

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
17 March 2011 (17.03.2011)(10) International Publication Number
WO 2011/031920 A3

(51) International Patent Classification:

C09K 8/588 (2006.01) *C09K 8/58* (2006.01)
C09K 8/584 (2006.01) *E21B 43/16* (2006.01)

(21) International Application Number:

PCT/US2010/048353

(22) International Filing Date:

10 September 2010 (10.09.2010)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/241,191 10 September 2009 (10.09.2009) US
 61/243,025 16 September 2009 (16.09.2009) US

(71) Applicant (for all designated States except US): **BOARD OF REGENTS, THE UNIVERSITY OF TEXAS SYSTEM** [US/US]; 201 West 7th Street, Austin, Texas 78701 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **WEERA-SOORIYA, Upali, P.** [US/US]; 11103 Andenwood

Drive, Austin, Texas 78726 (US). **POPE, Gary, A.** [US/US]; 302 Jeffrey Drive, Cedar Park, Texas 78613 (US).

(74) Agents: **GARSSON, Ross, Spencer** et al.; Matheson Keys Garsson & Kordzik PLLC, Bldg. 1, Suite 110, 7004 Bee Cave Road, Austin, Texas 78746 (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, RO, RS, RU, 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, 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, SE, SI, SK,

[Continued on next page]

(54) Title: PROCESS OF USING HARD BRINE AT HIGH ALKALINITY FOR ENHANCED OIL RECOVERY (EOR) APPLICATIONS

0.33% C16-17-7PO-SO₄, 0.33% C15-18 IOS, 0.33% C32-7PO-18EO-SO₄, 0.5% TEGBE, 3.5% EDTA Na₄

(57) Abstract: The present invention describes the use of EDTA and/or alkali treated hard brine at high pH for making ASP formulations for EOR applications.

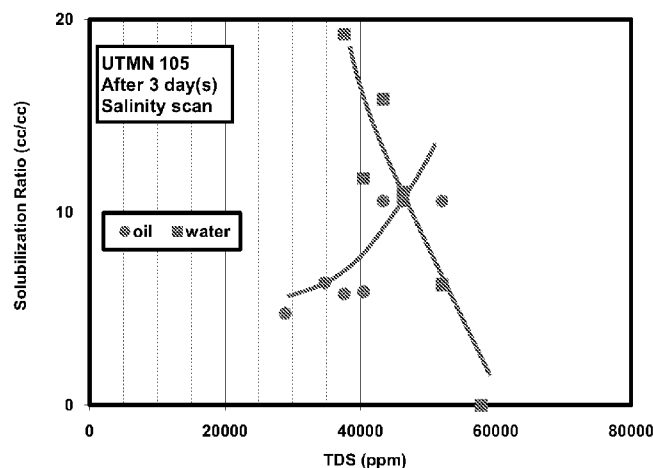


FIG. 2



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))*

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *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))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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

28 July 2011

A. CLASSIFICATION OF SUBJECT MATTER***C09K 8/588(2006.01)i, C09K 8/584(2006.01)i, C09K 8/58(2006.01)i, E21B 43/16(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)

C09K; E21B;

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: oil recovery, hard water, hard brine, alkaline-surfactant-polymer, chelating agent, composition

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SHUBO DENG et al., Effects of alkaline/surfactant/polymer on stability of oil droplets in produced water from ASP flooding, COLLOIDS AND SURFACES A: Physicochem. Eng. Aspects 211, 2002, pages 275-284. See abstract and pages 275-284.	1-49
A	US 2008-0312108 A1 (BERGER PAUL DANIEL et al.) 18 December 2008 See abstract and claims 1-22.	1-49
A	LI DAOSHAN et al., The effect of biosurfactant on the interfacial tension and adsorption loss of surfactant in ASP flooding, COLLOIDS AND SURFACES A: Physicochem. Eng. Aspects 244, 2004, pages 53-60. See abstract and pages 53-60.	1-49
A	WO 2009-058590 A2 (RHODIA INC. et al.) 07 May 2009 See abstract and claims 1-14.	1-49



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

22 APRIL 2011 (22.04.2011)

Date of mailing of the international search report

03 JUNE 2011 (03.06.2011)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Kim, Kwang Chul

Telephone No. 82-42-481-8293



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2010/048353Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

US 2008-0312108 A1

18.12.2008

None

WO 2009-058590 A2

07.05.2009

CA 2704177 A1

07.05.2009

CN 101842551 A

22.09.2010

EP 2205827 A2

14.07.2010

WO 2009-058590 A3

07.05.2009