Luminescence Technology Corp.

Summary of Thermally Activated Delayed Fluorescence (TADF) OLEDs

Researchers from Kyushu University that led by Chihaya Adachi developed one kind of new OLED light- emitting fluorescent materials with 100% internal quantum efficiency. They established light emission principle called thermally activated delayed fluorescence (TADF) and worked on designing a material to increase its luminous efficiency.

Now, there are more teams put their effort in this area, more references published and materials used. We can expect that will be great development in the future. Here, We summaries the literatures in recent years to understand TADF OLEDs development.

Short Name	Item No.	PL(nm)	CIE(x,y)	ΔE_{ST}(eV)	Max EQE(%)	Max current efficiency (cd/A)	Max power efficiency (lm/W)	Reference
TADF Blue Dopant Materials								
CZ-PS	LT-N672	404 nm (in Toluene)	0.15, 0.07	0.32	9.9	-	-	*J. Am. Chem. Soc. 2012, 134, 14706−14709*
2PXZ-TAZ	LT-N675	462 nm	0.16, 0.15	0.86	6.4	-	-	*J. Mater. Chem. C, 2013, 1,4599*-4604
ACRSA	LT-N681	490 nm	-	0.04	16.5	-	-	*Chem. Commun., 2013, 49, 10385*-10387
CC2BP	LT-N684	475 nm	0.17, 0.27	0.14	14.3	25.5	-	*Angew. Chem. 2014, 126, 6402 –6406*
DMAC-DPS	LT-N685	469 nm (in Toluene)	-	0.09	19.5	-	-	*Nature Photonics 8, 326–332 (2014)*
BDPCC-TPTA	LT-N686	463 nm (in Toluene)	0.19, 0.35	0.11	20.6	-	-	*Nature Materials 14, 330-336 (2015)*
BCC-TPTA	LT-N687	462 nm (in Toluene)	0.17, 0.27	0.19	16.8	-	-	*Nature Materials 14, 330-336 (2015)*
CC-TPTA	LT-N688	462 nm (in Toluene)	0.18, 0.28	0.29	14.6	-	-	*Nature Materials 14, 330-336 (2015)*
DCzTrz	LT-N689	449 nm (in Toluene)	0.15, 0.15	0.25	17.8	26.8	22.4	*Adv. Mater. (2015), 27(15), 2515-2520*
DDCzTrz	LT-N690	461 nm (in Toluene)	0.16, 0.22	0.27	18.9	26.2	31.3	*Adv. Mater. (2015), 27(15), 2515-2520*
DMOC-DPS	LT-N691	485 nm (in Toluene)	0.16, 0.16	0.21	14.5	24.0	-	*J. Mater. Chem. C, 2014, 2, 421*-424
CPC	LT-N695	474(toluene)	0.20,0.35	0.04	21.2	47.7	42.8	*Appl. Mater. Interfaces 2015, 7, 18930−18936*
TCzTrz	LT-N696	480nm	0.18,0.33	0.16	25		42.7	*Adv. Mater. 2015, 27, 5861–5867*
DMAC-TRZ	LT-N699	425 nm (in Toluene)			26.5	66.8	65.6	*Chem. Commun., 2015, 51, 13662-13665*
Cz-VPN	LT-N6001	440 nm (in Toluene)	0.15, 0.18	0.36	8.7	18	12.3	*Adv. Funct. Mater. 2016, 26, 1813−1821.*
4CZFCN	LT-N6005	471 nm(film)	0.16,0.25	0.06	20	36.1		*Adv. Funct. Mater. 2015, 25, 6786−6792.*
SpiroAc-TRZ	LT-N6006	480 nm(film)		0.072	36.7	94	98.4	*Adv. Mater. (2016), 28(32), 6976-6983*
TPXZPO	LT-N6007	478 nm(film)	0.17,0.20	0.11	15.3	26.4	23.6	*Chem. Mater. 2016, 28, 5667−5679*
MFAc-PPM	LT-N6013	458 nm (in Toluene)		0.25	20.4	41.7	37.2	*Chem. Sci., 2017, 8, 953−960*
DMTDAc	LT-N6014		0.15,0.13		19.8	22.6	23.3	*Organic Electronics (2016), 29, 160-164.*
Cz-TRZ3	LT-N6016	435 nm (in Toluene)	0.148,0.098	0.17	19.2			*Angewandte Chemie, International Edition (2017), 56, (6), 1571-1575*
Cz-TRZ4	LT-N6017	432 nm (in Toluene)	0.15,0.097	0.15	18.3			*Angewandte Chemie, International Edition (2017), 56, (6), 1571-1575*
TZ-SBA	LT-N6026	488 nm(film)	0.24,0.46	0.05	35.2			Chem. Mater. 2017, 29, 8630−8636
MFAc-PM	LT-N6027	461 nm (in Toluene)	0.15,0.18	0.26	17.1	34.3	31.7	*Chem. Sci., 2017, 8, 953−960*
MXAc-PM	LT-N6028	454 nm (in Toluene)	0.15,0.13	0.29	14.3	25	20.7	*Chem. Sci., 2017, 8, 953−960*
4TCzBN	LT-N6029	456 nm	0.16,0.26		21.5		42	*Chemical Science (2016), 7, (5), 3355-3363*
mPTC	LT-N6030	455nm	0.18,0.32	0.01	17.4			Appl. Mater. Interfaces 2016, 8, 16791−16798
IDCzTrzDBF	LT-N6032	500nm	0.22,0.48	0.05	12.2	33.6	19.3	*J. Mater. Chem. C,* 2019, 7, 2919--2926
TBPe	LT-E603	487 nm (in THF)	0.17, 0.30	-	8.7	18.0	7.0	*Nature Communications (2014), 5, 4016*
4CzFCN	CS10229	453 nm (film)	0.16,0.25		20	36.1		*Adv. Funct. Mater. 2015, 25, 6786–6792*
TADF Green Dopant Materials								
TTPA	LT-N507	554 nm (in CH2Cl2)	0.29, 0.59	-	11.7	38.0	30.0	*Nature Communications (2014), 5, 4016*
2PXZ-OXD	LT-N528	502 nm (in Toluene)	0.28, 0.45	0.57	14.9	-	-	*J. Mater. Chem. C, 2013, 1,4599*
ACRXTN	LT-N532	530 nm (in CH2Cl2)	0.29, 0.59	-	11.7	38.0	30.0	*Nature Communications (2014), 5, 4016*
DPAA-AF	LT-N536	499 nm (film)	-	0.021	9.6	-	-	*Chem. Lett. 2014, 43, 1017–1019*
AcPmBPX	LT-N538	490 nm (film)	-	0.05	10.3	23.4	-	*Dalton Transactions (2015), 44(18), 8356-8359*
PxPmBPX	LT-N540	530 nm (film)	-	0.02	11.3	35.3	-	*Dalton Transactions (2015), 44(18), 8356-8359*
DHPZ-2BI	LT-N541	550 nm (in CH2Cl2)	-	0.19	12	-	-	*J. Mater. Chem. C, 2015, 3, 2175*
PXZ–DPS	LT-N545	507 nm (in Toluene)	-	0.08	17.5	-	-	*Nature Photonics 8, 326–332 (2014)*
3DPA3CN	LT-N547	506 nm (in CH2Cl2)	-	0.103	21.4	-	-	*Chem. Commun., 2015, 51, 5028*

TmCzTrz	LT-N548		0.25,0.50	0.07	25.5		52.1	*Adv. Mater. 2015, 27, 5861−5867*
Px-VPN	LT-N552	577 nm (in Toluene)	0.35, 0.57	0.08	14.9	45.4	26.7	*Adv. Funct. Mater.* ***2016****, 26, 1813−1821.*
26PXZINN	LT-N563	551 nm (in Toluene)	0.37,0.58	0.06	22		99	*Chem. Asian J.* ***2017****, 12, 648-654*
DMAC-BP	LT-N565		0.26,0.55		18.9		59	*Adv. Mater. 2015, 27, 2096−2100*
DBQ-3DMAc	LT-N566	536,548 nm		0.04	22.4	80.3	64.1	*J. Name.,* ***2013****, 00, 1-3*
CzDBA	LT-N569	524 nm (in CBP film)	0.31,0.61		37.8	139.6	121.6	*Nature Photonics* ***12****, 235-240(2018)*
tBuCzDBA	LT-N571	553 nm (in CBP film)	0.37,0.60		32.4	127.9	109.8	*Nature Photonics* ***12****, 235-240(2018)*
BCzTrzDBF	LT-N573	503nm	0.24,0.52	0.06	20.1	59.6	35.1	*J. Mater. Chem. C*, 2019, 7, 2919--2926
TCzTrzDBF	LT-N574	511nm	0.27,0.57	0.01	23.5	74.8	44.7	*J. Mater. Chem. C*, 2019, 7, 2919--2926
TADF Red Dopant Materials								
TBRb	LT-N732	571 nm (in CH2Cl2)	0.45, 0.53	-	17.2	56.0	33.0	*Nature Communications (2014), 5, 4016*
DBP	LT-N4003	610 nm (in THF)	0.61, 0.39	-	10.9	20.0	10.0	*Nature Communications (2014), 5, 4016*
TXO-TPA	LT-N775	625 nm (film)	0.45, 0.53	0.052	18.5	43.3	47.4	*Adv. Mater. (2014), 26(30), 5198-5204*
TXO-PhCz	LT-N776	570 nm (film)	0.31, 0.56	0.073	21.5	76.0	70.0	*Adv. Mater. (2014), 26(30), 5198-5204*
TPA-DCPP	LT-N782	810 nm(in CH2Cl2)	0.70,0.29	0.13	9.6	7.4	6.8	Angew. Chem. 2015, 127, 13260 –13264
Ac-CNP	LT-N793	570 nm (film)	0.47,0.51	0.09	13.3	38.1	26.1	*Adv. Funct. Mater.* ***2016****, 26, 1813−1821.*
NAI-DMAC	LT-N797	582nm (in Toluene)	0.56,0.44	0.09	23.4	50.7	53.1	Adv. Mater. 2018, 30, 1704961
PXZ-DCPP	LT-N798	564 nm (film)	0.56,0.43	0.09	17.4	29.3	27.8	Organic Electronics (2018), 59, 32-38.
PTZ-DCPP	LT-N799	580 nm (film)	0.62,0.36	0.18	12.3	10.3	8.1	Organic Electronics (2018), 59, 32-38.

TADF Host Materials							
Name	**Item No.**	**PL(nm)**	**Reference**	**Name**	**Item No.**	**PL(nm)**	**Reference**
MCP	LT-E107	360 nm(in THF)	*1. J. Mater. Chem. C, 2014, 2, 8191* *2. Chem. Commun., 2015, 51, 3181*	mCPSOB	LT-N4112		*Organic Electronics 16 (****2015****) 109-112*
TcTa	LT-E207	385 nm(in THF)	*Nature Photonics 8, 326–332 (2014)*	3CzPFP	LT-N4114	412 nm(film)	*ACS Appl. Mater. Interfaces 2015, 7, 9625−9629*
CBP	LT-E409	369 nm(in THF)	*Nature Photonics 8, 326–332 (2014)*	3CN34BCz	LT-N4119		*ACS Appl. Mater. Interfaces* ***2014****, 6, 14874−14880*
CzSi	LT-N484	354 nm(in CH2Cl2)	*1. Adv. Mater. (2014), 26(38), 6642-6646* *2. J. Am. Chem. Soc. 2012, 134, 14706−14709*	CzAcSF	LT-N4120	443,466 nm(in CH2Cl2)	*Adv. Mater.* ***2015****, 27, 4358−4363*
PPT	LT-N4006	351 nm(in CH2Cl2)	*Appl. Phys. Lett. 104, 233304 (2014)*	SFXSPO	LT-N4123		*Adv. Mater. 2016, 28, 3122-3130*
PYD-2Cz	LT-N4072	373 nm (in THF)	*Chem. Mater. 2013, 25, 3910−3920*	CN-T2T	LT-N4124	420 nm(in CH2Cl2)	*Appl. Mater. Interfaces* ***2016****, 8, 4811−4818.*
DPEPO	LT-N4060	311 nm(in CH2Cl2)	*1. Nature Materials 14, 330–336 (2015)* *2. J. Am. Chem. Soc. 2012, 134, 14706−14709*	DPTPCz	LT-N4126		*Phys. Chem. Chem. Phys., 2012, 14, 14255–14261*
DCzDCN	LT-N4098	324 nm (in THF)	*Adv. Mater. (2014), 26(38), 4050-4055*	Cz-m2Ph-TRZ	LT-N4133	361,410nm(toluene)	*J. Phys. Chem. C*, **2015**, *119* (39), pp 22618–22624
TmPyPB	LT-N863	353 nm(in CH2Cl2)	*Adv. Mater. (2014), 26(30), 5198-5204*	PrDPhAc	LT-N4140	495 nm(in CH2Cl2)	*Chem. Commun.,* ***2016****, 52, 8149−8151*
BCzTPA	LT-N4102	397 (film)	*1. Adv. Funct. Mater. 2013, 23, 5550–5555* *2. Adv. Mater. 2012, 24, 3212–3217* *3. J. Mater. Chem. C, 2015, 3, 1700*	3,5-2CzBN	LT-N4142		*Chem. Sci.* ***2016****, 7, 3355−3363*
pCzB-2CN	LT-N4104	450 nm(in CH2Cl2)	*Adv. Mater. (2014), 26(30), 5198-5204*	Tri-o-2PO	LT-N4146	450 nm(in CH2Cl2)	*Adv. Funct. Mater.* ***2016****, 26, 7929−7936*
mCzB-2CN	LT-N4105	450 nm(in CH2Cl2)	*Adv. Mater. (2014), 26(30), 5198-5204*	mCPCN	LT-N4148	348,365 nm(in CH2Cl2)	*Journal of Materials Chemistry (2012), 22, (31), 16114-16120.*
PPF	LT-N4106	440 nm(in CH2Cl2)	*Chem. Commun., 2012, 48, 9580-9582*	CzFCN	LT-N4149	357 nm(film)	*Adv. Funct. Mater.* ***2013****, 23, 3096−3105*
pCzB-2CN	LT-N4104		*Appl. Mater. Interfaces*, 2015, *7* (4), pp 2899–2904	TCzCN	LT-N4150		*Advanced Optical Materials (2016), 4, (8), 1281-1287*
mCzB-2CN	LT-N4105		*Appl. Mater. Interfaces*, 2015, *7* (4), pp 2899–2904	DCb-PCz	LT-N4157	385 nm(film)	*ACS Appl. Mater. Interfaces* ***2017****, 9, 21346−21354*
4CN34BCz	LT-N4121	401nm(toluene)	Synthetic Metals 209 (2015) 19–23	PhCz2BP	LT-N4161	438 nm (in Toluene)	*Adv. Funct. Mater.* ***2018****, 1707002*

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