

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 November 2006 (09.11.2006)

PCT

(10) International Publication Number
WO 2006/119305 A3

(51) International Patent Classification:
H02N 6/00 (2006.01) H01L 31/00 (2006.01)
H01L 25/00 (2006.01) H01L 31/052 (2006.01)

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

(21) International Application Number:
PCT/US2006/016870

(22) International Filing Date: 3 May 2006 (03.05.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/677,112 3 May 2005 (03.05.2005) US
60/719,168 22 September 2005 (22.09.2005) US

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): UNIVERSITY OF DELAWARE [US/US]; Office of the Vice Provost for Research, 210 Hullihen Hall, Newark, DE 19716 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): BARNETT, Allen [US/US]; 19 Nivin Lane, Landenberg, PA 19350 (US). HONSBURG, Christiana [US/US]; 116 Eden Road, Landenberg, PA 19350 (US). HANEY, Michael, W. [US/US]; 12314 Myterra Way, Oak Hill, VA 20171 (US). MCFADDEN, Michael, J. [US/US]; 1802 Sheridan Court, McLean, VA 22101 (US).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report

(74) Agent: HUME, Larry, J.; Connolly Bove Lodge & Hutz LLP, Suite 800, 1990 M Street, N.W., Washington, DC 20036 (US).

(88) Date of publication of the international search report:
30 April 2009



WO 2006/119305 A3

(54) Title: ULTRA AND VERY-HIGH EFFICIENCY SOLAR CELLS

(57) Abstract: The present invention is an apparatus and method for the realization of a photovoltaic solar cell that is able to achieve greater than 50% efficiency and can be manufactured at low cost on a large scale. The apparatus of the present invention is an integrated optical and solar cell design that allows a much broader choice of materials, enabling high efficiency, the removal of many existing cost drivers, and the inclusion of multiple other innovations.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/16870

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **H02N 6/00**(2006.01);**H01L 25/00**(2006.01),**31/00**(2006.01),**31/052**(2006.01)

USPC: 136/243,246

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)

U.S. : 136/243, 246

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0148497A1 (SASAOKA et al) 17 October 2002 (17.10.2002), figure 1, 7B,	9-15
---	paragraph 77-104, example 1	-----
Y		1-8, 18-21
	the whole document	
Y	US 6,469,241 B1 (PENN) 22 October 2002 (22.10.2002), figure 1, col. 5, lines 26-col. 6, line 44	1-15
X	US 2004/0112424 A1 (ARAKI et al) 17 June 2004, the whole document, specifically paragraph 98	23, 24
X	US 4,021,267 A (DETLING) 3 May 1977 (03.05.1977), the whole document	16-17
---		-----
Y		18-20, 22
A	US 4,340,617 A (DEUTSCH et al) 20 July 1982 (20.07.1982), all figures,	1-24

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	"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
"E"	earlier application or patent published on or after the international filing date	"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
"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)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

05 May 2008 (05.05.2008)

Date of mailing of the international search report

15 MAY 2008

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (571) 273-3201

Authorized officer

KOURTNEY R. SALZMAN
Telephone No. (571) 272-1700



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US06/16870

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,964,713 A (GOETZBERGER) 23 October 1990 (23.10.1990), the whole document	1-15