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- **Yamamoto, Hitoshi**
Ewing, NJ 08618 (US)
- **Wang, Ting-Chih**
Ewing, NJ 08618 (US)
- **Weaver, Michael S.**
Ewing, NJ 08618 (US)
- **Xia, Chuanjun**
Ewing, NJ 08618 (US)
- **Alleyene, Bert**
Ewing, NJ 08618 (US)
- **Boudreault, Pierre-Luc T.**
Ewing, NJ 08618 (US)
- **Dyatkin, Alexey Borisovich**
Ewing, NJ 08618 (US)
- **Joseph, Scott**
Ewing, NJ 08618 (US)

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(71) Applicant: **Universal Display Corporation**
Ewing, NJ 08618 (US)

(74) Representative: **Maiwald Patentanwalts GmbH**
Elisenhof
Elisenstrasse 3
80335 München (DE)

(72) Inventors:
• **Adamovich, Vadim**
Ewing, NJ 08618 (US)

(54) **Organic electroluminescent materials and devices cross-reference to related applications**

(57) A composition formed of a mixture of two compounds having similar thermal evaporation properties that are pre-mixed into an evaporation source that can be used to co-evaporate the two compounds into an emission layer in OLEDs via vacuum thermal evaporation process is disclosed.

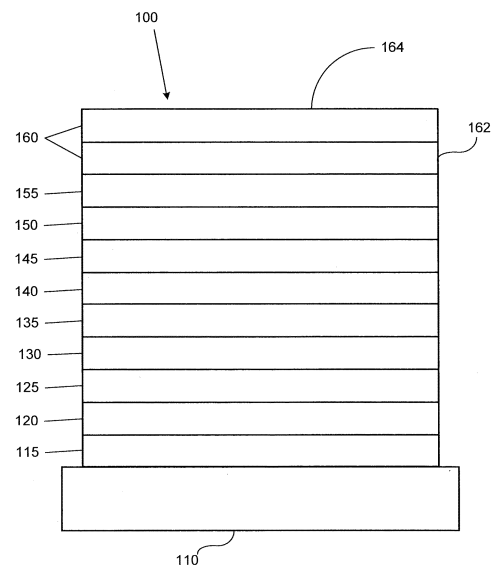


FIG. 1

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EUROPEAN SEARCH REPORT

 Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2012/005363 A1 (FUJIFILM CORP [JP]; KAMINAGA KUNIYUKI; ISE TOSHIHIRO) 12 January 2012 (2012-01-12)	1-6,9,10,12	INV. H01L51/00 H01L51/50 C07F15/00 C07D403/04 C07D403/10 C07D471/04
Y	* page 102, paragraph 268 - page 103,	7,8	
A	paragraph 271; example 30; table 3 * * page 109; compounds Ir-2 * * page 107; compounds A-2 *	11,13	
X	WO 2011/013843 A1 (FUJIFILM CORP [JP]; ISE TOSHIHIRO; KITAMURA TETSU; WATANABE TORU; TAKE) 3 February 2011 (2011-02-03)	1-6,9,10	
Y	* page 74; example 12; table 2 * * page 23; compound 4 * * page 45; compounds TM-19 *	7,8	
Y	WO 2011/136755 A1 (UNIVERSAL DISPLAY CORP [US]; NIPPON STEEL CHEMICAL CO [JP]; ADAMOVICH) 3 November 2011 (2011-11-03) * page 23; compound H235 *	7,8	
A	WO 2012/165844 A1 (ROHM & HAAS ELECT MATERIALS [KR]; YOON SEOK-KEUN [KR]; NA HONG-YOEP [K] 6 December 2012 (2012-12-06) * the whole document *	1-13	TECHNICAL FIELDS SEARCHED (IPC)
A	EP 2 166 592 A1 (IDEMITSU KOSAN CO [JP]) 24 March 2010 (2010-03-24) * the whole document *	1-13	H01L C07F C07D
X	US 2011/177641 A1 (CHEON KWANG OHK [US] ET AL) 21 July 2011 (2011-07-21)	1-4	
Y	* page 7, paragraph 71 - paragraph 75; example 2 * * page 6; compounds Host 1, Green dopant-1, Red dopant *	14	
----- -/--			
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 May 2015	Examiner Parashkov, Radoslav
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2012/166101 A1 (UNIVERSAL DISPLAY CORP [US]; ADAMOVICH VADIM [US]; YAMAMOTO HITOSHI [U] 6 December 2012 (2012-12-06) * page 15; compound Iridium compounds * -----	14	
X	EP 2 551 933 A1 (UNIVERSAL DISPLAY CORP [US]) 30 January 2013 (2013-01-30) * page 44; example 1; table 3 * * page 8; compound 53 * * page 42; compound Compound D * * page 41; compound host compounds * -----	1-4,15	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 May 2015	Examiner Parashkov, Radoslav
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

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1. claims: 5-13(completely); 1-4(partially)

a composition comprising the compounds of Formula I, and
Formula II of present claim 5;

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2. claims: 14(completely); 1-4(partially)

a composition comprising the compounds of Formula
Ir(L1)2(L2) of present claim 14;

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3. claims: 15(completely); 1-4(partially)

a composition comprising the compounds of Formula V, and
Formula VI of present claim 15;

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012005363 A1	12-01-2012	JP 4680322 B1	11-05-2011
		JP 2012019175 A	26-01-2012
		US 2013313531 A1	28-11-2013
		WO 2012005363 A1	12-01-2012

WO 2011013843 A1	03-02-2011	JP 4474493 B1	02-06-2010
		JP 2011049512 A	10-03-2011
		KR 20120018231 A	29-02-2012
		TW 201107451 A	01-03-2011
		US 2012126692 A1	24-05-2012
		WO 2011013843 A1	03-02-2011

WO 2011136755 A1	03-11-2011	CN 103026521 A	03-04-2013
		EP 2564438 A1	06-03-2013
		JP 5646733 B2	24-12-2014
		JP 2013530515 A	25-07-2013
		KR 20130073023 A	02-07-2013
		TW 201209047 A	01-03-2012
		US 2013112952 A1	09-05-2013
		WO 2011136755 A1	03-11-2011

WO 2012165844 A1	06-12-2012	CN 103732590 A	16-04-2014
		JP 2014522401 A	04-09-2014
		KR 20120132815 A	10-12-2012
		TW 201307329 A	16-02-2013
		US 2014100367 A1	10-04-2014
		WO 2012165844 A1	06-12-2012

EP 2166592 A1	24-03-2010	EP 2166592 A1	24-03-2010
		TW 200920813 A	16-05-2009
		US 2010207110 A1	19-08-2010
		US 2013187143 A1	25-07-2013
		WO 2009008357 A1	15-01-2009

US 2011177641 A1	21-07-2011	CN 102792480 A	21-11-2012
		EP 2526577 A1	28-11-2012
		JP 5642805 B2	17-12-2014
		JP 2013517612 A	16-05-2013
		JP 2015038887 A	26-02-2015
		KR 20120129912 A	28-11-2012
		TW 201208167 A	16-02-2012
		US 2011177641 A1	21-07-2011
		US 2013002132 A1	03-01-2013
		US 2014206121 A1	24-07-2014
		WO 2011090535 A1	28-07-2011

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ON EUROPEAN PATENT APPLICATION NO.**

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5

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10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012166101 A1	06-12-2012	CN 103563117 A	05-02-2014
		EP 2715825 A1	09-04-2014
		JP 2014519707 A	14-08-2014
		KR 20140033091 A	17-03-2014
		US 2014197389 A1	17-07-2014
		WO 2012166101 A1	06-12-2012

EP 2551933 A1	30-01-2013	CN 102898477 A	30-01-2013
		EP 2551933 A1	30-01-2013
		JP 2013028604 A	07-02-2013
		KR 20130018550 A	25-02-2013
		TW 201309714 A	01-03-2013
		US 2013026452 A1	31-01-2013
		US 2014159028 A1	12-06-2014

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专利名称(译)	有机电致发光材料和器件交叉引用相关应用		
公开(公告)号	EP2849240A3	公开(公告)日	2015-06-17
申请号	EP2014181083	申请日	2014-08-14
[标]申请(专利权)人(译)	环球展览公司		
申请(专利权)人(译)	通用显示器公司		
当前申请(专利权)人(译)	通用显示器公司		
[标]发明人	ADAMOVICH VADIM YAMAMOTO HITOSHI WANG TING CHIH WEAVER MICHAEL S XIA CHUANJUN ALLEYENE BERT BOUDREAULT PIERRE LUC T DYATKIN ALEXEY BORISOVICH JOSEPH SCOTT		
发明人	ADAMOVICH, VADIM YAMAMOTO, HITOSHI WANG, TING-CHIH WEAVER, MICHAEL S. XIA, CHUANJUN ALLEYENE, BERT BOUDREAULT, PIERRE-LUC T. DYATKIN, ALEXEY BORISOVICH JOSEPH, SCOTT		
IPC分类号	H01L51/00 H01L51/50 C07F15/00 C07D403/04 C07D403/10 C07D471/04		
代理机构(译)	MAIWALD专利ADVOCATE GMBH		
审查员(译)	PARASHKOV , 拉多斯拉夫		
优先权	61/867858 2013-08-20 US 61/874444 2013-09-06 US 61/894160 2013-10-22 US 61/920544 2013-12-24 US 61/940603 2014-02-17 US 14/253505 2014-04-15 US		
其他公开文献	EP2849240A2 EP2849240B1		
外部链接	Espacenet		

摘要(译)

本发明公开了一种由具有相似热蒸发性质的两种化合物的混合物形成的组合物，其预先混合到蒸发源中，该蒸发源可用于通过真空热蒸发工艺将两种化合物共蒸发成OLED中的发光层。

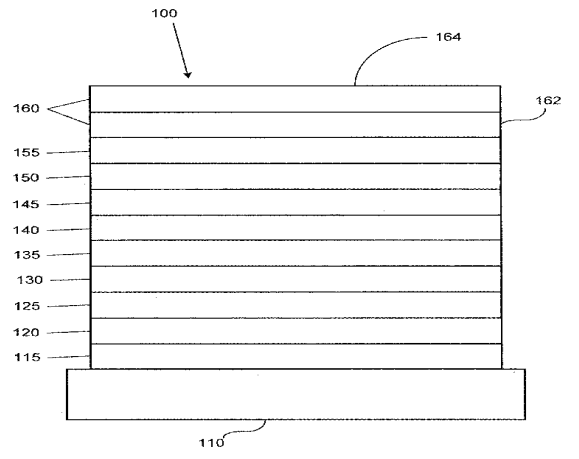


FIG. 1