



- (51) **International Patent Classification:**
H01L 31/042 (2006.01) *H01L 31/18* (2006.01)
H01L 31/072 (2012.01)
- (21) **International Application Number:**
PCT/US2012/031290
- (22) **International Filing Date:**
29 March 2012 (29.03.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
13/077,870 31 March 2011 (31.03.2011) US
- (63) **Related by continuation (CON) or continuation-in-part (CIP) to earlier application:**
US 13/077,870 (CON)
Filed on 31 March 2011 (31.03.2011)
- (71) **Applicant (for all designated States except US):** INTEGRATED PHOTOVOLTAICS, INC. [US/US]; 51 Daggett Drive, San Jose, California 95134 (US).
- (72) **Inventor; and**
- (75) **Inventor/Applicant (for US only):** ZEHAVI, Sharone [US/US]; 51 Daggett Drive, San Jose, California 95134 (US).
- (74) **Agents:** GALLENSON, Mavis S. et al.; 5670 Wilshire Boulevard, Suite 2100, Los Angeles, California 90036 (US).

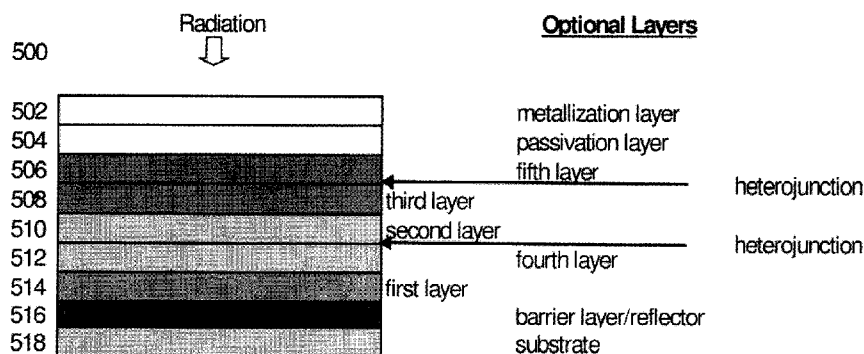
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, 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, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

- (88) **Date of publication of the international search report:**
10 January 2013

(54) **Title:** PHOTOVOLTAIC STRUCTURE



(57) **Abstract:** A photovoltaic device on a low-cost, conductive silicon layer is disclosed. The device comprises two semiconductor layers forming an active region; optional layers include "heterojunction layers", one or more barrier layers, a cap layer, a conductive and/or metallization layer, an anti-reflection layer, and distributed Bragg reflector. The device may comprise multiple active regions.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/031290**A. CLASSIFICATION OF SUBJECT MATTER*****H01L 31/042(2006.01)i, H01L 31/072(2006.01)i, H01L 31/18(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)

H01L 31/042; H01L 31/0376; H01L 31/06; H01L 31/18; H01L 31/00

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: minority, carrier, hetero junction

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7339110 B1 (WILLIAM P.MULLIGAN et al.) 04 March 2008 See abstract, claims 9-10 and figure 2.	1-19
A	US 04338481 A (MANDELKORN; JOSEPH) 06 July 1982 See abstract, claims 3, 7 and figure 1.	1-19
A	US 2009-0007965 A1 (ROHATGI AJEET et al.) 08 January 2009 See abstract, claims 1, 11 and figure 1.	1-19
A	US 2010-0116315 A1 (CLARK ANDREW et al.) 13 May 2010 See abstract, claims 12, 15 and figures 5-6.	1-19

☐ 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

19 NOVEMBER 2012 (19.11.2012)

Date of mailing of the international search report

20 NOVEMBER 2012 (20.11.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM Min Soo

Telephone No. 82-42-481-8249



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/031290

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7339110 B1	04.03.2008	US 7883343 B1 US 7897867 B1	08.02.2011 01.03.2011
US 04338481A A	06.07.1982	None	
US 2009-0007965 A1	08.01.2009	US 2005-252544 A1 US 2008-241986 A1 US 2008-241987 A1 US 2008-241988 A1	17.11.2005 02.10.2008 02.10.2008 02.10.2008
US 2010-0116315 A1	13.05.2010	US 2008-0295879 A1 US 2010-0038521 A1 US 2010-0038541 A1 US 2010-0109047 A1 US 2010-0122720 A1 US 7807917 B2 US 8039736 B2 US 8039737 B2 US 8039738 B2 US 8049100 B2 US 8178841 B2 WO 2009-015380 A1	04.12.2008 18.02.2010 18.02.2010 06.05.2010 20.05.2010 05.10.2010 18.10.2011 18.10.2011 18.10.2011 01.11.2011 15.05.2012 29.01.2009