

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

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Date of mailing (day/month/year) 28 August 2019 (28.08.2019)
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Applicant's or agent's file reference 1560-060300	FOR FURTHER ACTION See paragraph 2 below
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International application No. PCT/US2018/063593	International filing date (day/month/year) 03 December 2018 (03.12.2018)	Priority date(day/month/year)
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International Patent Classification (IPC) or both national classification and IPC C09K 8/46(2006.01)i, C04B 28/24(2006.01)i, C04B 7/02(2006.01)i, C04B 111/00(2006.01)n

Applicant HALLIBURTON ENERGY SERVICES, INC.

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578	Date of completion of this opinion 28 August 2019 (28.08.2019)	Authorized officer HEO, Joo Hyung Telephone No. +82-42-481-8150
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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2018/063593

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

- the international application in the language in which it was filed
- a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*. I(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

- a. forming part of the international application as filed:
- in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
- b. furnished together with the international application under PCT Rule 13*ter*. I(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
- c. furnished subsequent to the international filing date for the purposes of international search only:
- in the form of an Annex C/ST.25 text file (Rule 13*ter*. I(a)).
 - on paper or in the form of an image file (Rule 13*ter*. I(b) and Administrative Instructions, Section 713).

4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2018/063593

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-20</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>5-7,9,14,16-18</u>	YES
	Claims	<u>1-4,8,10-13,15,19-20</u>	NO
Industrial applicability (IA)	Claims	<u>1-20</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations :

Reference is made to the following documents:

D1 : US 2016-0084037 A1 (HALLIBURTON ENERGY SERVICES, INC.) 24 March 2016

D2 : US 2011-0041737 A1 (BEUCHLE, GUENTER et al.) 24 February 2011

D3 : WO 2018-157239 A1 (MACROCEMENT INDUSTRIES LTD.) 07 September 2018

D4 : US 2010-0010108 A1 (LECOLIER, ERIC et al.) 14 January 2010

D5 : US 2017-0349485 A1 (CIMPOR - CIMENTOS DE PORTUGAL, SGPS, S.A. et al.) 07 December 2017

I. Novelty and Inventive Step (PCT Article 33(2) and (3))

1. Claims 1-4, 8 and 10-13

1.1. Claim 1

D1, which is considered to be prior art to the subject matter of claim 1, discloses a method comprising steps of: providing a cement slurry comprising a plurality of cement particles, a plurality of inert microparticles, and water; introducing the cement slurry into a wellbore penetrating a subterranean formation; and allowing the cement slurry to set, wherein the inert microparticles have an average diameter of 10 nm to 20 microns (see claims 1 and 3 in D1).

The subject matter of claim 1 differs from that of D1 in that a cement composition comprises a composite cementitious material comprising a monophase amorphous hydraulic binder.

However, D2 discloses a monophase amorphous hydraulic binder which is mixed with water to make a cement paste (see paragraphs [0002], [0030]-[0031]; and claim 1 in D2). In consideration of the fact that D1 and D2 are in the same technical field relating to a cement, a person skilled in the art would easily apply the monophase amorphous hydraulic binder material of D2 to the cement slurry of D1 to arrive at claim 1 without difficulty.

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Accordingly, claim 1 would have been obvious over D1 in view of D2. Therefore, claim 1 has novelty but lacks an inventive step.

1.2. Claims 2-4, 8 and 10-13

Concerning the additional feature of claim 2, D1 discloses that the method comprises allowing the cement slurry to set at a location within the wellbore, wherein the location is a microannulus between a tubular and a cement sheath disposed in the wellbore (see claims 1 and 11 in D1).

Concerning the additional feature of claim 3, D1 discloses that the method comprises allowing the cement slurry to set at a location within the wellbore, wherein the location is a portion of the wellbore or a tubular disposed therein and, optionally, a proximal portion of the subterranean formation such that upon setting a cement plug is formed (see claims 1 and 15 in D1).

Concerning the additional feature of claim 4, D1 discloses that the cement slurry affects downhole equipment and tools including a wellbore casing, a completion string, an insert string, a drill string, and a pump (see paragraph [0038] in D1).

Concerning the additional feature of claim 8, D1 discloses that the inert microparticles include crystalline silica (see paragraph [0013] in D1).

The additional features of claims 10-12 can be easily optimized by repeated experiments practiced by a person skilled in the art, and no unexpected effect has been achieved compared to D1 and D2.

Concerning the additional feature of claim 13, D1 discloses that the cement slurry comprises the plurality of cement particles (see claim 1 in D1).

Accordingly, claims 2-4, 8 and 10-13 would have been obvious over D1 in view of D2. Therefore, claims 2-4, 8 and 10-13 have novelty but lack an inventive step.

2. Claims 15 and 19-20

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2.1. Claim 15

D1, which is considered to be prior art to the subject matter of claim 15, discloses a cement slurry comprising a plurality of cement particles, a plurality of inert microparticles, and water, and wherein the inert microparticles have an average diameter of 10 nm to 20 microns (see claims 1 and 3 in D1).

The subject matter of claim 15 differs from that of D1 in that a cement composition comprises a composite cementitious material comprising a monophase amorphous hydraulic binder.

However, D2 discloses a monophase amorphous hydraulic binder which is mixed with water to make a cement paste (see paragraphs [0002], [0030]-[0031]; and claim 1 in D2). In consideration of the fact that D1 and D2 are in the same technical field relating to a cement, a person skilled in the art would easily apply the monophase amorphous hydraulic binder material of D2 to the cement slurry of D1 to arrive at claim 15 without difficulty.

Accordingly, claim 15 would have been obvious over D1 in view of D2. Therefore, claim 15 has novelty but lacks an inventive step.

2.2. Claims 19-20

The additional features of claims 19-20 can be easily optimized by repeated experiments practiced by a person skilled in the art, and no unexpected effect has been achieved compared to D1 and D2.

Accordingly, claims 19-20 would have been obvious over D1 in view of D2. Therefore, claims 19-20 have novelty but lack an inventive step.

3. Claims 5-7, 9, 14 and 16-18

None of the prior art documents D1-D5 disclose or suggest that a monophase amorphous hydraulic binder is deposited on a micronized particulate solid (claims 5, 14 and 16); that a monophase amorphous hydraulic binder is at least partially coated on a micronized particulate solid (claim 7); and that a monophase amorphous hydraulic binder comprises at least one material selected from the group consisting of alpha-dicalciumsilicate hydrate, calcium silicate hydrate gel, tricalciumsilicate hydrate, and any combination thereof (claims 9 and 18).

Accordingly, claims 5, 7, 9, 14, 16 and 18 are not anticipated, nor are they obvious by the

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documents, taken alone or in combination. Therefore, claims 5, 7, 9, 14, 16 and 18 are novel and involve an inventive step.

Claims 6 and 17 are respectively dependent on claims 5 and 16, and therefore claims 6 and 17 are novel and involve an inventive step.

II. Industrial Applicability (PCT Article 33(4))

Claims 1-20 meet the requirements of industrial applicability.