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)	⊿ EST(eV)	Max EQE(%)	Max current efficiency (cd/A)	Max power efficiency (lm/W)	Reference
TADF Blue Dopant Materials								
CZ-PS	**LT-N672**	404nm (in Toluene)	0.15, 0.07	0.32	9.9	-	-	*J. Am. Chem. Soc. 2012, 134, 14706−14709*
2PXZ-TAZ	**LT-N675**	462nm	0.16, 0.15	0.86	6.4	-	-	*J. Mater. Chem. C, 2013, 1,4599-4604*
ACRSA	**LT-N681**	490nm	-	0.04	16.5	-	-	*Chem. Commun., 2013, 49, 10385-10387*
CC2BP	**LT-N684**	475nm	0.17, 0.27	0.14	14.3	25.5	-	*Angew. Chem. 2014, 126, 6402–6406*
DMAC-DPS	**LT-N685**	469nm (in Toluene)	-	0.09	19.5	-	-	*Nature Photonics 8, 326–332 (2014)*
BDPCC-TPTA	**LT-N686**	463nm (in Toluene)	0.19, 0.35	0.11	20.6	-	-	*Nature Materials 14, 330-336 (2015)*
BCC-TPTA	**LT-N687**	462nm (in Toluene)	0.17, 0.27	0.19	16.8	-	-	*Nature Materials 14, 330-336 (2015)*
DCzTrz	**LT-N689**	449nm (in Toluene)	0.15, 0.15	0.25	17.8	26.8	22.4	*Adv. Mater. (2015), 27(15), 2515-2520*
DDCzTrz	**LT-N690**	461nm (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**	485nm (in Toluene)	0.16, 0.16	0.21	14.5	24.0	-	*J. Mater. Chem. C, 2014, 2, 421-424*
CPC	**LT-N695**	474nm (in 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**	425nm (in Toluene)			26.5	66.8	65.6	*Chem. Commun., 2015, 51, 13662-13665*
Cz-VPN	**LT-N6001**	440nm (in Toluene)	0.15, 0.18	0.36	8.7	18	12.3	*Adv. Funct. Mater. 2016, 26, 1813−1821.*
4CZFCN	**LT-N6005**	471nm (film)	0.16,0.25	0.06	20	36.1		*Adv. Funct. Mater. 2015, 25, 6786−6792.*
TPXZPO	**LT-N6007**	478nm (film)	0.17,0.20	0.11	15.3	26.4	23.6	*Chem. Mater. 2016, 28, 5667−5679*
MFAc-PPM	**LT-N6013**	458nm (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**	435nm (in Toluene)	0.148,0.098	0.17	19.2			*Angewandte Chemie, International Edition (2017), 56, (6), 1571-1575*
Cz-TRZ4	**LT-N6017**	432nm (in Toluene)	0.15,0.097	0.15	18.3			*Angewandte Chemie, International Edition (2017), 56, (6), 1571-1575*
TZ-SBA	**LT-N6026**	488nm (film)	0.24,0.46	0.05	35.2			*Chem. Mater. 2017, 29, 8630−8636*
4TCzBN	**LT-N6029**	456nm	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*
BDBFCz-Trz	**LT-N6039**	488nm (film)	0.18,0.35	0.2	25.1	54.5	48.9	*Chem. C, 2019, 7, 4475--4483*
TRZ-p-ACRSA	**LT-N6041**		0.19,0.42		28	69.4	66.1	*Adv. Funct. Mater. 2019, 1808088*
TTSA	**LT-N6042**	481nm (film)	0.158,0.283	0.063	27.9			*Appl. Mater. Interfaces 2019, 11, 7199−7207*
TDBA-Ac	**LT-N6050**	458nm (in Toluene)	0.14,0.15	0.06	25.7	27.7	25.4	*Nature Photonics, volume 13, pages540–546*
OBA-O	**LT-N6055**	444nm (in Toluene)	0.17,0.17	0.09	17.8	33.2	34.2	*J. Mater. Chem. C, 2019,7, 11953-11963*
IP-PPI	**LT-N6056**	435nm (film)	0.153,0.097		4.86	4.49	4.49	
TB-P3Cz	**LT-N6057**	460nm (film)	0.15,0.08		6.13	4.59	4.12	*Adv. Optical Mater. 2020, 1902175*
TB-3Cz	**LT-N6058**	433nm (film)	0.17,0.07		9.90	4.0	3.76	*Adv. Optical Mater. 2020, 1902175*
TMCz-BO	**LT-N6060**	467nm (film)	0.14,0.18	0.02	20.7	29.8	31.2	*NATURE COMMUNICATIONS | (2020) 11:1765*
2F-BTH-DMF	**LT-N6064**	483nm (film)			8.5	26.6	26.1	*Adv. Optical Mater. 2018, 1801190*
TDBA-SAF	**LT-N6069**	456nm	0.142,0.09	0.11	28.2	27.3	19.9	*Adv. Mater. 2020, 2004083*
TBN-TPA	**LT-N6070**	470nm (in Toluene)		0.03	32.1	40.2	30	*Angew. Chem., Int. Ed. 2018, 57, 11316*
BuCzMeoB	**LT-N6071**	468nm (in Toluene)	0.135,0.266	0.095	32.8	56.8		*Adv. Optical Mater. 2018, 1800385*
M1	**LT-N6073**	488nm (film)			20.63	47.67	29.95	*Appl. Mater. Interfaces 2021, 13, 12305−12312*
PPCzTrz	**LT-N6074**		0.12,0.09		34.4	32.8		*Nature Photonics volume 15, pages208–215 (2021)*
PCzTrz	**LT-N6075**		0.12,0.09		29.3	38.9		*Nature Photonics volume 15, pages208–215 (2021)*
mtCzTrz	**LT-N6076**	469nm (in Toluene)	0.16,0.20		16.1	25	9.2	*Organic Electronics 82 (2020) 105716*

t-Bu-v-DABNA	**LT-N6077**	467nm (in Toluene)	0.11,0.15		36.3	32.5		
DMACN-B	**LT-N6078**		0.151,0.045		10		4.5	*Adv. Funct. Mater. 2021, 31, 2009488*
mMDBA-DI	**LT-N6079**	451nm (in Toluene)	0.14,0.21		32.5	40.9		
TB-tCz	**LT-N6080**	433nm (film)	0.17,0.06	0.227	15.9	2.72	2.14	*Adv. Funct. Mater. 2021, 2102588*
TB-tPCz	**LT-N6081**	445nm (film)	0.17,0.05	0.169	14.1	3.53	2.77	*Adv. Funct. Mater. 2021, 2102588*
tBuOBOtSAc	**LT-N6083**	448nm (in Toluene)	0.149,0.061	0.079	28.2			*Adv. Optical Mater. 2021, 2100406*
OBOtSAc	**LT-N6084**	451nm (in Toluene)	0.147,0.092	0.057	31.2			*Adv. Optical Mater. 2021, 2100406*
3tPAB	**LT-N6085**	458nm (film)	0.141,0.076	0.1	19.3	13.4	10.2	*Organic Electronics 97 (2021) 106275*
TBPe	**LT-E603**	487nm (in THF)	0.17, 0.30	-	8.7	18.0	7.0	*Nature Communications (2014), 5, 4016*
4CzFCN	**CS10229**	453nm (film)	0.16,0.25		20	36.1		*Adv. Funct. Mater. 2015, 25, 6786–6792*
TADF Green Dopant Materials								
TTPA	**LT-N507**	554nm (in CH2Cl2)	0.29, 0.59	-	11.7	38.0	30.0	*Nature Communications (2014), 5, 4016*
2PXZ-OXD	**LT-N528**	502nm (in Toluene)	0.28, 0.45	0.57	14.9	-	-	*J. Mater. Chem. C, 2013, 1,4599*
AcPmBPX	**LT-N538**	490nm (film)	-	0.05	10.3	23.4	-	*Dalton Transactions (2015), 44(18), 8356-8359*
PxPmBPX	**LT-N540**	530nm (film)	-	0.02	11.3	35.3	-	*Dalton Transactions (2015), 44(18), 8356-8359*
DHPZ-2BI	**LT-N541**	550nm (in CH2Cl2)	-	0.19	12	-	-	*J. Mater. Chem. C, 2015, 3, 2175*
PXZ–DPS	**LT-N545**	507nm (in Toluene)	-	0.08	17.5	-	-	*Nature Photonics 8, 326–332 (2014)*
TmCzTrz	**LT-N548**		0.25,0.50	0.07	25.5		52.1	*Adv. Mater. 2015, 27, 5861−5867*
Px-VPN	**LT-N552**	577nm (in Toluene)	0.35, 0.57	0.08	14.9	45.4	26.7	*Adv. Funct. Mater. 2016, 26, 1813−1821.*
26PXZINN	**LT-N563**	551nm (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, 548nm		0.04	22.4	80.3	64.1	*J. Name., 2013, 00, 1-3*
CzDBA	**LT-N569**	524nm (in CBP film)	0.31,0.61		37.8	139.6	121.6	*Nature Photonics 12, 235-240(2018)*
tBuCzDBA	**LT-N571**	553nm (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*
DBM-PXZ	**LT-N579**	540nm (in Toluene)	0.28,0.58		17.3			*Organic Electronics 34 (2016) 208e217*
PXZPDO	**LT-N580**		0.47,0.50	0.04	20.1	53.7	28.4	*Appl. Mater. Interfaces 2021, 13, 15459−15474*
BTH-DMF	**LT-N584**	519nm (film)			9.1	31	27.8	*Adv. Optical Mater. 2018, 1801190*
2,6-TXO-PhCz	**LT-N585**	550nm (film)	0.40,0.55	0.2	23.2	72.3	64.9	*Adv. Optical Mater. 2019, 7, 1801767*
2,7-TXO-PhCz	**LT-N586**	550nm (film)	0.39,0.55	0.01	24.4	74.6	68.9	*Adv. Optical Mater. 2019, 7, 1801767*
TADF Red Dopant Materials								
TBRb	**LT-N732**	571nm (in CH2Cl2)	0.45, 0.53	-	17.2	56.0	33.0	*Nature Communications (2014), 5, 4016*
TXO-TPA	**LT-N775**	625nm (film)	0.45, 0.53	0.052	18.5	43.3	47.4	*Adv. Mater. (2014), 26(30), 5198-5204*
TXO-PhCz	**LT-N776**	570nm (film)	0.31, 0.56	0.073	21.5	76.0	70.0	*Adv. Mater. (2014), 26(30), 5198-5204*
TPA-DCPP	**LT-N782**	810nm (in CH2Cl2)	0.70,0.29	0.13	9.6	7.4	6.8	*Angew. Chem. 2015, 127, 13260 –13264*
Ac-CNP	**LT-N793**	570nm (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**	564nm (film)	0.56,0.43	0.09	17.4	29.3	27.8	*Organic Electronics (2018), 59, 32-38.*
PTZ-DCPP	**LT-N799**	580nm (film)	0.62,0.36	0.18	12.3	10.3	8.1	*Organic Electronics (2018), 59, 32-38.*
APDC-DTPA	**LT-N7004**	693nm (device)		0.14	10.19			*Adv. Funct. Mater. 2017, 1700986*
oDTBPZ-DPXZ	**LT-N7010**		0.59,0.41	0.04	20.1	38.1	29.2	*Angew. Chem. Int. Ed. 2021, 60(5), 2478-2484*
PzDBA	**LT-N7013**		0.49,0.50		21.8	35.7		*Adv. Mater. 2021, 33, 2007724*
PzTDBA	**LT-N7014**		0.55,0.45		30.3	68.7		*Adv. Mater. 2021, 33, 2007724*

TADF Host Materials

Name	Item No.	PL(nm)	Reference	Name	Item No.	PL(nm)	Reference
MCP	**LT-E107**	360nm (in THF)	1. J. Mater. Chem. C, 2014, 2, 8191 2. Chem. Commun., 2015, 51, 3181	TCPZ	**LT-N4128**	467nm (film)	*Org. Electron. 14 (1); 260-266 (2013)*
TcTa	**LT-E207**	385nm (in THF)	Nature Photonics 8, 326–332 (2014)	Cz-m2Ph-TRZ	**LT-N4133**	361, 410nm (in Toluene)	*J. Phys. Chem. C*, 2015, 119 (39), pp 22618–22624
CBP	**LT-E409**	369nm (in THF)	Nature Photonics 8, 326–332 (2014)	p-DIC-TRZ-2Ph	**LT-N4136**	510nm (in Toluene)	*Organic Electronics 57 (2018) 53–59*
CzSi	**LT-N484**	354nm (in CH2Cl2)	1. Adv. Mater. (2014), 26(38), 6642-6646 2. J. Am. Chem. Soc. 2012, 134, 14706−14709	PrDPhAc	**LT-N4140**	495nm (in CH2Cl2)	*Chem. Commun., 2016, 52, 8149−8151*
TmPyPB	**LT-N863**	353nm (in CH2Cl2)	Adv. Mater. (2014), 26(30), 5198-5204	3,5-2CzBN	**LT-N4142**		*Chem. Sci. 2016, 7, 3355−3363*
PPT	**LT-N4006**	351nm (in CH2Cl2)	Appl. Phys. Lett. 104, 233304 (2014)	mCPCN	**LT-N4148**	348, 365 nm (in CH2Cl2)	*Journal of Materials Chemistry (2012), 22, (31), 16114-16120.*
DPEPO	**LT-N4060**	311nm (in CH2Cl2)	1. Nature Materials 14, 330–336 (2015) 2. J. Am. Chem. Soc. 2012, 134, 14706−14709	CzFCN	**LT-N4149**	357nm (film)	*Adv. Funct. Mater. 2013, 23, 3096−3105*
PYD-2Cz	**LT-N4072**	373nm (in THF)	Chem. Mater. 2013, 25, 3910−3920	TCzCN	**LT-N4150**	448nm (film)	*Advanced Optical Materials (2016), 4, (8), 1281-1287*
DCzDCN	**LT-N4098**	324nm (in THF)	Adv. Mater. (2014), 26(38), 4050-4055	SOTPA	**LT-N4153**	453nm (film)	*Journal of Materials Chemistry C, 2015, vol. 3, 17,*

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BCzTPA	**LT-N4102**	397 (film)	1. Adv. Funct. Mater. 2013, 23, 5550–5555 2. Adv. Mater. 2012, 24, 3212–3217	DCb-PCz	**LT-N4157**	385nm (film)	*ACS Appl. Mater. Interfaces 2017, 9, 21346−21354*
pCzB-2CN	**LT-N4104**	450nm (in CH2Cl2)	Adv. Mater. (2014), 26(30), 5198-5204	PhCz2BP	**LT-N4161**	438nm (in Toluene)	*Adv. Funct. Mater. 2018, 1707002*
mCzB-2CN	**LT-N4105**	450nm (in CH2Cl2)	Adv. Mater. (2014), 26(30), 5198-5204	TCPY	**LT-N4165**	415nm (film)	*J. Mater. Chem., 2012, 22, 3447–3456*
PPF	**LT-N4106**	440nm (in CH2Cl2)	Chem. Commun., 2012, 48, 9580-9582	mSiTrz	**LT-N4181**	455nm (film)	*Adv. Optical Mater. 2019, 1901374*
mCPSOB	**LT-N4112**		Organic Electronics 16 (2015) 109-112	PPBI	**LT-N4186**		*Nature Photonics, volume 13, pages540–546(2019)*
3CzPFP	**LT-N4114**	412nm (film)	ACS Appl. Mater. Interfaces 2015, 7, 9625−9629	SF3-TRZ	**LT-N4187**	412nm (film)	*Nat Commun. 2017, 8(1), 2250.*
3CN34BCz	**LT-N4119**		ACS Appl. Mater. Interfaces 2014, 6, 14874−14880	BICz	**LT-N4207**	407nm (in Toluene)	*Chemical Engineering Journal 416 (2021) 129185*
CzAcSF	**LT-N4120**	443, 466nm (in CH2Cl2)	Adv. Mater. 2015, 27, 4358−4363	mCDtCBPy	**LT-N4210**	425nm (film)	*Appl. Mater. Interfaces. 2020, 12 , 49905-49914*
SFXSPO	**LT-N4123**		Adv. Mater. 2016, 28, 3122-3130	mSiTrz	**LT-N4218**	431nm (in THF)	*Chemical Engineering Journal,2021, 417 , 128086*
DPTPCz	**LT-N4126**		Phys. Chem. Chem. Phys., 2012, 14, 14255–14261				

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