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Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

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:
16 January 2014

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(54) Title: METHOD FOR MANUFACTURING A SOLAR CELL

(57) Abstract: The invention relates to a method for manufacturing a solar cell from a semiconductor substrate of a first conductivity type, the semiconductor substrate having a front side and a back side, the method comprising in this sequence: creating by diffusion of a dopant of a second conductivity type a second conductivity-type doped layer in the front side and the back side, during diffusion forming of a dopant containing glassy layer on the front and back side; removing the second conductivity-type doped layer and the dopant containing glassy layer from the back side by a single sided etching process, while maintaining the dopant-containing glassy layer in the front side; creating a Back Surface Field (BSF) layer of the first conductivity type on the back side by implantation of a dopant of the first conductivity type into the back side; removing the dopant containing glassy layer from the front side of said substrate by an etching process; surface oxidation by heating said substrate for a predetermined period of time and to a predetermined temperature in oxidizing atmosphere to form passivation layers on the front side and the back side.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. H01L31/18 H01L31/068
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

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2011/025371 A1 (STICHTING ENERGIE [NL]; BARTON PAUL CORNELIS [NL]; NABER RONALD CORNEL) 3 March 2011 (2011-03-03) page 1, line 21 - line 22 page 7, line 24 - page 14, line 24 page 16, line 20 - page 17, line 29	1-13
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[X] Further documents are listed in the continuation of Box C.

[X] 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 another citation or other special reason (as specified)

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

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 July 2013	06/11/2013

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 2010 003784 A1 (BOSCH GMBH ROBERT [DE]) 13 October 2011 (2011-10-13) the whole document	1-13
A	L. KREININ ET AL: "Comparison of Different Technologies for Bifacial Silicon Based Solar Cells", THE COMPILED STATE-OF-THE-ART OF PV SOLAR TECHNOLOGY AND DEPLOYMENT : 22ND EUROPEAN PHOTOVOLTAIC SOLAR ENERGY CONFERENCE, EU PVSEC ; PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, HELD IN MILAN, ITALY, 3 - 7 SEPTEMBER 2007, MUNICH : WIP-RENEWABLE ENERG, 3 September 2007 (2007-09-03), pages 1665-1668, XP040513317, ISBN: 978-3-936338-22-5 page 1665, column 1, paragraph 4 - column 2, paragraph 1	1-13
A	KUZNICKI Z T ET AL: "ALUMINUM-BSF PROFILE REALIZED BY DIFFUSION, IMPLANTATION AND THERMAL ANNEALING", 14TH. E.C. PHOTOVOLTAIC SOLAR ENERGY CONFERENCE. BARCELONA, SPAIN, JUNE 30 - JULY 4, 1997; [PROCEEDINGS OF THE INTERNATIONAL PHOTOVOLTAIC SOLAR ENERGY CONFERENCE], BEDFORD : H. C. STEPHENS & ASSOCIATES, GB, vol. CONF. 14, 30 June 1997 (1997-06-30), pages 164-167, XP001136009, ISBN: 978-1-901675-03-0 the whole document	1-13
A	DEOK-KEE KIM ET AL: "Study of the ion-implanted back-surface fields in front-contact front-junction solar cells", PHOTOVOLTAIC SPECIALISTS CONFERENCE (PVSC), 2011 37TH IEEE, IEEE, 19 June 2011 (2011-06-19), pages 1933-1936, XP032168075, DOI: 10.1109/PVSC.2011.6186331 ISBN: 978-1-4244-9966-3 the whole document	1-13
A	WO 2009/064183 A1 (STICHTING ENERGIE [NL]; MIHAILETCHI VALENTIN DAN [NL]; KOMATSU YUJI [N) 22 May 2009 (2009-05-22) cited in the application the whole document	1-13

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INTERNATIONAL SEARCH REPORT

International application No
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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.
A	CHEN W J ET AL: "Low resistivity high efficiency silicon solar cell for potential space application", PROCEEDINGS OF THE PHOTOVOLTAIC SPECIALISTS CONFERENCE. LOUISVILLE, MAY 10 - 14, 1993; [PROCEEDINGS OF THE PHOTOVOLTAIC SPECIALISTS CONFERENCE], NEW YORK, IEEE, US, vol. CONF. 23, 10 May 1993 (1993-05-10), pages 1409-1414, XP010113136, DOI: 10.1109/PVSC.1993.346910 ISBN: 978-0-7803-1220-3 page 1413, column 1, paragraph 2 -----	1

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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.:

1-13

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: 1-13

   Method of manufacturing solar cell comprising formation dopant containing glassy layer and removal thereof from the backside by a single sided etching process and formation of BSF

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2. claims: 14, 15

   Method of manufacturing solar cell by by retaining the substrate in a carrier with a single production tool during a plurality of subsequent process steps

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3. claims: 16-24

   Production tool comprising oven, deposition unit and means for transport

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NL2013/050199

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