Title: SYNTHESIS AND USE OF COLLOIDAL III-V NANOPARTICLES

Abstract: A colloidal suspension of III-V semiconductor nanoparticles.
A. **CLASSIFICATION OF SUBJECT MATTER**

IPC: A61K 9/14 (2006.01)

USPC: 424/489

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)

U.S.: 424/489

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)

scisearch, embase, wipids, caplus, medline, biosis

C. **DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>US Application 20020182632 (ANDERSON et al) 05 December 2002 (05.12.2002), entire document, especially paragraph 0025 and figure 3A.</td>
<td>27-29,35-67</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search: 23 June 2008 (23.06.2008)

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 mailing of the international search report: 15 JUL 2008

Authorized officer: CHRISTOPHER M. GROSS

Telephone No. (571) 272-1600

Form PCT/ISA/210 (second sheet) (April 2007)
**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. [x] Claims Nos.: 9, 25 and 34
   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:
   Please See Continuation Sheet

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:
Please See Continuation Sheet

<p>| | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>[ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.</td>
</tr>
<tr>
<td>2.</td>
<td>[x] As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.</td>
</tr>
<tr>
<td>3.</td>
<td>[ ] 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.:</td>
</tr>
<tr>
<td>4.</td>
<td>[ ] 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.:</td>
</tr>
</tbody>
</table>

**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.

Form PCT/ISA/210 (continuation of first sheet(2)) (April 2007)
Continuation of Box II Reason 2:
Claim 25 cannot be searched because a CRF has not been furnished. Claim 34 cannot be searched because Group III and Group V elements are inherently different, each element from the periodic table has a unique number of protons and neutrons. Claim 9 does not make sense grammatically

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING
This International Search Authority has found 5 inventions claimed in the International Application covered by the claims indicated below:

This application contains the following inventions or groups of inventions which are not so linked as to form a single 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, claim(s) 1-8, 10-24, 26-29, drawn to a method of producing colloidal III-V semiconductor crystals.

Group II, claim(s) 30-32, drawn to a method of patterning nanoparticles on a surface.

Group III, claim(s) 33-35-44, drawn to a core shell structure comprising a core and shell, each comprising group III and group V elements.

Group IV, claim(s) 45-56, drawn to a group III-V semiconductor nanoparticle.

Group V, claim(s) 57-67, drawn to a colloidal suspension of group III-nitride semiconductor crystals

The inventions listed as Groups do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding technical features for the following reasons:

The technical feature linking groups I-V appears to be that they all relate to a method of comprising a Group III element source plus a Group V element source plus a reducing agent so as to prepare group III-V semiconductor crystals.

However, such a method has been described by McMurr et al (1998 Inorg. Chem. 37:6638-6644).

Therefore the technical feature linking the inventions of groups I-V does not constitute a special technical feature as defined by PCT rule 13.2, as it does not define a contribution over the prior art.

The special technical feature of Group I is considered to be a method of producing colloidal III-V semiconductor crystals.

The special technical feature of Group II is considered to be a method of patterning nanoparticles on a surface.

The special technical feature of Group III is considered to be a core shell structure comprising a core and shell, each comprising group III and group V elements.

The special technical feature of Group IV is considered to be a group III-V semiconductor nanoparticle.

The special technical feature of Group V is considered to be a colloidal suspension of group III-nitride semiconductor crystals.

The special technical feature of Group VI is considered to be a method of treatment.

Form PCT/ISA/210 (extra sheet) (April 2007)
The special technical feature of Group VII is considered to be an electronic representation of kinase binding sites.

The special technical feature of Group VIII is considered to be a kinase inhibitor chemical conjugate.

Accordingly, Groups I-V are not so linked by the same or a corresponding special technical feature as to form a single inventive concept.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

Group III source

The claims are deemed to correspond to the species listed above in the following manner: 1-67. The following claim(s) are generic: 1-8,10-24,26-29, for invention I; 30-32 for invention II; 33,35-44 for invention III; 45-56 for invention IV; 57-67 for invention V.

Group V source

The claims are deemed to correspond to the species listed above in the following manner: 1-67. The following claim(s) are generic: 1-8,10-24,26-29, for invention I; 30-32 for invention II; 33,35-44 for invention III; 45-56 for invention IV; 57-67 for invention V.

Solvent

The claims are deemed to correspond to the species listed above in the following manner: 1,21. The following claim(s) are generic: 1,21 for invention I;

Capping Agent

The claims are deemed to correspond to the species listed above in the following manner: 1,22,23. The following claim(s) are generic: 1,22,23,24 for invention I; claims 30,32 are generic for invention II.

Core Material

The claims are deemed to correspond to the species listed above in the following manner: 1,22,23. The following claim(s) are generic: claims 33,35-44 are generic for invention III.

Shell Material

The claims are deemed to correspond to the species listed above in the following manner: 1,22,23. The following claim(s) are generic: 33,35-44 are generic for invention III.

According to the guidelines in Section (f)(i)(a) of Annex B of the PCT Administrative Instructions, the special technical feature as defined by PCT Rule 13.2 shall be considered to be met when all the alternatives of a Markush-group are of similar nature. For chemical alternatives, such as the claimed sequences, the Markush group shall be regarded as being of similar nature when

(A) all alternatives have a common property or activity and

(B)(1) a common structure is preset, i.e., a significant structure is shared by all of the alternatives or

(B)(2) in cases where the common structure cannot be the unifying criteria, all alternatives belong to an art recognized class of compounds in the art to which the invention pertains.

The species listed above are considered to be separate inventions for the following reasons:

The genus/genera set forth above as Group III source, Group V source, Solvent, Capping Agent, Core Material and Shell Material include species which do not share a common core structure. For example: A group III source or core or shell comprising GaBr3 salt does not share a common structure or activity with AICl3; A group V source or core or shell such as trimethyl arsine does not share a common structure with diisopropylethylamine; Capping reagents such as TOPO do not share a common structure with a polynucleotide; Solvents such as chloroform do not share a common core with paraffin oil.