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(54) Title: WHITE PHOSPHORS, METHODS OF MAKING WHITE PHOSPHORS, WHITE LIGHT EMITTING LEDS, METH-
ODS OF MAKING WHITE LIGHT EMITTING LEDS, AND LIGHT BULB STRUCTURES

(57) Abstract: Phosphor compositions, white phosphor compositions, methods of making white phosphor compositions, tinted
white phosphor compositions, methods of making tinted white phosphor compositions, LEDs, methods of making LEDs, light bulb
structures, paints including phosphor compositions, polymer compositions including phosphor compositions, ceramics including
phosphor compositions, and the like are provided.



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INTERNATIONAL SEARCH REPORT

07/069320 US-05-2008

International application No.

PCT/US 07/69320

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01L 27/15, H01L 33/00 (2007.01)

USPC - 257/82

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

USPC: 257/82

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 257/82, 257/79, 257/81, 257/98, 257/99, 257/13; H01L 27/15, H01L 29/16, H01L 33/00 (text searched)
Google Scholar (see keywords below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST(USPT,PGPB,EPAB,JPAB); Google Scholar

Search terms - phosphor, white, ceramic, percent, incandescent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2006/0091790 A1 (Nagatomi et al.) 04 May 2006 (04.05.2006), entire document, especially Abstract, paragraph [0001], paragraph [0022], paragraph [0089], paragraph [0112]	1-4,22-28,30-35,37,38 ----- 13, 14, 19-21, 29
X --- Y	US 2006/0082288 A1 (Menkara et al.) 20 April 2006 (20.04.2006), entire document, especially paragraphs [0008]-[0013], [0044], [0064] and [0065]	5-10 ----- 11-14
X --- Y	US 2006/0027781 A1 (Dong et al.) 09 February 2006 (09.02.2006), entire document, especially paragraph [0020], paragraph [0021], paragraph [0029]	15-18, 27, 36 ----- 19, 20, 29
X	US 2004/0245912 A1 (Thurk et al.) 09 December 2004 (09.12.2004), entire document, especially paragraph [0013], paragraph [0028], paragraph [0030], Abstract	39 and 40
Y	US 2005/0227569 A1 (Maeda et al.) 13 October 2005 (13.10.2005), entire document, especially paragraph [0242]	11 and 12
Y	US 2005/0269582 A1 (Mueller et al.) 08 December 2005 (08.12.2005), entire document, especially Abstract	21

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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International application No.

PCT/US 07/69320

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I, claims 1-26, is directed to a composition containing two phosphor compounds that emit radiation in visible, but complimentary colors.

Group II, claims 27-40, is directed to a structure comprising a LED or light bulb covered with a phosphor composition where the phosphor composition absorbs the light and emits light at a different wavelength.

The special technical feature of Group I is the two phosphor compounds that emit radiation in visible, but complimentary colors, which is not present in Group II that has a special technical feature of a LED or light bulb covered with a phosphor composition where the phosphor composition absorbs the light and emits light at a different wavelength. None of these technical features are common to the other groups, nor do they correspond to a special technical feature in the other groups. Accordingly, unity of invention is lacking under PCT Rule 13.1 because the groups do not share a same or corresponding special technical feature.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.