

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2020/057096

International filing date (day/month/year)
23.10.2020

Priority date (day/month/year)
01.11.2019

International Patent Classification (IPC) or both national classification and IPC
 INV. C09K8/536 C09K8/56 C09K8/70 E21B43/26 C09K8/524 C09K8/528 E21B37/06

Applicant
BAKER HUGHES OILFIELD OPERATIONS LLC

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 43 <i>bis</i> .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 usually 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 66.1 *bis*(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:



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Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

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Box No. I Basis of the 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 43bis.1(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 13ter.1(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 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(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:

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)	Yes: Claims	<u>1-25</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-21</u>
	No: Claims	<u>22-25</u>
Industrial applicability (IA)	Yes: Claims	<u>1-25</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1 Reference is made to the following documents:
- D1** WO 2016/085559 A2 (CARBO CERAMICS INC [US]) 2 June 2016 (2016-06-02)
- D2** WO 2016/070044 A1 (PREFERRED TECHNOLOGY LLC [US]) 6 May 2016 (2016-05-06)
- 2 The present application does not meet the criteria of Article 33(3) PCT, because the subject-matter of independent claims 22 and 24 does not involve an inventive step.
- Document D1 is regarded as being the prior art closest to the subject-matter of claim 22, and discloses (cf. paragraphs [00102] to [00118], Examples, claims) a method of hydraulic fracturing a subterranean formation, comprising:
- injecting a hydraulic fluid into a subterranean formation at a rate and pressure sufficient to open a fracture therein; and
- injecting a fluid containing a proppant composition into the fracture, the proppant composition comprising:
- a plurality of particulates; and
- at least one particulate of the plurality of particulates comprising a chemical treatment agent;
- eluting the chemical treatment agent from the at least one particulate located inside the fracture after a period of time, wherein the proppant composition further comprises:
- a degradable coating or a non-degradable coating, and wherein the degradable coating degrades inside the fracture.
- The subject-matter of claim 22 therefore differs from this known method in that according to claim 22, the treatment agent is released from the composite through fissures in the coating.
- The subject-matter of claim 22 is therefore new.

The problem to be solved by the present invention may therefore be regarded as the provision of an alternative method of controlling the rate of release of a well treatment agent into a fracture, wherein the well treatment agent is immobilized on the surface of a particulate material, and wherein the surface of the particulate material (composite) is coated.

The solution proposed in claim 22 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Document D2 (cf. paragraph [0070] and claims) a method of treating a fractured subterranean stratum comprising:

contacting the fractured stratum with a proppant that comprises one or more of a hydrophobic coating, a coating that inhibits the formation of scale, a coating that reduces friction, a coating that controls sulfides, an acid or base resistant coating, a coating that inhibits corrosion, a coating that inhibits paraffin precipitation, a biocidal coating, a coating that inhibits asphaltene precipitation, a coating that inhibits hydrates and/or hydrate agglomerates, or a coating that contains and/or releases a compound that acts as a clay stabilizer. D2 foresees that the active material of the well-fluid insoluble coating is released under crack closure stresses, which means that the coating develops ruptures/fissures under the stress conditions and the active material is released from the coating.

Therefore, the combination of the teachings of documents D1 and D2 would lead the skilled person to the subject-matter of claim 22.

The same reasoning applies, *mutatis mutandis*, to the subject-matter of the corresponding independent claim 24, which therefore is also considered not inventive.

Dependent claims 23 and 25 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect inventive step.

In particular:

Claim 23: The particle size of the coated composite can appropriately be selected by the skilled person according to the particular circumstances.

Claim 25: Documents D1 and D2 foresee stimulation operations (fracturing).

- 3 Document D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses (cf. paragraphs [00102] to [00118], Examples, claims) a method of hydraulic fracturing a subterranean formation, comprising:

injecting a hydraulic fluid into a subterranean formation at a rate and pressure sufficient to open a fracture therein; and

injecting a fluid containing a proppant composition into the fracture, the proppant composition comprising:

a plurality of particulates; and

at least one particulate of the plurality of particulates comprising a chemical treatment agent;

eluting the chemical treatment agent from the at least one particulate located inside the fracture after a period of time, wherein the proppant composition further comprises:

a degradable coating or a non-degradable coating, and wherein the degradable coating degrades inside the fracture.

The subject-matter of claim 1 therefore differs from this known method in that according to claim 1, stress is applied to the composite to create fissures in the coating, and the treatment agent is released from the composite through the created fissures in the coating.

The subject-matter of claims 1-21 is therefore new.

The problem to be solved by the present invention may therefore be regarded as the provision of an alternative method of controlling the rate of release of a well treatment agent into a fracture, wherein the well treatment agent is immobilized on the surface of a particulate material, and wherein the surface of the particulate material (composite) is coated.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

There is no hint or suggestion in the prior art that would motivate the skilled person to apply stress to the composite to create fissures in the coating so that the treatment agent can be released from the composite through the created fissures in the coating.

For the same reasons, the subject-matter of independent claim 13 can also be considered to involve an inventive step.

Claims 2-12 and 14-21 are dependent on claims 1 and 13 and as such also meet the requirements of the PCT with respect to inventive step.

Re Item VII

Certain defects in the international application

- 1 The vague and imprecise statement in the description ("falling within the spirit and scope of the claims") in paragraph [00013] implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them.
- 2 The sentence "All references are incorporated herein by reference." in paragraph [00016] should be deleted. Please refer to paragraphs [00053], [00058], [0068], [00081], [00085] and [00094] as well.
- 3 The expression "and the like" in paragraphs [00040] and [00076] should be deleted.
- 4 The units psi, °F and pounds per thousand gallon (pptg) employed in paragraphs [0009], [00023], [00033], [00040], [00042], [00050], [00053], [000146], [000148], [000153], [000159], [000171] to [000177], in Tables II and IV, and in claims 4-6, 15-18 and 25 are not additionally expressed in terms of the units stipulated by Rule 10.1(a) and (b) PCT.
- 5 The claim-like clauses, i.e. Embodiments 1-47 on pages 35-41 should be deleted, since they otherwise may lead to unclarity as to the actual scope of protection.

Re Item VIII

Certain observations on the international application

- 1 The term "well treatment agent" used in claims 1, 7, 13, 22 and 24 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.