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[Continued on next page]

(54) Title: NANOWIRE ARRAYS FOR NEUROTECHNOLOGY AND OTHER APPLICATIONS

(57) Abstract: The present invention generally relates to nanowires. In one aspect, the present invention is generally directed to systems and methods of individually addressing nanowires on a surface, e.g., that are substantially upstanding or vertically-oriented with respect to the surface. In some cases, one or more nanowires may be individually addressed using various integrated circuit ("IC") technologies, such as CMOS. For example, the nanowires may form an array on top of an active CMOS integrated circuit.

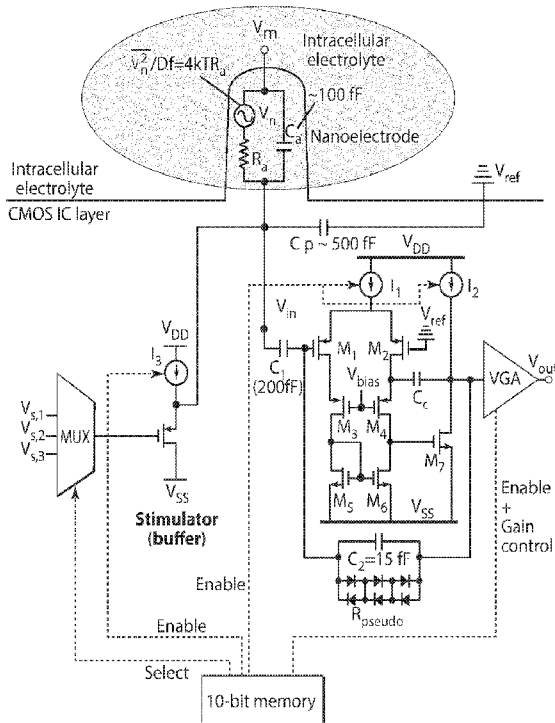


Fig. 7

TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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## INTERNATIONAL SEARCH REPORT

International application No.

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - H01L 23/52 (2016.01) CPC - H01L 23/52 (2016.01) According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - B82Y 30/00, 5/00; H01L 21/20, 21/70, 23/52, 23/532, 23/58, 29/775 (2016.01) CPC - B82Y 30/00, 5/00; H01L 21/20, 21/70, 21/743, 23/52, 23/5386, 23/58, 29/775 (2016.01)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC 257/204, 428, 499, 773, 784; 977/762, 925 (keyword delimited)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patents, Google Scholar Search terms used: nanowire, integrated circuit, vertical, record, electroporation, compound, cells		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0187840 A1 (DELL'ACQUA-BELLAVITIS et al) 16 August 2007 (16.08.2007) entire document	1-3, 25-27, 48-50, 66-68
A	US 2003/0100189 A1 (LEE et al) 29 May 2003 (29.05.2003) entire document	1-3, 25-27, 48-50, 66-68
A	US 2013/0260467 A1 (PARK et al) 03 October 2013 (03.10.2013) entire document	1-3, 25-27, 48-50, 66-68
A	US 2012/0094382 A1 (PARK et al) 19 April 2012 (19.04.2012) entire document	1-3, 25-27, 48-50, 66-68
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> 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 application or patent but published on or after the international filing date "L" 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 "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 12 April 2016		Date of mailing of the international search report <b>03 MAY 2016</b>
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300		Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2016/012685

**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.: 4-24, 28-47, 51-65, 69-87, 92-95  
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:

See supplemental page

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 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.:  
1-3,25-27,48-50,66-68

- 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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2016/012685

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-3,25-27,48-50,66-68, drawn to a plurality of upstanding nanowires on a substrate.

Group II, claims 88-91, drawn to a method of fabricating a device.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: upstanding nanowires in electrical communication with an integrated circuit as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: generating an etch mask; depositing a conformal coating comprising an electrically conductive material as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of nanowires on a substrate; integrated circuit, this technical feature is not a special technical feature as it does not make a contribution over the prior art. Specifically, US 2003/0100189 A1 (LEE et al) 29 May 2003 (29.05.2003) teaches nanowires on a substrate (Paras. 6 and 12); integrated circuit (Para. 6).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.