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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: METHODS OF NANOWIRE FUNCTIONALIZATION, DISPERSION, ALIGNMENT AND ATTACHMENT

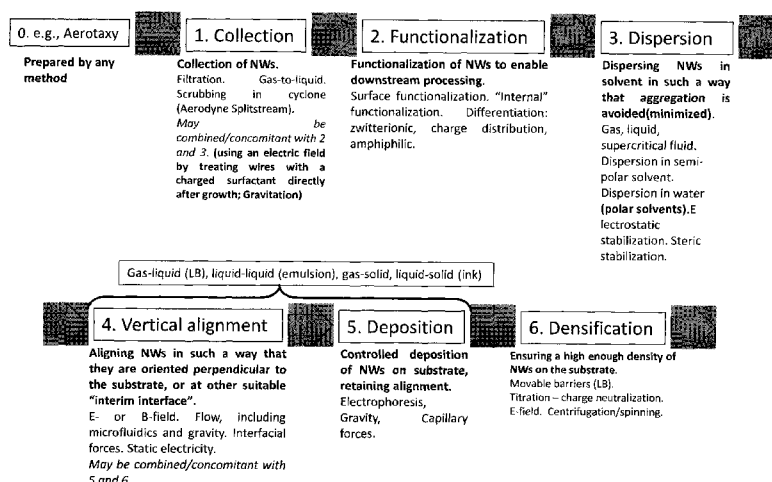


Fig. 1A

(57) Abstract: A nanowire device and a method of making a nanowire device are provided. The device includes a plurality of nanowires functionalized with different functionalizing compounds. The method includes functionalizing the nanowires with a functionalizing compound, dispersing the nanowires in a polar or semi-polar solvent, aligning the nanowires on a substrate such that longitudinal axes of the nanowires are oriented about perpendicular to a major surface of the substrate, and fixing the nanowires to the substrate.





— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
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INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2013/050389

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01L29/66 B82Y10/00 B82Y40/00 H01L51/00 H01L29/06
 ADD. H01L29/16 H01L29/20 H01L29/22

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)
 H01L B82Y C01B

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)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/057614 A2 (NANO PROPRIETARY INC [US]; YANIV ZVI [US] APPLIED NANOTECH HOLDINGS IN) 15 May 2008 (2008-05-15)	1,8-17
Y	figures 1, 7 page 3, line 21 - page 5, line 20	1-3,5,6, 8-17
X	US 2006/240492 A1 (RUSLING JAMES F [US] ET AL) 26 October 2006 (2006-10-26) paragraphs [0021] - [0030]; figure 1	1,8
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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 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 23 September 2013	Date of mailing of the international search report 01/10/2013
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Dauw, Xavier
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/050389

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:

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 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.:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-20, 53-68

Method of making a nanowire device with a plurality of aligned nanowires, by functionalizing one end of the nanowires, dispersing the nanowires, aligning the nanowires perpendicularly to a surface and fixing the nanowires to a substrate.

2. claims: 21-52

Method of functionalizing a nanowire having a semiconducting and a metal portion, by first covering a first portion with a sacrificial layer, functionalizing the second portion, uncovering the first and covering the second portion and functionalizing the first portion.
A corresponding nanowire, a corresponding composition and a corresponding ink.

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2013/050389

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ALLA PETUKHOVA ET AL: "Standing Arrays of Gold Nanorods End-Tethered with Polymer Ligands", SMALL, vol. 8, no. 5, 12 March 2012 (2012-03-12), pages 731-737, XP055072439, ISSN: 1613-6810, DOI: 10.1002/sml.201101297 sections 2.4 and 3; figure 7	1,8
Y	----- US 2006/286023 A1 (HUANG HOUJIN [JP]) 21 December 2006 (2006-12-21) paragraphs [0016] - [0019]; figures 2-9	1-3,5,6, 8-17
A	----- KWANG HEO ET AL: "Large-Scale Assembly of Silicon Nanowire Network-Based Devices Using Conventional Microfabrication Facilities", NANO LETTERS, vol. 8, no. 12, 10 December 2008 (2008-12-10), pages 4523-4527, XP055072436, ISSN: 1530-6984, DOI: 10.1021/nl802570m the whole document Figure 1 and corresponding text.	1-3,5,6, 8-17
A	----- WO 2004/099307 A2 (WISCONSIN ALUMNI RES FOUND [US]; HAMERS ROBERT J [US]; BAKER SARAH [US]) 18 November 2004 (2004-11-18) Figures 3-5 and corresponding text.	1-68
X	----- US 7 880 318 B1 (KAMINS THEODORE I [US] ET AL) 1 February 2011 (2011-02-01) column 5, lines 27-67; figure 3	28,29, 31-34, 38-41, 48-52
X	----- WO 2006/137940 A2 (UNIV CALIFORNIA [US]; GUR ILAN [US]; MILLIRON DELIA [US]; ALIVISATOS P) 28 December 2006 (2006-12-28) Fig. 1 and corresponding text.; paragraphs [0032], [0034]	28-34, 38-41, 48-52
X	----- US 7 105 052 B1 (SCHLENOFF JOSEPH B [US]) 12 September 2006 (2006-09-12) Figs. 1, 2, 4 and corresponding text.; column 4, lines 1-12	35-37, 42-45
A	----- WO 2007/081501 A1 (GEN ELECTRIC [US]; ZHANG ANPING [US]; LI YUN [US]; FEIST THOMAS PAUL [US]) 19 July 2007 (2007-07-19) Figs. 9-11 and corresponding text.	1-68

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/SE2013/050389

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			WO 2007081501 A1
