Improvement efficiency of blue fluorescence device with sensitizer system

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A conventional fluorescent material without the property of thermally activated delayed fluorescence (TADF) has lower quantum efficiency than phosphorescence material in OLED device[1]. However, the low quantum efficiency of the fluorescent device can be overcome by device development, and blue fluorescence devices to exploit high efficiency were recently reported by a TADF sensitized fluorescent system. A high quantum efficiency of 13.4% was obtained in the TADF sensitized blue fluorescent device. However, the quantum efficiency was much lower than that of blue phosphorescent OLEDs. Therefore, we fabricated blue fluorescence OLED device using the TADF sensitized fluorescent system having bis[4-(9,9-dimethyl-9,10-dihydroacridine)phenyl]sulfone (DMAC-DPS) and bis[2-(diphenylphosphino)phenyl]ether oxide(DPEPO) as the sensitizer system. [2] The blue material, 2,5,8,11-tetra-tert-butylperylene(TBPe), was used as blue fluorescence dopant. DMAC-DPS is a high efficiency TADF material that can form excitons and transfer energy to dopant. DPEPO disturbed quenching process of DMAC-DPS by suppressing the molecular interaction of DMAC-DPS. The blue fluorecence device at 0.5% TBPe concentration showed a high quantum efficiency of 18.5%, and a color coordinate of (0.15,0.21) at 1000cd/m². because of good förster energy transfer from DMAC-DPS to TBPe.

Table 1. Device performances of the blue fluorescence devices

	V(V)	I(A/cm^2)	L(cd/m^2)	x	y	QE(%)		J(Cd/A)	
						1000cd	[Max]	1000cd	[Max]
TBPe(0%)	4.6	3.92	1000	0.16	0.23	15.6	22.6	26.2	39.1
TBPe(0.1%)	4.4	4.15	1000	0.16	0.23	14.6	20.0	24.7	34.3
TBPe(0.5%)	4.8	4.91	1000	0.15	0.21	13.4	18.5	20.8	29.0

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