(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau





(10) International Publication Number WO 2012/149007 A3

(43) International Publication Date 1 November 2012 (01.11.2012)

(51) International Patent Classification: E21B 21/08 (2006.01) E21B 41/02 (2006.01) E21B 43/22 (2006.01)

(21) International Application Number:

(22) International Filing Date:

25 April 2012 (25.04.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/096,413 28 April 2011 (28.04.2011) US

- (71) Applicant (for all designated States except US): BAKER HUGHES INCORPORATED [US/US]; PO Box 4740, Houston, Texas 77210-4740 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): XU, Zhiyue [US/US]; 18709 N. Bee Cave Springs Circle, Cypress, Texas 77433 (US). JOHNSON, Michael [US/US]; 6230 Clear Canyon Drive, Katy, Texas 77450 (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.

PCT/US2012/034978 (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, MD, 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).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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:

17 January 2013

(54) Title: FUNCTIONALLY GRADIENT COMPOSITE ARTICLE

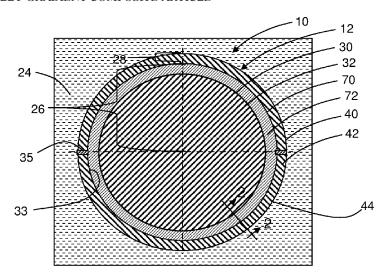


FIG. 1

(57) Abstract: A composite downhole article is disclosed. The article is selectively corrodible in a wellbore fluid. The article includes at least one corrodible core member comprising a first material that is corrodible in a wellbore fluid at a first corrosion rate. The article also includes at least one outer member disposed on the core member and comprising a second material that is corrodible in the wellbore fluid at a second corrosion rate, wherein the corrodible core member has a composition gradient or a density gradient, or a combination thereof, and wherein the first corrosion rate is substantially greater than the second corrosion rate.



International application No. PCT/US2012/034978

A. CLASSIFICATION OF SUBJECT MATTER

E21B 21/08(2006.01)i, E21B 43/22(2006.01)i, E21B 41/02(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)

E21B 21/08; E21B 34/06; A61F 2/06; E21B 36/04; C25D 5/18; E21B 41/00; E21B 33/13; A63B 53/10

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: corrodible, core member, outer member

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2007-0299510 A1 (SUBRAMANIAN, VENKATRAMAN et al.) 27 December 2007 See abstract, paragraphs [0078],[0082]-[0085], and figure 3.	1-6,9-24 7,8
A	US 2010-0294510 A1 (HOLMES KEVIN C.) 25 November 2010 See abstract, paragraph [0019], and figure 4.	1-24
A	US 05607017 A (OWENS, STEVE et al.) 04 March 1997 See abstract, column 2 lines 42-50, column 3 lines 5,6, and figure 2.	7,8
А	WO 2009-079745 A1 (TOMANTSCHGER, KLAUS et al.) 02 July 2009 See abstract, claims 18,21,22, and figure 1.	12,22

	Further	documents	are listed	in the	continuation	of Box	C.
--	---------	-----------	------------	--------	--------------	--------	----

 \boxtimes

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

09 NOVEMBER 2012 (09.11.2012)

- "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

Date of mailing of the international search report

12 NOVEMBER 2012 (12.11.2012)

Name and mailing address of the ISA/KR



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

Facsimile No. 82-42-472-7140

Authorized officer

Park Sang Hyun

Telephone No. 82-42-481-5434



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/034978

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0299510 A1	27.12.2007	EP 2020956 A2 US 2008-097620 A1 WO 2007-140320 A2 WO 2007-140320 A3	11.02.2009 24.04.2008 06.12.2007 20.11.2008
US 2010-0294510 A1	25.11.2010	AU 2010-249969 A1 AU 2010-249969 A1 CA 2762070 A1 GB 201117902 D0 GB 2482621 A NO 20111603A WO 2010-135115 A2 WO 2010-135115 A3	03. 11. 2011 25. 11. 2010 25. 11. 2010 30. 11. 2011 08. 02. 2012 22. 11. 2011 25. 11. 2010 24. 03. 2011 25. 11. 2010
US 05607017 A	04.03.1997	None	
WO 2009-079745 A1	02.07.2009	CA 2708186 A1 CN 101903566 A EP 2220270 A1 EP 2220270 A4 KR 10-2010-0103626 A US 2009-0159451 A1	02.07.2009 01.12.2010 25.08.2010 09.03.2011 27.09.2010 25.06.2009