

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

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# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) 01-07-2020

Applicant's or agent's file reference  
AA 2207

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/FI2020/050226

International filing date (day/month/year)  
07-04-2020

Priority date (day/month/year)  
08-04-2019

International Patent Classification (IPC) or both national classification and IPC  
See Supplemental Box

Applicant  
Carbofex OYJ

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/SE  
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Date of completion of this opinion  
01-07-2020

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**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: cover sheet

**International Patent Classification (IPC)**

**C10B 53/02** (2006.01)

**C10B 7/10** (2006.01)

**C10B 47/44** (2006.01)

**C10B 49/04** (2006.01)

**C10L 5/44** (2006.01)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/FI2020/050226

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 English 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*.1(b)).
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*.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 13*ter*.1(a)).
    - ☐ on paper or in the form of an image file (Rule 13*ter*.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 and industrial applicability; citations and explanations supporting such statement**

1. Statement

|                               |        |            |     |
|-------------------------------|--------|------------|-----|
| Novelty (N)                   | Claims | <u>1-8</u> | YES |
|                               | Claims |            | NO  |
| Inventive step (IS)           | Claims | <u>1-8</u> | YES |
|                               | Claims |            | NO  |
| Industrial applicability (IA) | Claims | <u>1-8</u> | YES |
|                               | Claims |            | NO  |

2. Citations and explanations

The invention relates to a method and an apparatus for manufacturing, with thermal treatment, bio coal. Feedstock (x) is conveyed in a process space (2) with the conveyor arrangement (3), whereby a pyrolysis gas (y) is generated from the feedstock (x) present inside the conveyor arrangement (3) as a result of heat transfer from a combustion chamber (4). The amount of polycyclic aromatic hydrocarbons (PAHs) compounds contained in the non-energent bio coal (x') is reduced/eliminated by means of water vapour (z') by delivering water (z) into the interior of the conveyor arrangement (3).

Documents cited in the International Search Report:

D1: WO2018039738 A1

D2: EP2072600 A2

D3: US2014183022 A1

D4: US2010228062 A1

D5: US2019367814 A1

D6: Buss, W.el al., Strategies for producing biochars with minimum PAH contamination. Journal of Analytical and Applied Pyrolysis, 119, pp. 24-30, 6th June 2016

D7: Polycyclic aromatic hydrocarbons (PAHs) in biochar - Their formation, occurrence and analysis: A review, Congying Wang et al., Organic Geochemistry 114 (2017) 1-11

The cited documents represent the general state of the art.

None of the documents discloses reduction/elimination of polycyclic aromatic hydrocarbons (PAHs) compounds contained in the bio coal by means of water vapour delivered into the interior of the conveyor arrangement in a counterflow relative to the feedstock.

Moreover, there is no indication in the art that would lead a person skilled in the art to the claimed method and apparatus for manufacturing bio coal with thermal treatment, in order to obtain a bio coal with a minimal amount of PAHs. Therefore, the claimed invention is not obvious to a person skilled in the art.

.../...

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: **Box No. V**

Accordingly, the invention defined in claims 1-8 is novel and is considered to involve an inventive step (Articles 33(2) and 33(3) PCT). The invention is industrially applicable (Article 33(4) PCT).

**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:

Claims 1 and 6 are not clear (Article 6 PCT). The expression non-energent is used in the claims and according to the description it is used to mean carbon sink or carbon sequestration. The expression does not have a well-recognized meaning in the art. The expression is also used throughout the application and leaves the reader in doubt as to the meaning of the technical feature to which it refers.

X and X' and Y and Y' are used inconesquentling in the claims and should be corrected.