



(51) International Patent Classification:

G02B 6/12 (2006.01)

(21) International Application Number:

PCT/US20 12/042902

(22) International Filing Date:

18 June 2012 (18.06.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61512038 27 July 2011 (27.07.2011) US

13/524,455 15 June 2012 (15.06.2012) US

(71) Applicant (for all designated States except US): MAS-

SACHUSETTS INSTITUTE OF TECHNOLOGY

[US/US]; 77 Massachusetts Avenue, Cambridge, MA 02139 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): JIA, Lin [CN/US];

70 Pacific Street #526, Cambridge, MA 02139 (US).

THOMAS, Edwin Lorimer [US/US]; 2305 Blue Bonnet

Blvd., Houston, TX 77030 (US).

(74) Agent: CONNORS, Matthew E.; Gesmer Updegrave

LLP, 40 Broad Street, Boston, MA 02109 (US).

(81) Designated States (unless otherwise indicated, for every

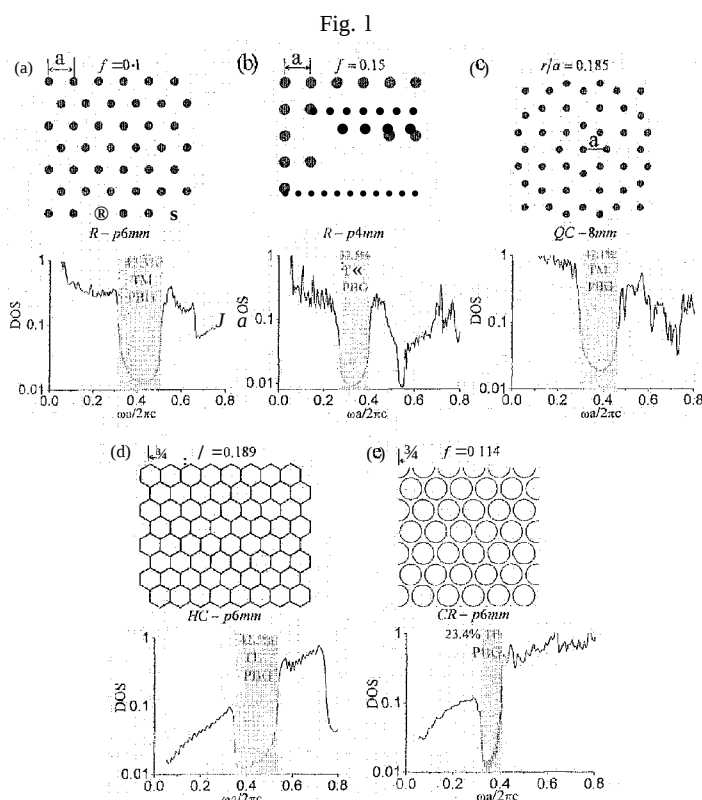
kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every

kind of regional protection available): ARIPO (BW, GH,

[Continued on nextpage])

(54) Title: 2-PATTERN COMPOUND PHOTONIC CRYSTALS WITH A LARGE, COMPLETE PHOTONIC BAND GAP



(57) Abstract: 2-pattern photonic crystal and the associated photonic devices are described here. A 2-pattern photonic crystal has a large, complete photonic band gap. It includes a TM sub[^] structure providing a large TM photonic band gap superimposed on a TE sub-structure providing a large TE photonic band gap. The resulting 2-pattern photonic crystals have complete photonic band gaps larger than 15%. By altering the respective sub-structures, optical devices for different polarizations (TE, TM or both) can be readily designed, and those optical devices can be integrated on the same plane.

— with international search report (Art. 21(3))

4 July 2013

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/042902**A. CLASSIFICATION OF SUBJECT MATTER****G02B 6/12(2006.01)i**

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)

G02B 6/12; C09K 11/00; G02F 1/00; G02B 5/30; G02B 5/00; G02B 6/10

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: TE, TM, sub-structure, photonic band gap, photonic crystal, superimpose

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	W0 2011-005530 A2 (THE TRUSTEES OF PRINCETON UNIVERSITY) 13 January 2011 See abstract, pages 2, 16, 24-25 and figures 2-4.	1-2, 5, 10, 13-14 ,16-20
Y		7-9
A		3-4, 6, 11-12, 15
Y	US 2002-0041749 A1 (JOHNSON et al.) 11 April 2002 See abstract, paragraph [0029] and figure 3.	7-9
A		1-6, 10-20
A	US 2004-0091224 A1 (BAUMBERG et al.) 13 May 2004 See abstract, paragraphs [0101]-[0102] and figures 15b, 42.	1-20
A	US 2009-0212265 A1 (STEINHARDT et al.) 27 August 2009 See abstract, paragraph [0071] and figures 2.	1-20
A	KR 10-2003-0085668 A (SAMSUNG ELECTRONICS CO., LTD.) 07 November 2003 See abstract, claim 1 and figure 2.	1-20



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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of 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

25 FEBRUARY 2013 (25.02.2013)

Date of mailing of the international search report

26 FEBRUARY 2013 (26.02.2013)

Name and mailing address of the ISA/KR



Facsimile No. 82-42-472-7140

Authorized officer

KANG, Sung Chul

Telephone No. 82-42-481-8405



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/042902

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
wo 2011-005530 A2	13.01.2011	EP 2445986 A2 Wo 2011-005530 A3	02.05.2012 21.04.2011
US 2002-004 1749 A1	11.04.2002	US 6597851 B2	22.07.2003
US 2004-0091224 A1	13.05.2004	AU 200 1-46695 A1 AU 200 1-46695 B2 AU 4669501 A AU 776204 B2 CA 2404743 A1 CA 2404743 C CN 1268953 CO CN 1427960 AO EP 1269229 A1 GB 0008546 DO HK 1057258 A1 JP 2003-530589 A KR 10-0848980 B1 US 6888994 B2 wo 01-77726 A1	23.10.2001 02.09.2004 23.10.2001 02.09.2004 18.10.2001 25.10.2011 09.08.2006 02.07.2003 02.01.2003 24.05.2000 09.03.2007 14.10.2003 30.07.2008 03.05.2005 18.10.2001
US 2009-02 12265 A1	27.08.2009	CN 10 1243342 A CN 10 1243342 CO EP 1902335 A2 EP 19 10875 A2 JP 2009-500 183 A US 2012-049 112 A1 US 8064127 B2 wo 2007-009046 A2 wo 2007-009046 A3 wo 2007-030 196 A2 wo 2007-030 196 A3	13.08.2008 13.08.2008 26.03.2008 16.04.2008 08.01.2009 01.03.2012 22.11.2011 18.01.2007 18.01.2007 15.03.2007 12.07.2007
KR 10-2003-0085668 A	07.11.2003	None	