International Application Published Under the Patent Cooperation Treaty (PCT)

Title: COATED CRUCIBLES AND METHODS FOR PREPARING AND USE THEREOF

Abstract: Silicon nitride coated crucibles for holding melted semiconductor material and for use in preparing multicrystalline silicon ingots by a directional solidification process; methods for coating crucibles; methods for preparing silicon ingots and wafers; compositions for coating crucibles and silicon ingots and wafers with a low oxygen content.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. C3QB11/00 C3QB15/10 C3QB29/06 C3QB35/00 C04B35/584

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)
C30B C04B C23C

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td></td>
<td>abstract; figures 5a, 6b, 6c; example 2; table 2</td>
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<tr>
<td></td>
<td>paragraphs [0031], [0033], [0034], [0047], [0048], [0068], [0069], etc.</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
  *W* document defining the general state of the art which is not considered to be of particular relevance
  *E* earlier document but published on or after the international filing date
  *I* 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
  *P* document published prior to the international filing date but later than the priority date claimed

* Other documents:
  *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
  *A* document member of the same patent family

Date of the actual completion of the international search: 8 September 2010
Date of mailing of the international search report: 10/02/2011

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Fax: (+31-70) 340-3016

Authorized officer
Lemoisson, Fabienne
### International Search Report

**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.: 43, 45, 145, 147, 286, 288 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:

   see FURTHER INFORMATION sheet PCT/ISA/210

3. **☐** Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 64(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 0% of inventions concerned. Some and/or all claims 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.:

   1-35, 37-42, 44, 46-107, 240-285, 287 (completely) ; 209-239(partially)

**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.
## DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
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<td>X-N</td>
<td>[0071], [0074] - [0083], [0085], [0089], [0112], [0113]</td>
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<td>WO 2008/118023 A1 (ELKEM SOLAR AS [NO]; TRONSTAD RAGNAR [NO]; ENEBakk ERIK [NO])</td>
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<td>2 October 2008 (2008-10-02)</td>
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<td></td>
<td>page 3, lines 28-29 - page 4, lines 1-23; examples 1,2</td>
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<td>26 July 2007 (2007-07-26)</td>
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<td>paragraph [0105]; table 1</td>
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This International Searching Authority found multiple (groups of) inventions in this international application, as follows:


Invention 1 concerns a crucible having a first coating on a first area and a second coating on a second area of its inner surface, wherein the second coating comprises an additive not present in the first coating, the related method of making the crucible, a method of preparing a multicrystal silicon ingot using the crucible and a composition (medium, Si3N4, binder and dispersant) applied to the crucible to make the first coating and another composition (medium, Si3N4, binder and sintering agent) applied to the crucible to make the second coating.

2. claims: 108-142, 144, 146, 148-180, 289-329(completely) ; 209-224(partially)

Invention 2 concerns a crucible having a coating on a portion area, the related method of making the crucible, a method of preparing a multicrystal silicon ingot using the crucible and a composition (medium, Si3N4, binder and sintering agent being silica or yttria) applied to the crucible to make the coating.

3. claims: 181-208, 330-354(completely) ; 225-239 (partially)

Invention 3 concerns a method of applying a composition to a portion of the inner face of a crucible, a composition (medium, Si3N4, binder and dispersant) applied to the crucible to make the coating and a method of preparing a multicrystal silicon ingot using the related crucible.

4. claims: 355-367

Invention 4 concerns a silicon ingot and the related multicrystal silicon wafer.
Continuation of Box 11.2
Claims Nos.: 43, 45, 145, 147, 286, 288

The claims 43, 45, 145, 147, 286 and 288 are product-by-process claims.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) PCT declaration be overcome.
<table>
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<th>Publication date</th>
<th>Patent family member(s)</th>
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<td>WO 2008118023 Al</td>
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