Title: NANOMEMBRANE STRUCTURES HAVING MIXED CRYSTALLINE ORIENTATIONS AND COMPOSITIONS

Abstract: The present nanomembrane structures include a multilayer film comprising a single-crystalline layer of semiconductor material disposed between two other single-crystalline layers of semiconductor material. A plurality of holes extending through the nanomembrane are at least partially, and preferably entirely, filled with a filler material which is also a semiconductor, but which differs from the nanomembrane semiconductor materials in composition, crystal orientation, or both.

FIG. 1
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

(88) Date of publication of the international search report: 18 June 2009
### A. CLASSIFICATION OF SUBJECT MATTER

INV. H01L21/18 H01L21/20 H01L21/762

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)

HOIL

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, INSPEC

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<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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<td>X</td>
<td>WO 2006/065444 A (WISCONSIN ALUMNI RES FOUND [US]; SAVAGE DONALD E [US]; ROBERTS MICHELL) 22 June 2006 (2006-06-22) cited in the application paragraphs [0007] - [0009], [0021], [0029] - [0037], [0042], [0046], [0047], [0057]; figures 4-6,8</td>
<td>1,2, 8-11, 17, 18,20, 21,23</td>
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Further documents are listed in the continuation of Box C

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

'L' document which may throw doubts on patentability 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

'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

'W' document member of the same patent family

Date of the actual completion of the international search

4 February 2009

Date of mailing of the international search report

13/05/2009

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, Fax (+31-70) 340-3016

Bruckmayer, Manfred
<table>
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<td>US 2005/199984 A1 (NOWAK EDWARD J [US])</td>
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<td>15 September 2005 (2005-09-15)</td>
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<td>paragraphs [0009], [0013], [0025], [0026], [0028], [0031], [0039], [0041], [0042], [0045] - [0047], [0063] - [0068]; figure 5F</td>
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<td>COHEN GUY MOSHE [US] ET AL</td>
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)
### 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.:**
     - 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:

```markdown
see additional sheet
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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.:**

   1-23

#### 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.**

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Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-23

A method for forming a heterogeneous structure, or the structures made according to that method, comprising forming a heterostructure comprising two particular areas, which are different in composition, crystal orientation or strain state.

2. claims: 24-27

A method of forming a heterogeneous structure comprising filling, at least partially, holes in a semiconductor substrate using a flexible thin semiconductor film.
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
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