

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

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

To:

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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/US2017/040369

International filing date (day/month/year)  
30.06.2017

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC  
INV. C04B41/89 F01D5/28

Applicant  
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**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**

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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:
    - 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:

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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	
	No: Claims	<u>1-8</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-8</u>
Industrial applicability (IA)	Yes: Claims	<u>1-8</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. Reference is made to the following documents:

D1: US 2006/024528 A

D2: EP 1 142 850 A

D3: EP 1 666 437 A

D4: US 2003/003328 A

2. The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of claims 1-8 is not new for the following reasons:

2.1 Document D1 discloses in claim 1 a layered structure comprising a substrate comprising a layer of an oxide/oxide ceramic composite material, a first oxide layer disposed directly on the substrate and a second oxide layer disposed directly on the first oxide layer. Claim 3 discloses that the first layer comprises an yttrium aluminum garnet. Claim 7 discloses that the first oxide layer comprises yttria. Claim 11 discloses that the second oxide layer comprises stabilized zirconia. Claim 9 discloses for the first oxide layer a thickness of 10 mils (254  $\mu\text{m}$ ). According to paragraph [0024] the second ceramic layer may comprise a segmented columnar ceramic layer, which has a thickness of 5 to 60 mils (127 to 1524  $\mu\text{m}$ ).

The subject-matter of claims 1-8 is thus not new over the disclosure of D1.

2.2 Document D2 discloses in claim 11 a gas turbine engine component formed of a silicon-containing material and having a thermal/environmental barrier coating system on a surface thereof, the coating system comprising a third layer having a thickness of up to 500  $\mu\text{m}$ , which consists essentially of yttria stabilized zirconia and a further material, and a top coat of yttria-stabilized zirconia having a thickness of 1250  $\mu\text{m}$ . Claim 2 discloses that the substrate is a ceramic composite material.

The subject-matter of claims 1-4, 6 and 7 is thus not new over the disclosure of D2.

2.3 Document D3 discloses in paragraph [0034] a SiC/SiC ceramic matrix composite, which is coated with an intermediate layer comprising 50 wt.% YSZ and 50 wt.% mullite and a thermal barrier coating of yttria-stabilized zirconia. Paragraph [0020] discloses a thickness range for the thermal barrier coating of 76.2 to 254  $\mu\text{m}$ .

The subject-matter of claims 1-4, 6 and 7 is thus also not new over the disclosure of D3.

2.4 Document D4 discloses a ceramic matrix composite substrate coated with a coating system comprising a top layer of yttria-stabilized zirconia and an intermediate layer comprising as a third sublayer yttria-stabilized zirconia mixed with a further material (see claims 1, 12 and 13). Paragraph [0022] discloses for the YSZ topcoat a thickness of 125 to 750  $\mu\text{m}$ . Paragraph [0031] discloses for the YSZ-containing sublayer a thickness of 250  $\mu\text{m}$ .

The subject-matter of claims 1-7 is thus not new over the disclosure of D4.

### **Re Item VIII**

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

The present application does not meet the requirements of Article 6 PCT for the following reasons:

1. Claim 1 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 intermediate layer 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.

2. Claim 4, which depends on claim 1 refers to an yttrium-containing material. However, claim 1 does not mention an yttrium-containing material.

3. It appears from the description on page 6 in lines 10-11 that it is essential to the definition of the invention that the material of the intermediate layer is distinct from that of the TBC layer. Since independent claim 1 does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

4. The vague and imprecise statement in the description on page 8 in the last sentence referring to the spirit of the claims implies that the subject-matter for which protection is sought may be different to that defined by the wording of the claims, thereby resulting in lack of clarity when used to interpret them.