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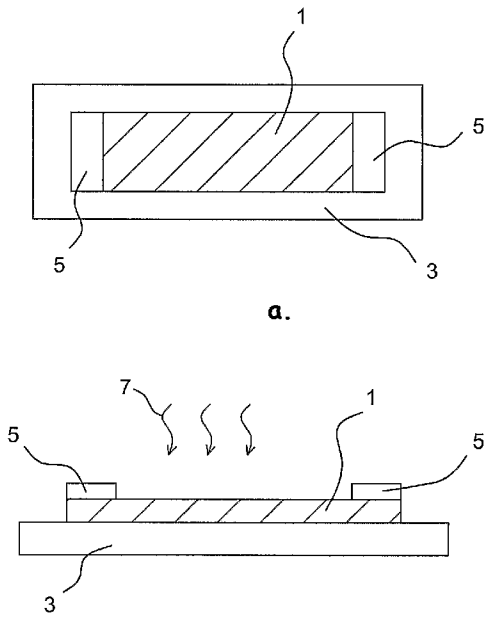
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SEMICONDUCTOR MATERIALS AND METHODS OF PRODUCING THEM



(57) Abstract: A method of producing particles containing metal oxide for use in semiconductor devices includes the steps of heating metal-containing particles in a flame produced by a mixture of oxygen and a fuel component comprising at least one combustible gas selected from hydrogen and hydrocarbons, the oxygen being present in the mixture in a proportion of not less than 10 mole% below, and not more than 60 mole% above, a stoichiometric amount relative to the fuel component, so as to oxidize metal in at least an outer shell of the particles; cooling the oxidized particles by feeding them into a liquid or sublimable solid medium; collecting the cooled oxidized particles; and providing a distance between entry of the particles into the flame and collection of the particles of at least 300mm. In this manner, such particles may be oxidized so as to provide a shell of metal oxide material which leaving unoxidized a core of metal. A semiconductive layer of such particles on a substrate may be formed by feeding, to a hot zone, such preoxidized metal-containing particles; heating the metal-containing particles in the hot zone to render the particles at least partially molten; and depositing the particles in the at least partially molten state onto the substrate. The above oxidation process may be employed to provide metal oxide particles in which different respective metals having different respective valencies are present in different respective molar proportions. The valencies and molar proportions may be selected so as to provide n- or p-type semiconductor layers.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. C23C8/10 C23C4/10

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)
C23C H01F

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, CHEM ABS Data, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 344 042 A (JEFFERY * BOARDMAN) 24 May 2000 (2000-05-24) page 7, paragraph 4 - page 13; claims 1-28	1-44
X	US 3 169 851 A (JR. DAVID H. FLEMING, ET AL) 16 February 1965 (1965-02-16) column 2, line 52 - line 58 column 3, line 18 - line 23 sentence 48 - sentence 74 column 4, line 38 - line 49 column 5, line 32 - line 55 column 6, line 1 - line 6; examples I-IV column 8, line 59 - line 65	1

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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 document but published on or after the international filing date

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"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	Date of mailing of the international search report
31 August 2006	08 NOV 2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Elsen, Daniel

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/001768

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 10, 31 August 1999 (1999-08-31) & JP 11 139827 A (NIPPON SANSO KK; POWDERTECH CO LTD), 25 May 1999 (1999-05-25) abstract -----	1
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 546 (C-661), 6 December 1989 (1989-12-06) & JP 01 224206 A (NATL RES INST FOR METALS), 7 September 1989 (1989-09-07) abstract -----	5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2006/001768

Box 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 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 fee, this Authority did not invite payment of any additional fee.

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.:

1-44

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ 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: 1-44

   method of producing particles containing metal oxide

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2. claims: 45-76

   method of forming semiconductive layer of particles on a substrate

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3. claims: 77-88,89-97

   metal oxide particle

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4. claims: 98,99

   metal oxide particle

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5. claims: 100-105,106,107

   semiconductor devices

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2006/001768

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 3169851 A	16-02-1965	AT 239289 B	25-03-1965
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		JP 4020842 B	07-04-1992