

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 2021-389JE	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/IB2022/056509	International filing date ( <i>day/month/year</i> ) 14 July 2022 (14.07.2022)	Priority date ( <i>day/month/year</i> ) 30 July 2021 (30.07.2021)	
International Patent Classification (IPC) or national classification and IPC See relevant information in Form PCT/ISA/237			
Applicant UNIVERSIDADE DE TRÁS-OS-MONTES E ALTO DOURO			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application
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	Date of issuance of this report 18 January 2024 (18.01.2024)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Cécile Chatel  e-mail ro.ib@wipo.int

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.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/IB2022/056509

International filing date (day/month/year)  
14.07.2022

Priority date (day/month/year)  
30.07.2021

International Patent Classification (IPC) or both national classification and IPC  
INV. C12Q1/6816 G01N33/50 G01N21/64

Applicant  
UNIVERSIDADE DE TRAS-OS-MONTES E ALTO DOURO

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 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 66.1bis(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:



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Tel. +49 89 2399 - 0  
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Date of completion of  
this opinion

see form  
PCT/ISA/210

Authorized Officer

Mueller, Frank

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**Box No. I Basis of the opinion**

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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.
  - b.  furnished subsequent to the international filing date for the purposes of international search (Rule 13ter.1(a)),
    - accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
4.  With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.
5. Additional comments:

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**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**

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1. Statement

Novelty (N)	Yes: Claims	<u>1-8, 12, 13</u>
	No: Claims	<u>9-11</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-13</u>
Industrial applicability (IA)	Yes: Claims	<u>1-13</u>
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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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. The present claimed subject-matter refers to a method for detecting an analyte in a sample by using carbon dots and by determining a fluorescence shift (independent claim 1), an apparatus therefor (independent claim 9) and a kit thereof (independent claim 11).

2. Reference is made to the following documents:

- D1 WO 2020/089810 A1 (UNIV DE TRAS OS MONTES E ALTO DOURO [PT])  
7 May 2020 (2020-05-07) cited in the application
- D2 LEE HA NEUL ET AL: "A Carbon-Dot-Based Fluorescent Nanosensor for Simple Visualization of Bacterial Nucleic Acids",  
MACROMOLECULAR BIOSCIENCE,  
vol. 17, no. 9, 14 June 2017 (2017-06-14), page 1700086,
- D3 SHARMA SAKSHI ET AL: "Nanomaterials-Based Biosensors for COVID-19 Detection-A Review",  
IEEE SENSORS JOURNAL, IEEE, USA,  
vol. 21, no. 5, 9 November 2020 (2020-11-09), pages 5598-5611,

3. The prior art already describes the use of carbon dots for detecting analytes in a sample. D1 describes the use of carbon dots which are incubated in the presence of a ss-DNA specific probe for detecting a change in fluorescence in the presence of target nucleic acids, see esp. Figures 2 and 3 and page 15, 4. par. ff. for describing an apparatus for carrying out said method.

The present application defined the distinctive feature of the present claimed method in comparison to the prior art D1, pars. 13 and 14 of the present application, to be that a direct interaction of Cdots and nucleic acids is carried out and that a preheating step is used.

It is considered that the present application, as the prior art D1, uses the Cdots which are modified with ss DNA nucleic acids and that a pretreatment step of the sample is used, temperature is mentioned, page 13, 2. par.

The subject-matter of claim 1 therefore is considered to be distinguished from the prior art D1 by defining a temperature range of 70-100°C for carrying out a pretreatment step.

At present no technical effect which is associated with the claimed distinction could be identified in the present application. By taking D1 as closest prior art, the technical problem underlying the present claimed subject-matter is considered to provide an alternative method for carrying out an analyte detection. The solution thereof, the use of a temperature range of 70-100°C as a pretreatment step, is considered to describe a routine modification for the skilled person for which no inventive step can be acknowledged (Article 33(3)PCT). In addition the subject-matter of claims 2 to 8 is considered to describe standard variations in the technical field of nucleic acid analysis for which no inventive step can be acknowledged (Article 33(3) PCT).

The subject-matter of independent claim 9 is considered to be already disclosed in D1, page 15, 4. par. The subject-matter of present claims 9 and 10 therefore do not comply with the requirements of Article 33(2) PCT. The subject-matter of claim 11 describes a kit composition of technical features which are considered to be already described in D1, see e.g. claims and Figure 2, page 10, 3. par and page 13, 2. par. The provision of known technical features in form of a kit is considered not to be inventive (Article 33(3) PCT). The subject-matter of dependent claims 12 and 13 is considered to describe a standard modification for the skilled person. Claims 12 and 13 therefore do not comply with the requirements of Article 33(3) PCT.

The disclosure of D2 describes the use of carbon dots for detecting the presence of target nucleic acids in a sample by carrying out fluorescence detection, see esp. Figure 1 and 3 and page 7, item 4. The disclosure of D2 is thus considered to be equally relevant for the present claimed subject-matter as D1. Thus also the subject-matter of present claims 1 to 13 do not comply with the requirements on an inventive step with respect to D2 as closest prior art (Article 33(3) PCT).

D3 is cited for describing general nanostructure materials for detecting corona virus in a sample, see esp. Table 1.

### **Re Item VIII**

#### **Certain observations on the international application**

The wording of claim 1 does not provide clear technical features for the terms "probe" and "analyte" and therefore renders the scope of the claim and how to carry it out unclear (Article 6 PCT).

The method of claim 1 does not provide technical features in which solution the claimed method has to be carried out contrary to the teaching of the description, see esp. par. 14. The subject-matter of claim 1 therefore lacks support (Article 6 PCT).

The wording of claim 4 does not provide technical features to distinguish the detection of SARS-CoV-2 from other genes or proteins and therefore renders said claim unclear (Article 6 PCT).

The subject-matter of claim 11 refers to a kit (product) which is not defined by clear technical features and therefore do not comply with the requirements of Article 6 PCT.