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(54) Title: ELECTROLUMINESCENCE DEVICE

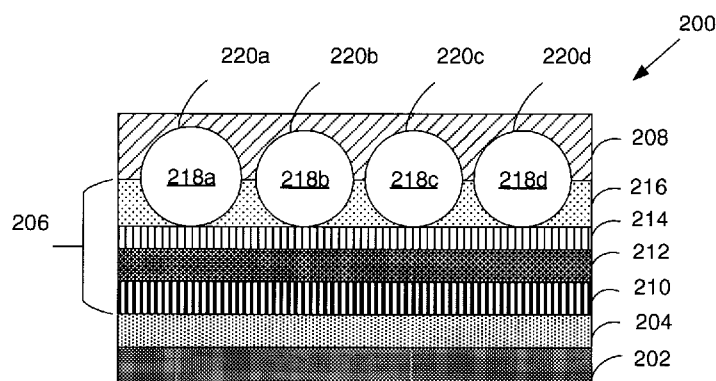


FIG. 2

(57) Abstract: The present disclosure relates to an organic electroluminescence device with enhanced out-coupling efficiency. The electroluminescence device comprises a substrate, a first electrode disposed on the substrate, an organic layer and a second electrode. The organic layer is formed between the first electrode and the second electrode. The organic layer comprises one or more nanoparticles forming protrusion features on the organic layer thereby forming a topographical structured organic layer in the electroluminescence device. The electroluminescence device is capable of reducing the surface plasmon polariton loss thereby, enhancing the light out-coupling the electroluminescence device.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2017/051158

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01L51/50 H01L51/52
ADD.

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)

H01L H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/083712 A1 (NOVALED AG [DE]) 13 June 2013 (2013-06-13) pages 3, 6,7,8 pages 13,19,22; figures 1,3,4 -----	1-14, 16-21
X	US 2014/061591 A1 (CHICHAK KELLY SCOTT [US] ET AL) 6 March 2014 (2014-03-06) paragraphs [0007], [0019], [0020], [0021], [0068]; figure 1 -----	1-12, 15-21
A	US 2011/045392 A1 (LEMMER ULI [DE] ET AL) 24 February 2011 (2011-02-24) paragraphs [0010], [0025], [0026], [0031] - [0033] ----- -/-	1-21



Further documents are listed in the continuation of Box C.



See patent family annex.

* 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

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"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

12 October 2017

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25/10/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/104183 A1 (MITSUBISHI CHEM CORP [JP]; NAGAYAMA DAIGO [JP]; NAGAO SHIGEKI [JP]; YA) 16 September 2010 (2010-09-16) paragraphs [0007], [0014], [0051], [0053], [0061], [0067] -----	22-25
X	US 2007/290604 A1 (SAKANOUE KEI [JP] ET AL) 20 December 2007 (2007-12-20) paragraphs [0187], [0188], [0215], [0217] -----	22-25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2017/051158

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:

see additional sheet

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 an 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-21

Electroluminescence device comprising an organic layer between a first electrode and a second electrode, wherein a composition of the organic layer comprises one or more nanoparticles such that a density of the one or more nanoparticles in the organic layer is less than 7 nanoparticles/square micrometer and each of the one or more nanoparticles forms a bulge section on the organic layer.

2. claims: 22-25

A composition of an organic layer, comprising a solvent, an organic material and a plurality of nanoparticles wherein a weight percentage of the plurality of nanoparticles is less than 0.5% and greater than 0%.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2017/051158

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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