Title: CAAC IGZO DEPOSITED AT ROOM TEMPERATURE

Abstract: A co-sputter technique is used to deposit In-Ga-Zn-O films using PVD. The films are deposited in an atmosphere including both oxygen and argon. A heater setpoint of about 300C results in a substrate temperature of about 165C. One target includes an alloy of In, Ga, Zn, and O with an atomic ratio of In:Ga:Zn of about 1:1:1. The second target includes a compound of zinc oxide. The third target includes a compound of indium oxide. The films exhibit the c-axis aligned crystalline (CAAC) phase in an as-deposited state, when deposited at room temperature, without the need of a subsequent anneal treatment.
Date of publication of the international search report:
26 November 2015
A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01L 21/203, 31/0392 (2015.01)
CPC - H01L 21/203, 27/1222, 27/1225

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)

IPC(8) Classification(s): H01L 21/203, 31/0392 (2015.01)
CPC Classification(s): H01L 21/203, 27/1222, 27/1225

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)

Patent (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Patents; Google Scholar; ProQuest; EBSCO Discovery; physical vapor deposition, sputtering, oxidizing gas, oxygen concentration, reactive, three, multiple, target, CAAC, IZGO, InGaZn alloy, In oxide, Zn oxide, power

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>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 201 1/0140100 A1 (TAKATA, M et al.) 16 June 2011; paragraphs (0134), (0153)</td>
<td>1-2, 5-7, 9, 11-12, 15-17, 19</td>
</tr>
<tr>
<td>Y</td>
<td>US 2012/0306834 A1 (UEDA, N et al.) 06 December 2012; abstract; paragraph (0157)</td>
<td>3-4, 8, 10, 13-14, 18, 20</td>
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<td>Y</td>
<td>WO 2013/035335 A1 (EBATA, K et al.) 14 March 2013; abstract; claim 13</td>
<td>8, 18</td>
</tr>
<tr>
<td>Y</td>
<td>US 2012/0161 133 A1 (YAMAZAKI, S) 28 June 2012; paragraphs (0172)-(0173), (0185), (0189)</td>
<td>18, 20</td>
</tr>
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</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

Date of the actual completion of the international search
26 May 2015 (26.05.2015)

Date of mailing of the international search report
22 JUN 2015

Name and mailing address of the ISA:
Mail Stop PCT, Attn: ISA-US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Authorized officer
Shane Thomas
PCT Hepath: 571-272-4300
PCT OSP: 571-272-7714

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