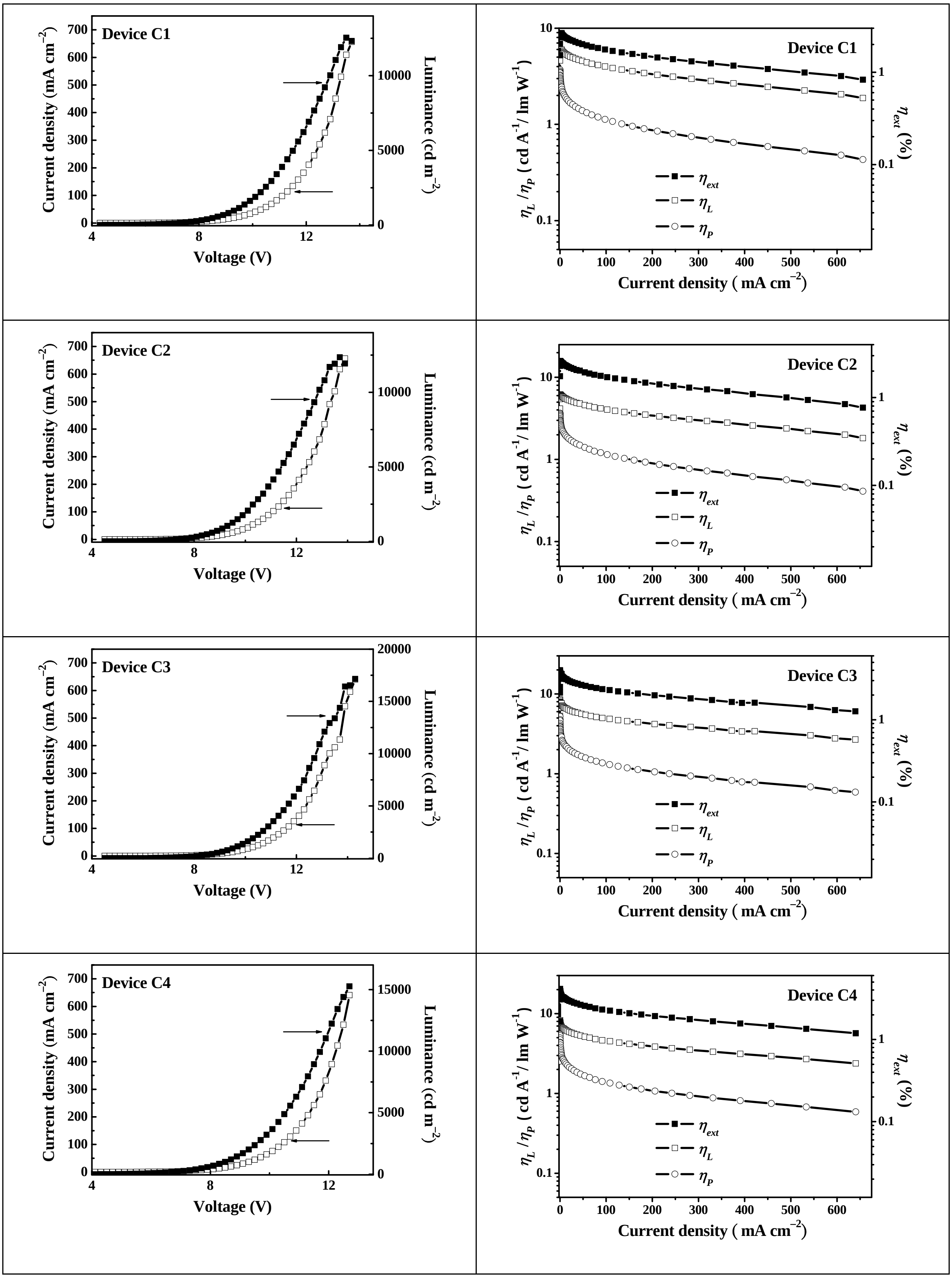

Fig. S4 The *J–V–L* curves and the efficiency versus current density relationship for devices **C1−C4** with **Pt-Ge** as emitter.

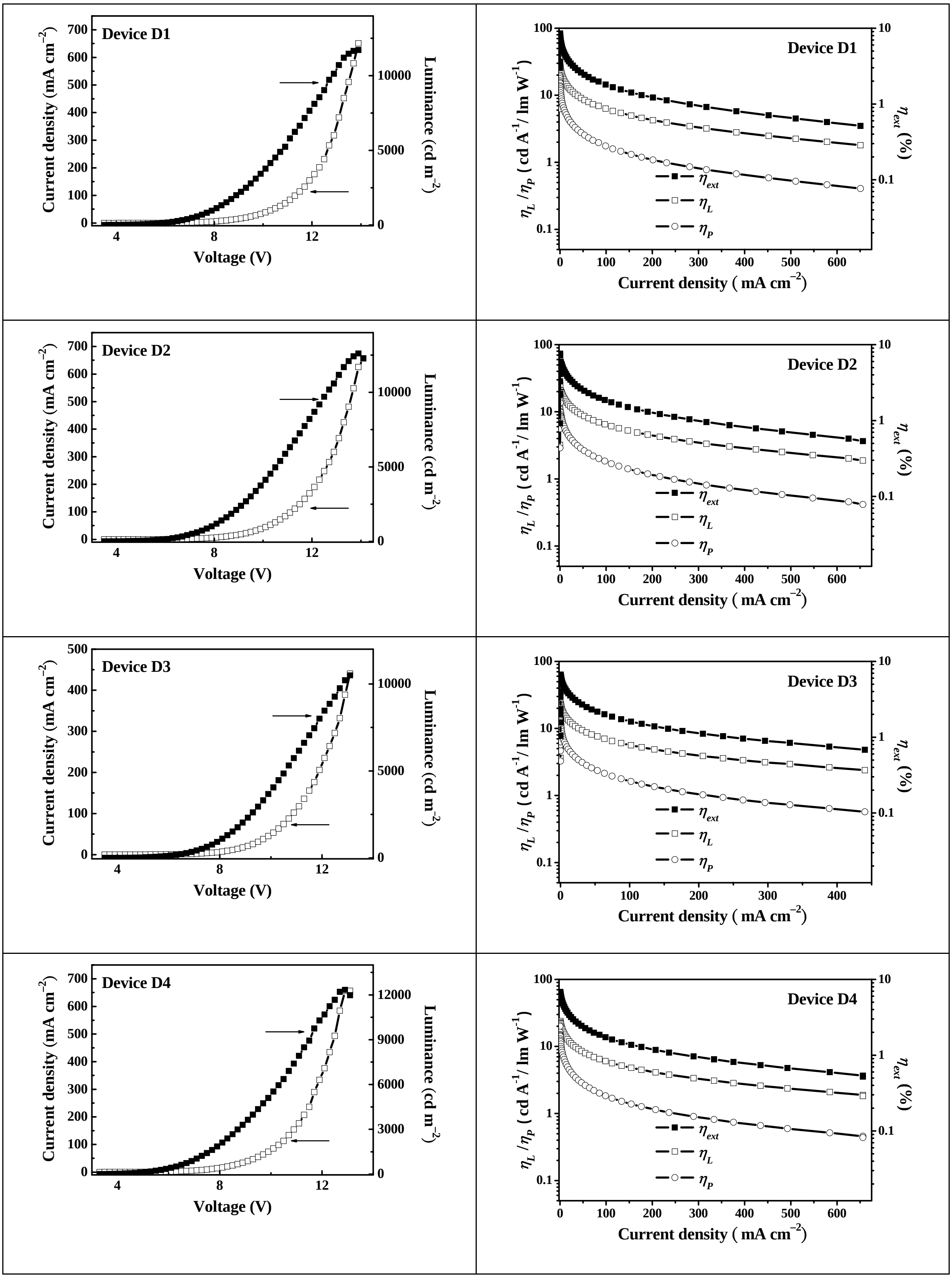

Fig. S5 The *J*–*V*–*L* curves and the efficiency versus current density relationship for devices **D1**−**D4** with **Pt-N** as emitter.

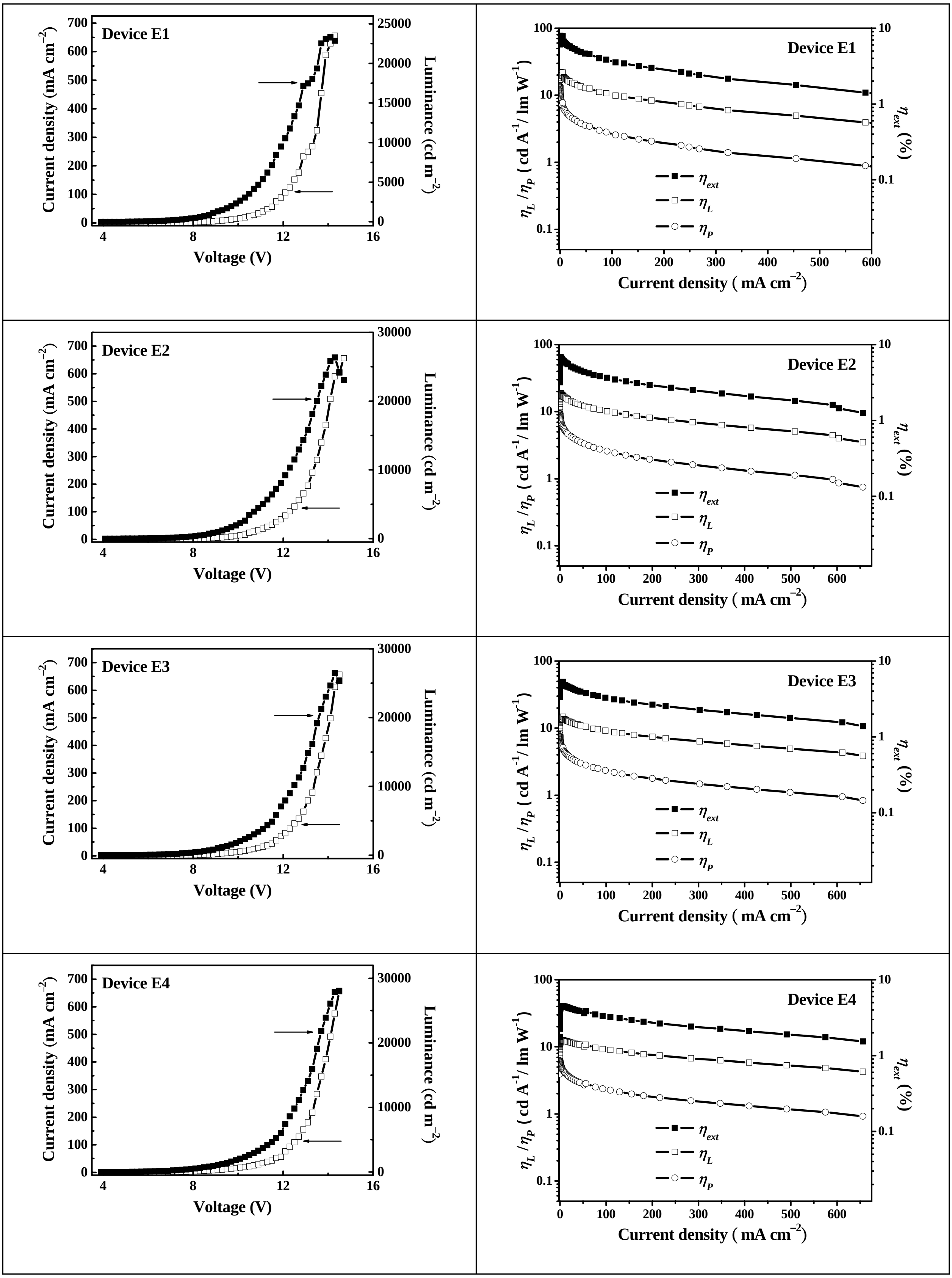

Fig. S6 The *J*–*V*–*L* curves and the efficiency versus current density relationship for devices **E1**−**E4** with **Pt-PO** as emitter.

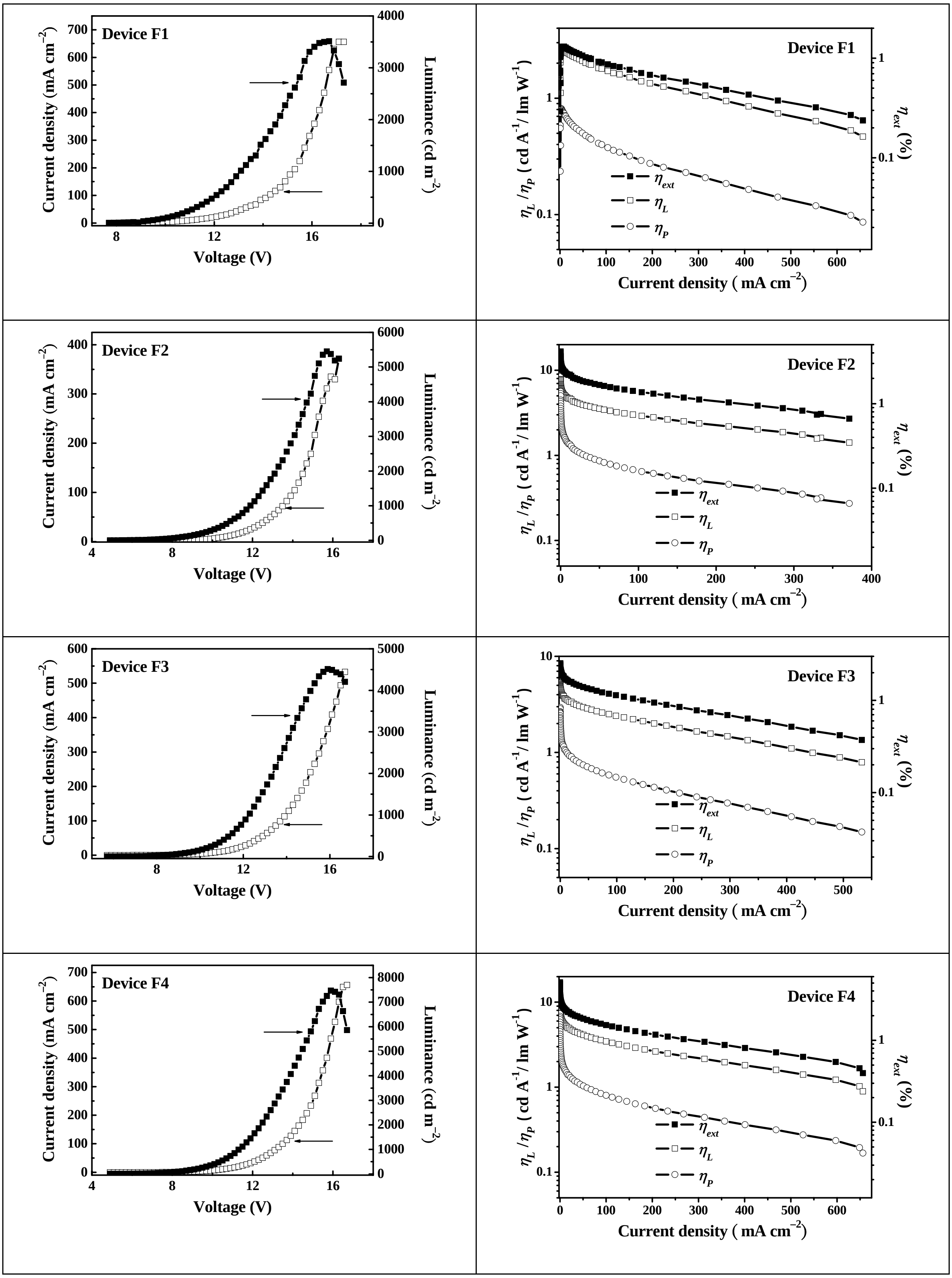

Fig. S7 The *J–V–L* curves and the efficiency versus current density relationship for devices **F1−F4** with **Pt-O** as emitter.

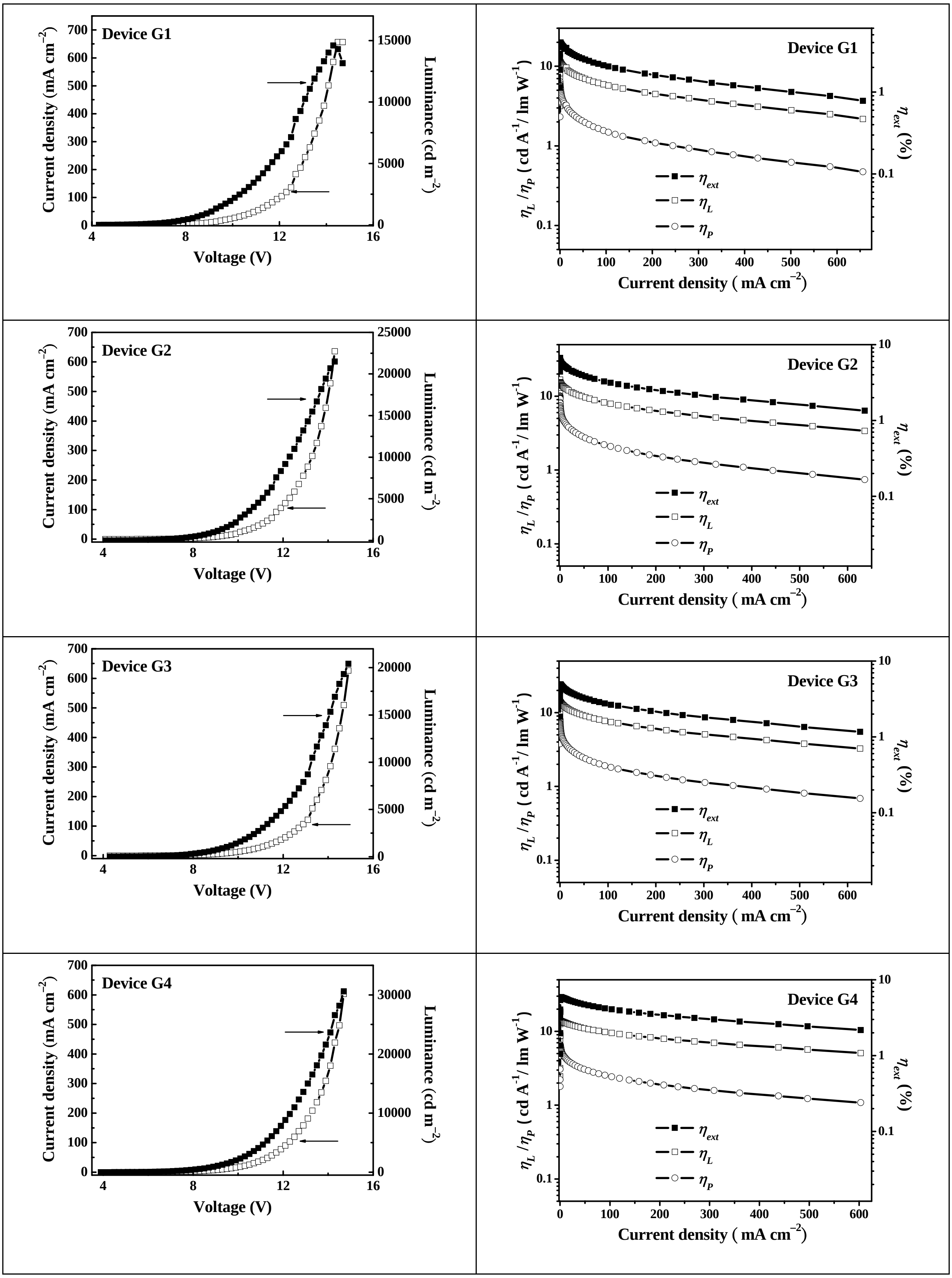

Fig. S8 The *J*–*V*–*L* curves and the efficiency versus current density relationship for devices **G1**−**G4** with **Pt-S** as emitter.

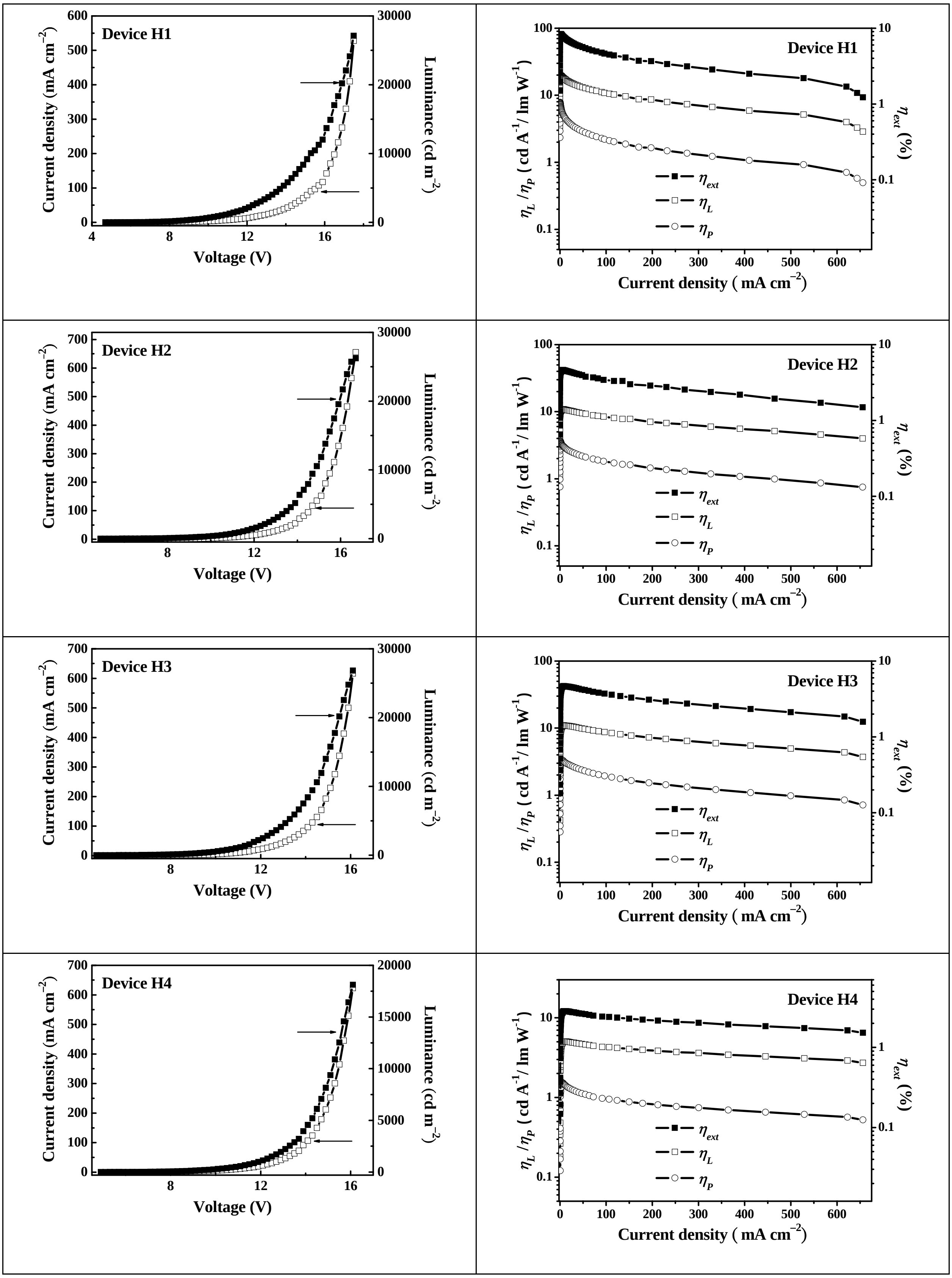

Fig. S9 The *J*–*V*–*L* curves and the efficiency versus current density relationship for devices **H1**−**H4** with **Pt-SO$_2$** as emitter.

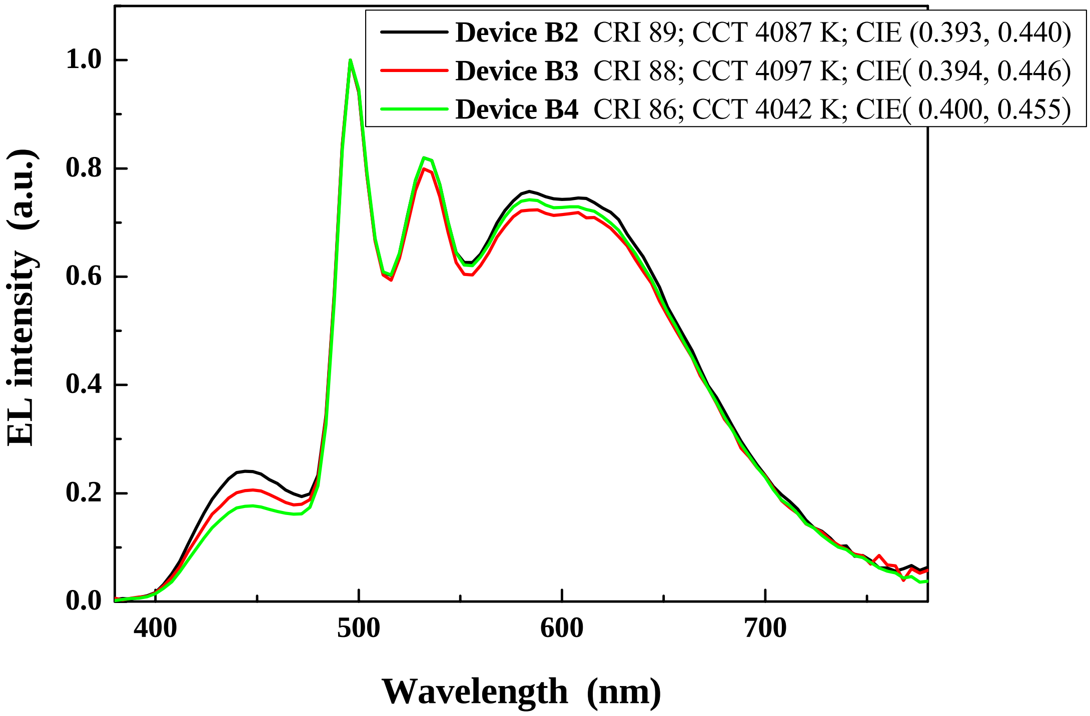

Fig. S10 EL spectra for the devices **B2**–**B4** at 6 V.

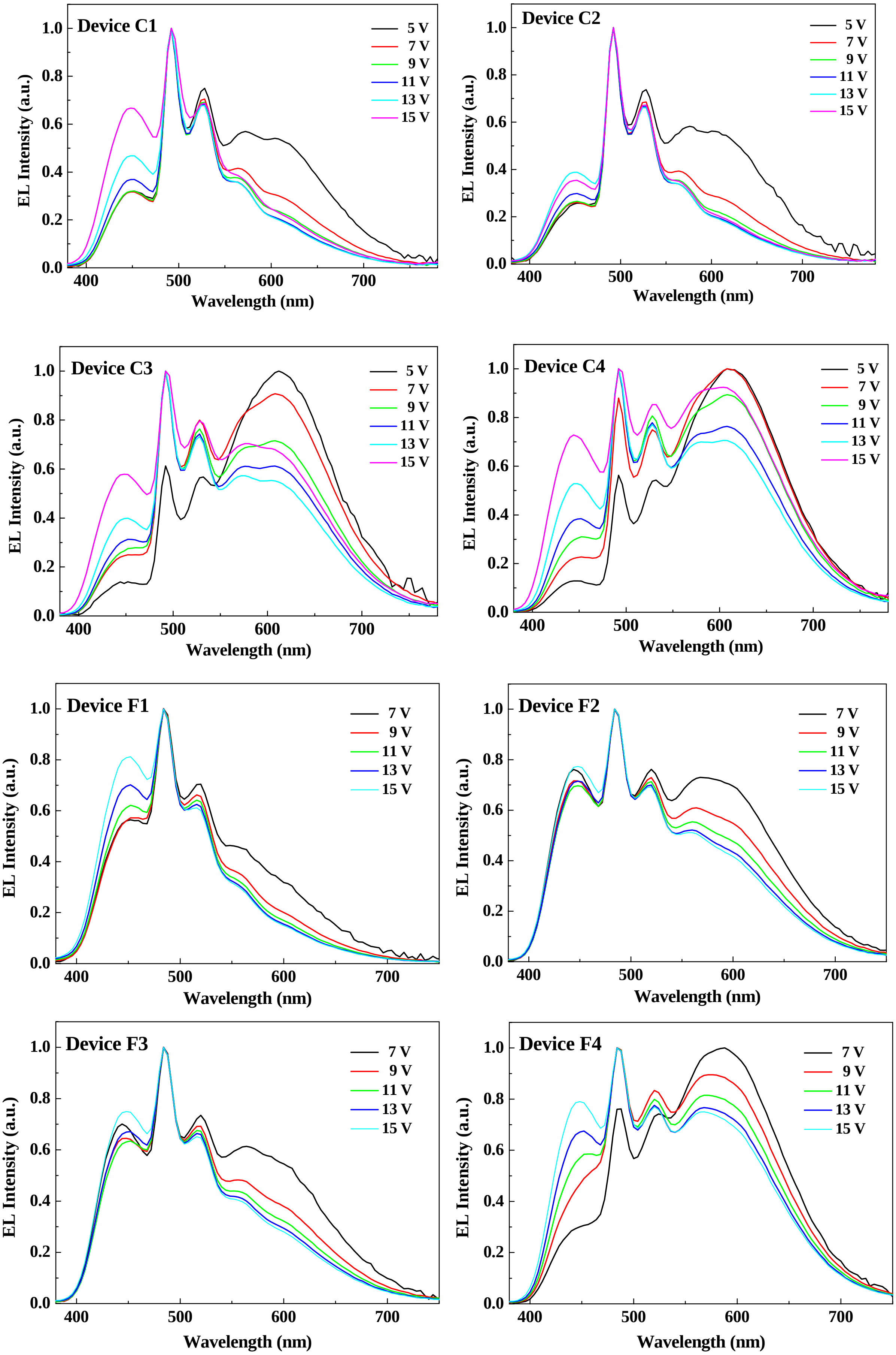

Fig. S11 EL spectra for the devices **C1−C4** and devices **F1−F4** at different driving voltages.

(a) **(b)**

Fig. S12 The image of the objects with different perceived colors (blue-green-yellow-red) when they are illuminated under (a) our WOLEDs and (b) the sunlight, showing an excellent true color reproduction.

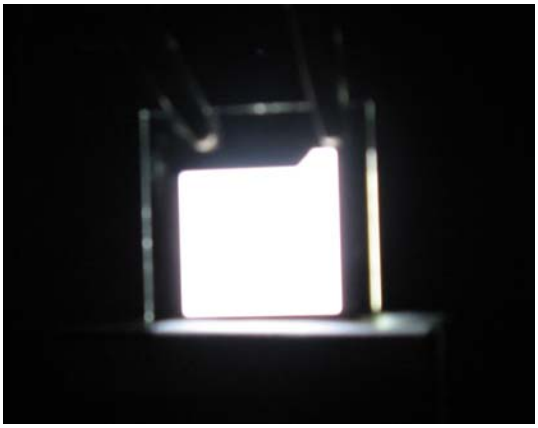

Fig. S13 A representative photo of a single-dopant WOLED fabricated from **Pt-Ge**.