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Published:

- with international search report (Art. 21(3))
- 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:

5 July 2012

(54) Title: SYSTEM AND METHOD FOR DELIVERY OF DNA-BINDING CHEMOTHERAPY DRUGS USING NANOPARTICLES

(57) Abstract: System and method for loading the front line anticancer drug, doxorubicin (DOX) onto DNA-capped gold nanoparticles whose duplex DNA has been designed for specific DOX intercalation. Since each AuNP contains about 108 high affinity drug sites, this design allows for a high local DOX concentration on the particle. Drug binding was confirmed by monitoring the increase in DNA melting temperature, the shift in the plasmon resonance maximum, and the increase in the NP hydrodynamic radius as a function of [DOX]/[DNA] ratio. The feasibility of the nanoparticles as a drug delivery system was demonstrated by showing that particle-bound DOX could be transferred to a target DNA.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/058805**A. CLASSIFICATION OF SUBJECT MATTER***A61K 9/16(2006.01)i, A61K 31/7042(2006.01)i, A61K 47/48(2006.01)i, A61K 47/02(2006.01)i, A61P 35/00(2006.01)i*

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)

A61K 9/16; A61K 9/14; A61K 49/00; A61B 5/055; A61K 9/50; A61K 9/51; A61P 35/00; A61K 9/127; A61C 19/06; C07K 17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: nanoparticle, drug delivery, nucleic acid, gold, doxorubicin

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 7332586 B2 (S. FRANZEN et al.) 19 February 2008 See abstract, lines 29-34 in column 3, lines 4-8 in column 7, line 40 in column 19 - line 3 in column 21, lines 33-45 in column 21 and claims 1, 4, 5, 13, 20.	1-8, 13
Y	WO 2009-155431 A1 (UNIVERSITY OF LOUISVILLE RESEARCH FOUNDATION, INC.) 23 December 2009 See paragraphs [0003], [0044], [0047], [0049], and claims 1, 6-7, 10.	1-8, 13
A	US 2009-0148535 A1 (C. BAMDAD) 11 June 2009 See abstract, paragraphs [0010], [0012], and claims 1-2.	1-8, 13
A	US 2006-0222595 A1 (P. MUKHERJEE et al.) 05 October 2006 See paragraphs [0004], [0013], and claims 5-7, 9.	1-8, 13
A	US 2007-0292495 A1 (F. N. LUDWIG et al.) 20 December 2007 See paragraphs [0001], [0039], and claims 1, 3, 5.	1-8, 13
A	US 2008-0038686 A1 (S. NAGAI) 14 February 2008 See abstract and claims 1, 2, 11.	1-8, 13



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 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

16 MAY 2012 (16.05.2012)

Date of mailing of the international search report

17 MAY 2012 (17.05.2012)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2011/058805

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7332586 B2	19.02.2008	US 2003-0147966 A1 US 2008-0199529 A1	07.08.2003 21.08.2008
WO 2009-155431 A1	23.12.2009	US 2011-0104074 A1	05.05.2011
US 2009-0148535 A1	11.06.2009	WO 2009-075817 A1	18.06.2009
US 2006-0222595 A1	05.10.2006	None	
US 2007-0292495 A1	20.12.2007	US 8048448 B2 WO 2007-146426 A2 WO 2007-146426 A3	01.11.2011 21.12.2007 12.09.2008
US 2008-0038686 A1	14.02.2008	AU 2007-240888 A1 CA 2649583 A1 EP 2007307 A2 JP 2009-534097 A JP 2009-534097 T KR 10-2009-0009856 A WO 2007-123880 A2 WO 2007-123880 A3	01.11.2007 01.11.2007 31.12.2008 24.09.2009 24.09.2009 23.01.2009 01.11.2007 28.08.2008

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2011/058805**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.: 14-17
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 14-17 are directed to a treatment method of the human body by therapy and thus relate to a subject matter which this International Searching Authority is not required to search under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under the PCT.
2. ☒ Claims Nos.: 9-12
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:
Claims 9-12 are considered to be unclear under PCT Article 6, because claim 9 directed to "a molecule" is referring to claim 7 directed to "a method", and claims 10-12 are referring to unclear claims 9-10.
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:

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 fee, this Authority did not invite payment of any additional fee.
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.