

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

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

To:

see form PCT/ISA/220

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/IB2019/060338

International filing date (day/month/year)
29.11.2019

Priority date (day/month/year)
30.11.2018

International Patent Classification (IPC) or both national classification and IPC
INV. C08J5/00 B82Y30/00 C08K9/04 C08K3/04

Applicant
SABIC GLOBAL TECHNOLOGIES B.V.

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*bis*.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

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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>1-20</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-20</u>
Industrial applicability (IA)	Yes: Claims	<u>1-20</u>
	No: Claims	

2. Citations and explanations

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

1 **Re Item VIII**

Certain observations on the international application

1. The way of carrying out the TGA appears to be specific and should be defined in claim 1 (see claim 7).

2. The method of claim 15 leads to a polymeric composite material according to claim 1. Otherwise, a problem of unity might arise. For sake of clarity, claim 15 should refer back to claim 1. Claim 20 would then be obsolete and should be deleted.

3. The terms "microcrystalline" and "nanocrystalline" have no well defined meaning as to the sizes which are covered therewith.

4. The term "coordinated" in claim 5 is not clear as to which interaction is covered therewith.

5. The feature "wherein the [...] reinforce a polymer matrix of the one or more polymers" lacks clarity (claim 9): Either it is implicit and then not necessary to mention or claim 9 should define the features needed for observing reinforcement. Same considerations apply for claim 11 ("has improved creep performance").

6. It is not clear how the average aspect ratio is defined and measured (claim 10).

In view of the above, the requirements of Art. 6 PCT are not fulfilled.

2 **Re Item V**

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

Reference is made to the following documents:

- D1 DATABASE WPI
 Week 201812 12 January 2018 (2018-01-12) Thomson Scientific,
 London, GB;
 AN 2018-06137V
 XP002790975,
 & CN 107 573 555 A (ANHUI MEITENG SPECIAL CABLE
 MATERIAL CO) 12 January 2018 (2018-01-12)
- D2 DATABASE WPI
 Week 201673 27 July 2016 (2016-07-27) Thomson Scientific,
 London, GB;
 AN 2016-498608
 XP002790976,
 & CN 105 801 937 A (ANHUI HUAHAI SPECIAL CABLES
 HOLDINGS CO) 27 July 2016 (2016-07-27)
- D3 WO 2008/034939 A1 (NATUCCELL AY [FI]; MOILANEN PASI [FI];
 VIRTANEN JORMA [FI]) 27 March 2008 (2008-03-27)

1. Novelty (Art. 33(2) (PCT))

1. 1 D1 and D2 disclose a polymeric composite. In D1, the carbon nanotube (CNT) is modified by a silane coupling agent. In D2 it is a multiwalled nanotube with carboxyl or hydroxyl groups.

1.2 D3 discloses in examples 1-5 and 8-13 the formation of a material comprising microcrystalline cellulose and HNT which is a (functionalized) carboxyl or hydroxyl - CNT (p. 40, l. 9). Such material can be used to enforce and render plastics and resins like polyethylene, polystyrene, polycarbonate, epoxies and polyurethane electrically conductive.

1.3 At present, absorption of the crystalline cellulose on the surface of the functionalized CNT is considered to be implicit when the cellulose and CNT material as described in D1-D3 are mixed.

1.4 None of D1-D3 explicitly discloses an oxidation level of 3-25 wt%.

Hence, the subject-matter of claims 1-20 fulfills the requirements of Art. 33(2) PCT.

2. Inventive step - Art. 33(3) PCT

2.1 Aim of present application is to provide a CNT composite material wherein the CNT disperse well into the polymeric matrix, said composite having increased mechanical properties. In that respect, D2 or D3 appear to be a suitable closest prior art since mechanical properties and dispersibility appear as well to be a concern.

D2 as closest prior art

2.2 D2 discloses CNT functionalized with hydroxyl groups, said groups are said to increase the compatibility of the CNT in the rubber, which in turn increases the composite's mechanical performances (see the machine translation). The application does not appear to show that working within an oxidation level of 3-25 wt% is linked to an unexpected effect besides the effects already disclosed in D2. Hence, the objective problem to solve is formulated as how to provide an alternative polymeric composite material with good mechanical performances.

2.3 At present, working within the claimed range is considered to be within the skills of the skilled practitioner. Hence, an inventive step cannot be acknowledged for independent claims 1, 15, 20.

2.4 The features disclosed in claims 2-14, 16-19 are either considered explicitly or implicitly disclosed in the prior art or represent obvious modifications of the composite material and the method for its production, which cannot be considered as involving an inventive step.

2.5 Similar conclusions would be made starting from D3 as closest prior art.