

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 10-1043-PCT	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/US2011/060392	International filing date ( <i>day/month/year</i> ) 11 November 2011 (11.11.2011)	Priority date ( <i>day/month/year</i> ) 14 November 2010 (14.11.2010)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant ARIZONA BOARD OF REGENTS, a body corporate of THE STATE OF ARIZONA acting for and on behalf of ARIZONA STATE UNIVERSITY			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input checked="" type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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	Date of issuance of this report 14 May 2013 (14.05.2013)
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From the  
 INTERNATIONAL SEARCHING AUTHORITY

**PCT**

WRITTEN OPINION OF THE  
 INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: JAMES SUGGS  
 MCDONNELL BOEHNEN HULBERT &  
 BERGHOFF LLP  
 300 S. WACKER DRIVE, SUITE 3100  
 CHICAGO, IL 60606

Date of mailing  
 (day/month/year) **09 MAR 2012**

Applicant's or agent's file reference  
 10-1043-PCT

**FOR FURTHER ACTION**  
 See paragraph 2 below

International application No. PCT/US2011/060392	International filing date (day/month/year) 11 November 2011	Priority date (day/month/year) 14 November 2010
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International Patent Classification (IPC) or both national classification and IPC  
 IPC(8) - H01L 21/326 (2012.01)  
 USPC - 438/761

Applicant ARIZONA BOARD OF REGENTS, A BODY CORPORATION OF THE STATE OF ARIZONA  
 ACTING FOR AND

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Date of completion of this opinion  <b>29 February 2012</b>	Authorized officer:  <b>Blaine R. Copenheaver</b>  PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

PCT/US2011/060392-09 03.2012

International application No.  
PCT/US2011/060392

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
  - the international application in the language in which it was filed.
  - a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
  
2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
  
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - on paper
    - in electronic form
  
  - b. (time)
    - in the international application as filed
    - together with the international application in electronic form
    - subsequently to this Authority for the purposes of search
  
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
  
5. Additional comments:

**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

the entire international application.

claims Nos. 4-18, 23-25

because:

the said international application, or the said claims Nos. \_\_\_\_\_ relate to the following subject matter which does not require an international search (*specify*):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 4-18, 23-25 are so unclear that no meaningful opinion could be formed (*specify*):

Claims 4-18, 23-25 are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

the claims, or said claims Nos. \_\_\_\_\_ are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

no international search report has been established for said claims Nos. 4-18, 23-25

a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.

pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).

See Supplemental Box for further details.

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## I. Statement

Novelty (N)	Claims	<u>2, 3/2, 19-22</u>	YES
	Claims	<u>1, 3/1</u>	NO
Inventive step (IS)	Claims	<u>None</u>	YES
	Claims	<u>1-3, 19-22</u>	NO
Industrial applicability (IA)	Claims	<u>1-3, 19-22</u>	YES
	Claims	<u>None</u>	NO

## 2. Citations and explanations:

Claims 1, 3/1 lack novelty under PCT Article 33(2) as being anticipated by Jin.

Regarding claim 1, Jin discloses a plasmonic structure (paragraph 62 and 94, using the methods of Jin to form plasmonic structures) comprising: a substrate (figures 10a-10e show a method of manufacturing, paragraphs 64-68; substrate 90); a plurality of metal particles disposed on the substrate (92); and one or more metal structures electrically coupled to and disposed on a surface of each of the plurality of metal particles (100, figure 10e, paragraph 96, using the nano-particle array as seed catalysts to grow the nanowires), the metal having a structure different from the structure of the metal particles (seeds vs. nanowires, paragraph 68).

Regarding claim 3 depending upon claim 1, Jin discloses the plurality of metal particles has an average diameter in the range of about 5 nm to about 2 micron (paragraph 69).

Claims 2, 3/2, 19-22 lack an inventive step under PCT Article 33(3) as being obvious over Jin in view of Tuominen et al, hereinafter referred to as Tuominen.

Regarding claim 19, Jin discloses a method for making a plasmonic structure (paragraph 62 and 94), the method comprising: providing a substrate (90; paragraphs 64-68; figures 10a-e) having disposed thereon a plurality of metal particles (92); growing one or more metal structures electrically coupled to and disposed on each of the plurality of metal particles (nanowires 100; paragraphs 68-69; figure 10e). Jin is silent regarding providing an anode and a cathode and disposing a liquid on the surface of the substrate, such that the liquid is in electrical contact with the anode, the cathode and the plurality of metal particles; and applying a bias voltage across the metal particles and the anode.

In the same field of endeavor, Tuominen discloses a method of manufacturing nanowires (abstract) comprising providing an anode and a cathode (paragraph 100, figure 2, two electrodes are inherently a cathode and anode) and disposing a liquid on the surface of the substrate (aqueous solution; paragraph 100; see figure 2), such that the liquid is in electrical contact with the anode, the cathode and the plurality of metal particles (see figure 2; paragraph 100, the gold particles at the bottom of the substrate); and applying a voltage across the metal particles and the anode (see figure 2; paragraphs 90 and 100). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the device of Jin with the method of manufacturing as taught by Tuominen in order to control the growth of the device.

Regarding claim 20, Jin discloses an anode is disposed on the top surface of the substrate (paragraph 50).

Regarding claims 21-22, Jin is silent regarding the liquid is an aqueous liquid (claim 21); the liquid is an aqueous solution of electrolyte (claim 22). Tuominen discloses the liquid is an aqueous liquid (paragraph 90); the liquid is an aqueous solution of electrolyte (paragraph 90). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the device of Jin with the method of manufacturing as taught by Tuominen in order to control the growth of the device.

Regarding claim 2, Jin is silent regarding the one or more metal structures are formed by electrodeposition. Tuominen discloses the use of electrodeposition to form metal structures (paragraph 90). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the device of Jin with the method of manufacturing as taught by Tuominen in order to control the growth of the device.

Regarding claim 3 depending upon claim 2, Jin discloses the plurality of metal particles has an average diameter in the range of about 5 nm to about 2 micron (paragraph 69).

Claims 1-3, 19-22 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.