



(43) International Publication Date
22 November 2012 (22.11.2012)

(10) International Publication Number
WO 2012/159121 A3

(51) International Patent Classification:

C12Q 1/68 (2006.01) *G01N 33/569* (2006.01)
G01R 33/465 (2006.01) *G01N 27/72* (2006.01)

(21) International Application Number:

PCT/US2012/038903

(22) International Filing Date:

21 May 2012 (21.05.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/487,977 19 May 2011 (19.05.2011) US

(71) Applicant (for all designated States except US): **UNIVERSITY OF CENTRAL FLORIDA RESEARCH FOUNDATION, INC.** [US/US]; 12201 Research Parkway, Suite 501, Orlando, FL 32826 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **NASER, Saleh** [US/US]; 20721 Quinella St., Orlando, FL 32833 (US). **PEREZ, J. Manuel** [US/US]; 2006 Gloria Oak Court, Orlando, FL 32820 (US). **KAITTANIS, Charalambos** [CY/US]; 475 Main Street, Apt. 8A, New York, NY 10044 (US).

(74) Agents: **VAN DYKE, Timothy H.** et al.; Beusse Wolter Sanks Mora & Maire, 390 N. Orange Avenue, Suite 2500, Orlando, FL 32801 (US).

(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, 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, 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.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, 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, ML, MR, NE, SN, TD, TG).

Published:

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

(88) Date of publication of the international search report:

23 May 2013

(15) Information about Correction:

Previous Correction:

see Notice of 28 March 2013

(54) Title: MICROBE DETECTION VIA HYBRIDIZING MAGNETIC RELAXATION NANOSENSORS

(57) Abstract: Disclosed herein are methods and materials for facilitating the detection of nucleic acid analytes of interest. Specifically exemplified herein are methods for detecting mycobacterial microorganisms, namely *Mycobacterium avium* spp. *paratuberculosis*. Also disclosed is new hybridizing magnetic relaxation nanosensor (hMRS) particularly adapted to detect a target nucleic acid analyte of interest.



WO 2012/159121 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/038903**A. CLASSIFICATION OF SUBJECT MATTER***C12Q 1/68(2006.01)i, G01R 33/465(2006.01)i, G01N 33/569(2006.01)i, G01N 27/72(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)

C12Q 1/68; G01N 30/00; G01R 33/28; G01R 33/34; G01R 33/44; C40B 30/04; A61K 47/48

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: hybridizing magnetic relaxation nanosensor(hMRS), magnetic resonance, Mycobacterium, antibody

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KAITTANIS, C. et al. "One-step, nanoparticle-mediated bacterial detection with magnetic relaxation.", Nano Lett., February 2007, vol.7, no.2, pp.380-383. See whole document.	1-37
A	US 2010-0072994 A1 (LEE, W.D. et al.) 25 May 2010. See claim 1.	1-37
A	US 2011-0021374 A1 (LEE, W. D.) 27 January 2011. See claim 32.	1-37
A	WO 2009-085214 A1 (T2 BIOSYSTEMS, INC.) 9 July 2009. See claim 1.	1-37
A	EP 1631318 B1 (CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS & MIDATECH LIMITED) 10 November 2010. See claim 1.	1-37
PX	KAITTANIS, C. et al. "Rapid and sensitive detection of an intracellular pathogen in human peripheral leukocytes with hybridizing magnetic relaxation nanosensors.", PLoS One, 9 April 2012, vol.7, issue.4, e35326. See whole document.	1-25



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

25 JANUARY 2013 (25.01.2013)

Date of mailing of the international search report

28 JANUARY 2013 (28.01.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Lee Hyojin

Telephone No. 82-42-481-8743



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/038903

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0072994 A1	25.03.2010	AU 2007-317787 A1 AU 2007-317787 A2 CA 2669045 A1 EP 2084550 A1 WO 2008-057578 A1	15.05.2008 30.07.2009 15.05.2008 05.08.2009 15.05.2008
US 2011-0021374 A1	27.01.2011	AU 2006-284832 A1 AU 2006-284832 A8 AU 2006-284832 B2 CA 2620861 A1 EP 1932009 A2 JP 2009-506345 A US 2007-0116602 A1 US 2009-0134869 A1 US 2011-0018538 A1 US 2011-0020787 A1 US 2011-0020788 A1 US 2011-0020953 A1 US 7564245 B2 US 8102176 B2 US 8310231 B2 US 8310232 B2 US 8334693 B2 US 8344731 B2 WO 2007-027843 A2 WO 2007-027843 A3	08.03.2007 01.05.2008 02.06.2011 08.03.2007 18.06.2008 12.02.2009 24.05.2007 28.05.2009 27.01.2011 27.01.2011 27.01.2011 27.01.2011 21.07.2009 24.01.2012 13.11.2012 13.11.2012 18.12.2012 01.01.2013 08.03.2007 08.03.2007
WO 2009-085214 A1	09.07.2009	AU 2008-343871 A1 CA 2710191 A1 EP 2223133 A1 JP 2011-508213 A JP 2011-508213 T	09.07.2009 09.07.2009 01.09.2010 10.03.2011 10.03.2011
EP 1631318 B1	10.11.2010	AT 487496 T AU 2004-244811 A1 AU 2004-244811 B2 AU 2004-244811 B9 CA 2528460 A1 CA 2528460 C DE 602004030003 D1 DK1631318T3 EP 1631318 A2 EP 2277548 A2 EP 2277548 A3 EP 2486944 A1 ES 2355728 T3 GB 0313259 D0 JP 05-008977 B2 JP 2006-527245 A	15.11.2010 16.12.2004 07.02.2008 24.04.2008 16.12.2004 30.10.2012 23.12.2010 21.02.2011 08.03.2006 26.01.2011 27.04.2011 15.08.2012 30.03.2011 16.07.2003 08.06.2012 30.11.2006

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/038903Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

JP 2006-527245 T	30. 11. 2006
US 2006-0233712 A1	19. 10. 2006
WO 2004-108165 A2	16. 12. 2004
WO 2004-108165 A3	16. 06. 2005