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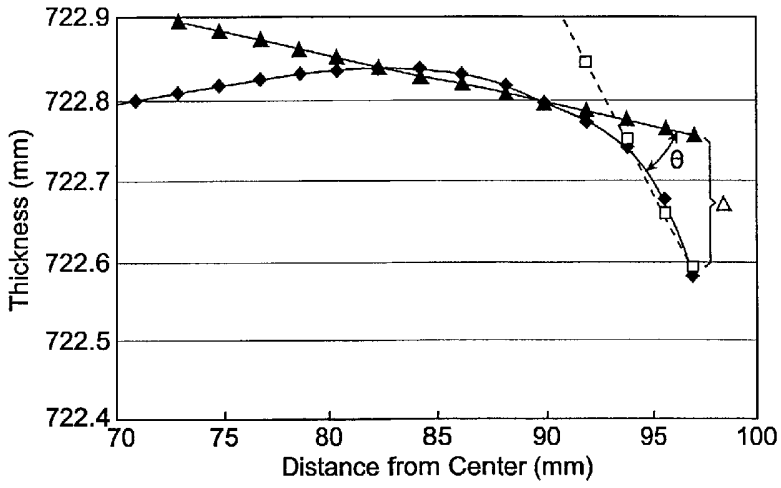
Published:
— *with international search report*

[Continued on next page]

(54) Title: METHODS AND COMPUTER PROGRAM PRODUCTS FOR CHARACTERIZING A CRYSTALLINE STRUCTURE



(57) Abstract: Methods and computer program products are provided for analyzing a crystalline structure, such as a wafer or an epitaxial layer in more detail, including the portion of the crystalline structure proximate the edge. The methods and computer program products of one aspect determine the average thickness and the normalized profile of a crystalline structure with enhanced detail. Additionally, the method and computer program product of another aspect represent the profile proximate the edge of the crystalline structure with a pair of lines that are selected to permit the profile of the crystalline structure proximate the edge of the crystalline structure to be characterized in more detail. Further, the method of yet another aspect permits the average edge profile for a plurality of crystalline structure to be defined.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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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.

INTERNATIONAL SEARCH REPORT

Internati plication No
PCT/US 03/10565

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01B5/06 G01B7/06 G01B11/06 G01B21/08 H01L21/66

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 7 G01B H01L B24B

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, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 849 916 A (ABBE ROBERT C ET AL) 18 July 1989 (1989-07-18) column 3, line 60 -column 7, line 65; figures 1-5	1-6, 31-33
A	US 5 995 226 A (ABE KOHZO ET AL) 30 November 1999 (1999-11-30) column 3, line 17 -column 5, line 3; figures 1-4	1-6
A	EP 0 806 266 A (CANON KK) 12 November 1997 (1997-11-12) abstract; figure 1 page 6, line 41 -page 7, line 50; figure 5	1-6, 31-33

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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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

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"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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Date of the actual completion of the international search	Date of mailing of the international search report
28 October 2003	11. 11. 03

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	Beyfuß, M

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INTERNATIONAL SEARCH REPORT

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PCT/US 03/10565

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	US 2003/023402 A1 (YAMAMOTO HIDEKAZU ET AL) 30 January 2003 (2003-01-30) abstract paragraph '0059! - paragraph '0068!; figures 1,3	7,9,10, 12
A	EP 0 687 526 A (SHINETSU HANDOTAI KK) 20 December 1995 (1995-12-20) column 5, line 51 -column 8, line 23; figures 1-3	7-12
X	US 6 367 159 B1 (ITO SHINJU ET AL) 9 April 2002 (2002-04-09)	13-21, 23-29
A	column 4, line 22 -column 5, line 32; figure 1 column 7, line 16 -column 8, line 31; figures 10,11	7-12,22, 30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/10565

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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.:

Remark on Protest

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

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 03 /10565

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-6

   A method of analysing a crystalline structure comprising: obtaining thickness data at different angular positions for different radial locations and determining for each radial location an average thickness based on the thickness data at the different angular positions.

2. Claims: 7-12

   A method of defining a normalised shape of a crystalline structure comprising: determining the thickness for different radial locations, defining a reference line for compensating for taper across the crystalline structure such that the reference line represents the adjusted relationship between thickness and radial location, and determining the normalised profile of the crystalline structure based upon deviations in the adjusted relationship from the reference line for each of the radial locations.

3. Claims: 13-30

   A method of representing a shape of a crystalline structure comprising: determining the thickness for different radial locations, defining first and second lines based upon the thickness across different regions, defining the first line upon the thickness across a region closer to the edge of the structure, and defining the second line upon the thickness across a region positioned further from the edge of the structure.

4. Claims: 31-33

   A method for defining an average edge profile for a plurality of crystalline structures comprising: determining an average thickness at different angular positions for first and second radial locations of the structures, determining the average edge profile at the different angular positions for the structures based upon a difference between the average at the first radial location for the structures and the average thickness at the second radial location for structures at each of the different angular positions.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern: Application No
PCT/US 03/10565

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