

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/GB2011/051565

International filing date (day/month/year)
19.08.2011

Priority date (day/month/year)
20.08.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02B1/11

Applicant
OXFORD ENERGY TECHNOLOGIES LIMITED

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.

3. For further details, see notes to 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 filed or furnished:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search
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 in 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>5, 6, 10, 12</u>
	No: Claims	<u>1-4, 7-9, 11, 13-15</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-15</u>
Industrial applicability (IA)	Yes: Claims	<u>1-15</u>
	No: Claims	

2. Citations and explanations

see separate sheet

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 XIAOYU LI ET AL: "Self-Cleaning Antireflective Coatings Assembled from Peculiar Mesoporous Silica Nanoparticles",
LANGMUIR,
vol. 26, no. 16, 17 August 2010 (2010-08-17), pages 13528-13534,
XP55011538,
ISSN: 0743-7463, DOI: 10.1021/la1016824
- D2 US 2010/027123 A1 (IMAI HIROAKI [JP] ET AL) 4 February 2010
(2010-02-04)
- D3 YASUTO HOSHIKAWA ET AL: "Mesoporous Silica Nanoparticles with Remarkable Stability and Dispersibility for Antireflective Coatings",
CHEMISTRY OF MATERIALS,
vol. 22, no. 1, 12 January 2010 (2010-01-12), pages 12-14, XP55011542,
ISSN: 0897-4756, DOI: 10.1021/cm902239a
cited in the application

- 1 The application does not meet the requirements of Article 6 PCT, because claims 8 and 12 are not clear.
- 1.1 Claim 8 does not meet the requirements of Article 6 PCT because the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result (e.g. method of preparation).
- 1.2 Claim 12 furthermore specifies for instance a solution having an elastic modulus greater than the underlying substrate. However, a solution does not contain any substrate.

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

2.1 Document D1 discloses an optical coating comprising:-

a) a binder (see page 13529, chapter "thin film assembly", whereby poly (diallyldimethylammonium chloride) (PDDA) is a polymer that binds the mesoporous SiO₂ nanoparticles (NP) within each layer and between each layer,

b) a plurality of porous silica nanoparticles in which the pores are randomly oriented (page 13529, chapter "morphologies and structures of mesoporous silica nanoparticles", table 1; whereby the particles with random orientation of pores MPSNPs-2 have a higher pore volume).

The subject matter of claim 1 is therefore not novel over the disclosure of document D1 (Article 33(2) PCT).

2.2 Furthermore, document D2 might be considered as forming the closest prior art (e.g. when assuming that the binder should be a crosslinking agent that embeds the functionalized particles within the matrix to avoid high temperatures during calcination) and discloses a binder (paragraphs 65-68, e.g. tetraethoxysilane (TEOS)) and porous nanoparticles (abstract, paragraphs 47 and 65). The pores appear to be regularly oriented (see figure 2 and paragraph 47). However, the skilled person wishing to increase the pore size (e.g. in order to further reduce the value of the refractive index) would use particles having randomly oriented pores according to the teaching of document D1 (see above) without having resort to inventive skill.

The subject matter of claim 1 is therefore also not inventive over the disclosure of D2 combined with that of D1 (Article 33(3) PCT).

2.3 Furthermore, the coatings disclosed in D1 and D2 are all prepared in a solution (D1: see page 13529, chapter "thin film assembly" whereby the substrate is dipped into an apparently aqueous solution of nanoparticles; D2: paragraphs 65 and 93, whereby the coating solution comprises a solvent).

The subject matter of claim 1 is therefore not novel over the disclosure of document D1 (Article 33(2) PCT) and also not inventive over the disclosure of D2 combined with that of D1 (Article 33(3) PCT).

- 2.4 Claim 3 is a method claim whose steps effectively correspond to the features enumerated in claims 1 and/or 2 and a similar objection to that raised against said claims applies to claim 3, whereby the single coating solution used in D2 comprises the binder, the solvent and the particles. The coating process used in D1 further uses a first solution having the aqueous PDPA binder solution (cf page 13529, chapter "thin film assembly) and a second aqueous solution comprising the nanoparticles. The step of coating on a substrate is disclosed in the passages already cited further disclosing the step of calcination/drying in D1 and solvent drying in paragraph 96 of D2.

The subject matter of claim 3 is therefore not novel over the disclosure of document D1 (Article 33(2) PCT) and also not inventive over the disclosure of D2 combined with that of D1 (Article 33(3) PCT).

- 3 Dependent claims 4-15 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 of novelty and/or inventive step, see D1, D2, the passages cited in the search report and the following arguments (the references in round brackets applying to the prior art documents and the references in square brackets applying to the relevant claims of the present application):
- 3.1 A hydrophobic layer within the pores [cf. claim 4] is disclosed in D1 (page 13529, chapter "hydrophobic modification of coatings") and also in paragraph 52 of D2.
- 3.2 The binder used in D2 is the same as being used in the present application (namely TEOS, see present claim 6; see paragraph 68 in D2) and therefore can be assumed to be hydrophilic [cf. claims 5 and 6].
- 3.3 The particles disclosed in D1 and D2 have no ingress of water or binder into the air filled pores [cf. claims 7 and 8] (see D1: page 13531, right hand column, whereby the pores are completely filled with air. The air inclusion is even stable within a humid environment, see page 13534, left hand column;

D2: paragraphs 47 and 86, whereby a refractive index of 1.09 can only be achieved with completely air filled pores, see also D3: page 14, left and column, second last phrase).

- 3.4 The particles disclosed in D1 and D2 have a pore diameter $< 10\text{nm}$ [cf. claim 9] (D1: table 1; D2: paragraph 47). Document D2 furthermore discloses particles having a particle diameter in the range of 20-30nm [cf. claim 10] (paragraph 48).
- 3.5 A well known adhesion promoting treatment of the substrate is disclosed in D1 on page 13529, chapter "Thin film assembly" [cf. claim 11].
- 3.6 The selection of an elastic modulus of the coating close to the elastic modulus of the substrate is a well known requirement for the skilled person wishing to avoid stress and cracking of the coating in case of temperature variations.
- 3.7 The use of the coating of D1 in a solar cell is disclosed on page 13528, first paragraph and the use of the coating of D2 on a glass panel, e.g. waveguide, is disclosed in paragraph 35 [cf. claims 13 and 15].
- 3.8 The refractive index of the coatings disclosed in D1 and D2 is equal or within 20% of the square root of the refractive index of the substrate (see D1: page 13531, right hand column; D2: paragraphs 36 and 86, whereby the square root of the refractive index of glass forming the substrate with $n=1.45$ is close to the disclosed value of 1.9 of the AR coating) [cf. claim 14].