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Datasheet for the decision of 9 January 2009

Case Number: T 0478/07 - 3.2.07

Application Number: 98310176.7

Publication Number: 1008672

IPC: C23C 28/00

Language of the proceedings: EN

Title of invention:
Platinum modified diffusion aluminide bond coat for a thermal barrier coating system

Applicant:
GENERAL ELECTRIC COMPANY

Headword:
-

Relevant legal provisions:
EPC Art. 54, 123(2)

Relevant legal provisions (EPC 1973):
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Keyword:
"Decision according to the state of the file"
"Amendments extending beyond content of the application as originally filed (main and auxiliary request - yes)"
"Novelty (main request - no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0478/07 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 9 January 2009

Appellant: GENERAL ELECTRIC COMPANY
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Representative: Goode, Ian Roy
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 27 October 2006 refusing European application No. 98310176.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
E. Dufrasne

Summary of Facts and Submissions

I. The applicant lodged an appeal against the decision of the Examining Division to refuse the European patent application No. 98 310 176.7.

The Examining Division held that the subject-matter of product claim 1 filed with letter dated 22 September 2006 lacked novelty over the disclosure of D1 (EP-A-0 821 078) because it did not fulfil the criteria b) and c) for a selection invention as set out in the Guidelines for Examination in the European Patent Office, Chapter C-IV, 7.7 ii).

II. With its grounds of appeal dated 5 March 2007 the appellant requested to set aside the decision and to grant a patent on the basis of claims 1-15 filed with letter dated 22 September 2006 as a main request, alternatively on the basis of claims 1-8 of the auxiliary request as submitted together with the grounds of appeal. In case that the Board should consider a decision other than according to the aforementioned requests, oral proceedings were requested.

III. The independent claims 1 and 4 of the main request read as follows:

"1. A component (22) having a thermal barrier coating system (20) on a surface thereof that is formed by a superalloy substrate, the coating system (20) comprising:
an aluminide bond coat (24) at the surface of the component (22), the bond coat (24) comprising platinum,

about 0.01 to about 5.0 weight percent zirconium, and about 10 ppm to about 1.0 weight percent yttrium, wherein the bond coat is spallation resistant and includes aluminide intermetallics;
an aluminum oxide layer on the bond coat (24); and
a ceramic layer (26) chemically bonded to the bond coat (24) by the aluminum oxide layer, characterized in that:
the bond coat (24) further comprises about 0.01 to about 5.0 weight percent hafnium."

"4. A method for forming a thermal barrier coating system on a component, the component having a surface formed of a superalloy, the method comprising the steps of:
forming an aluminide bond coat at the surface of the component by a process in which platinum and yttrium are deposited on the component such that the bond coat contains aluminide intermetallics, platinum, about 0.01 to about 5.0 weight percent zirconium, and about 10 ppm to about 1.0 weight percent yttrium;
forming an aluminum oxide layer on the bond coat; and
forming a ceramic layer on the aluminum oxide layer so as to be chemically bonded to the bond coat by the aluminum oxide layer, characterized in that:
the bond coat (24) further comprises about 0.01 to about 5.0 weight percent hafnium."

The sole independent claim 1 of the auxiliary request reads as follows (amendments compared to method claim 4 of the main request are in bold; emphasis added by the Board):

"1. A method for forming a thermal barrier coating system on a component **(22)**, the component **(22)** having a

surface formed of a superalloy, the method comprising the steps of:
forming an aluminide bond coat **(24)** at the surface of the component by a process in which platinum and yttrium are deposited on the component **(22)** such that the bond coat contains aluminide intermetallics, platinum, about 0.01 to about 5.0 weight percent zirconium, and about 10 ppm to about 1.0 weight percent yttrium;
forming an aluminum oxide layer on the bond coat **(24)**; and forming a ceramic layer **(26)** on the aluminum oxide layer so as to be chemically bonded to the bond coat by the aluminum oxide layer, characterized in that:
the bond coat (24) further comprises about 0.01 to about 5.0 weight percent hafnium**; and wherein: the bond coat (24) is formed by sputtering or arc coating using a pre-alloyed target cathode material to provide the desired combination of platinum, yttrium and hafnium**."

IV. With a communication dated 27 October 2008 and annexed to the summons for oral proceedings the Board presented its preliminary opinion with respect to claims 1-15 of the main request and claims 1-8 of the auxiliary request, no further amended claims having been filed since.

First of all, the Board remarked that it had the power to examine whether or not the application and the invention to which it relates met the requirements of the EPC and that this also held good for requirements the Examining Division had not considered in the examination proceedings or had regarded as fulfilled.

The Board gave its preliminary and non-binding opinion and stated amongst others that claim 4 of the main request and claim 1 of the auxiliary request contravened Article 123(2) EPC and that the subject-matter of claims 1 and 4 of the main request lacked novelty over D1 (EP-A-0 821 078), as follows:

"3. Admissibility of amendments (Article 123(2) EPC)

Main request

3.1 Claim 1 of the main request seems to be based on claims 1, 2, 4 and 6 of the application as originally filed (with the originally used definitions "additive metal being chosen from the group consisting of Pt, Pd, Rh, Si and Cr" and "active metal" having been omitted)."

and:

"3.4 Method claim 4 seems to be partly derivable from page 5, lines 26 to 32 in combination with page 8, lines 26 to 33 and claim 1, however, the feature "**by a process in which platinum and yttrium are deposited on the component such that the bond coat contains aluminide intermetallics**, ..." seems to have **no** basis in the application as originally filed since the said aluminide intermetallics are not deposited **as such** but are the result of a diffusion process of the deposited materials and aluminium (see page 11, line 16 to page 12, line 31). Hence claim 4 seems to contravene Article 123(2) EPC."

and:

"Auxiliary request

3.12 Claim 1 of the auxiliary request apart from the features discussed for claim 4 of the main request appears to contravene Article 123(2) EPC since the feature "formed by sputtering or arc coating using a pre-alloyed target cathode material to provide the desired combination of platinum, yttrium and hafnium" appears to have no basis in the application as originally filed which only discloses that "one or more noble metals and the active elements can be applied simultaneously by sputtering or cathodic arc processes" (see page 11, lines 23 to 28) which has to be seen in the context of the general statement that "certain combinations of the metal additives, active elements and aluminium can be codeposited and diffused into the substrate using suitable techniques" (see page 11, lines 16 to 19). The specific combination of prealloyed "Pt, Y and Hf" is nowhere disclosed in the whole specification as originally filed (see also page 12, lines 11 to 24), let alone that a prealloyed target cathode material can be used which - according to said new wording - can contain all elements of the bond coat layer (i.e. including Al and Zr, and e.g. Cr, Si, Pd and/or Rh; see page 6, lines 3 to 10 and page 10, lines 2 to 10) and provides "the desired combination of Pt, Y and Hf"."

and:

"5. Novelty (Article 54 EPC)

It appears that the subject-matter of claim 1 of the main request lacks novelty over D1 for not meeting the criteria of a selection invention.

5.1 First of all, with respect to the advantageous properties of the bond coat as defined in claim 1 of the main request it has to be considered - due to the statement at page 11, lines 7 to 15 of the present application as originally filed: "to achieve the advantages of this invention, the additive metals are present in amounts of about 5 to about 50 weight percent, while the active elements are **preferably** present in amounts of about 10 parts per million (ppm) to about 1.0 weight percent yttrium **and/or** about 0.01 to about 5.0 weight percent zirconium, **with possible additions** of about 0.01 to about 5.0 weigh percent hafnium" (emphasis added by the Rapporteur) - that it is sufficient that the additive metal (which can be Cr and Si **and/or** a noble metal such as **Pt**, Rh and Pd; see page 10, lines 5 to 8 of the application as originally filed) within said given range, **e.g. Pt is mixed only with Y** (as said active metal) **within said second specified range**.

The other mentioned active elements are thus optional only. This view is also supported by the example(s) of the application in which the bond coat only comprised Pt and Y but did **not** contain any Zr. Consequently, the said effect is already obtained by the combination of one additive metal with one active metal.

5.2 D1 discloses a modified platinum aluminide coating on a nickel or cobalt base superalloy substrate and a CVD method for making the same (see abstract). Said platinum aluminide coating represents a bond coat between the superalloy substrate and the outer ceramic thermal barrier layer (see page 7, lines 26 to 30). Said Pt aluminide coating preferably includes about 0.01 weight% to less than 2 weight % of each of silicon, hafnium, and at least one of zirconium and an active element selected from the group consisting of Ce, La, Y, Mg and Ca in the outer additive layer (see claims 1, 2, 8, 9 and 14 to 17). According to the description said other active elements are e.g. Ce, La, Y (see page 2, line 56; page 3, line 55 to page 4, line 3). The overall Pt concentration in the additive layer is 10-30 weight% and the overall Al concentration is 10-30 weight% (see page 4, lines 7 to 9). Thus according to a more specific general teaching the bond coat can comprise (in weight%) 10-30 Pt, 10-30 Al, about 0.01- < 2 Si, about 0.01- < 2 Hf, about 0.01- < 2 Zr, and about 0.01- < 2 of other active elements (e.g. Ce, La, Y). Thus there exists one short list of active elements from which the skilled person has only to select one (Y) out of 3 possibilities (or 5).

In this context it has to be considered that D1 mentions in its description that there exist copending applications of the common assignee dealing also with Pt aluminide diffusion coatings modified by the inclusion of the active elements such as **Y**, Hf and/or Zr (see page 2, lines 48 to 50). Therefore, the person skilled in the art would seriously contemplate to select Y from said short list.

Further, the concentration ranges for Hf and Zr according to claim 1 ("about 0.01-5.0 weight%") are anticipated by the narrower range of D1 ("about 0.01 to < 2 weight%") and there exists a broad overlap of almost 50% of said range of "about 0.01- < 2 weight% Y" with the range of "about 10 ppm to 1.0 weight % Y" (10 ppm=0.001 weight%) of claim 1. Said selected sub-range of "about 10 ppm to 1.0 weight% Y" includes the disclosed endpoint "about 0.01 weight%" and is also not sufficiently far removed from the endpoints of said known range of "about 0.01 to < 2 weight% Y". Finally, the selected range appears to be an arbitrary specimen of the prior art D1 which involves no new technical teaching since no new effect can be seen and the effect claimed is also present in non-claimed ranges (see paragraph above). Hence claim 1 of the main request appears not to meet any of the criteria (a) to (c) for a selection invention as set out in the Guidelines for Examination in the European Patent Office (see Guidelines, C-IV, 7.7, point (ii)). Hence the subject-matter of claim 1 lacks novelty over the disclosure of D1.

The same conclusion applies to the method of claim 4 of the main request which does not exclude the CVD process according to D1 for making the product of claim 1."

V. The appellant was given the opportunity to file observations to the communication which should be filed well in advance, i.e. at least one month, before the date of the oral proceedings in order to give sufficient time to the Board to prepare for the oral proceedings.

With fax of 7 January 2009 the appellant stated that it did not intend to attend the oral proceedings. Furthermore, it requested that a decision be taken in accordance with the current state of the file, i.e. including the requests submitted with letter dated 5 March 2007.

VI. At the end of the oral proceedings held on 9 January 2009 in the absence of the appellant, the Board announced its decision.

Reasons for the Decision

1. The statement of the appellant in its fax dated 7 January 2009 that it did not intend to attend the oral proceedings and its request to decide on the state of the file is considered by the Board as a withdrawal of the auxiliary request for oral proceedings, as is consistent Case Law (see Case Law of the Boards of Appeal, 5th edition 2006, VI.C.2.2), the appellant relying on its written submissions.

2. In the communication accompanying the summons for oral proceedings the Board, taking account of these submissions, amongst others raised objections under Articles 123(2) and 54 EPC, explaining why in the Board's opinion the subject-matter of claim 4 of the main request and of claim 1 of the auxiliary request extended beyond the content of the application as originally filed and why the subject-matter of claims 1 and 4 of the main request lacked novelty over the disclosure of D1 (see point IV).

3. The appellant did not reply in substance to these objections. Since there has been no attempt by the appellant to refute or overcome the objections raised in the above communication, the Board has no reason to depart from its preliminary opinion expressed therein.

4. With regard to the above, the Board concludes - for the reasons set out in the communication (see point IV above) - that the subject-matter of claim 4 of the main request contravenes Article 123(2) EPC and that the subject-matters of claims 1 and 4 of the main request lack novelty over D1 (Article 54 EPC).

The Board thus confirms the Examining Division's decision concerning a lack of novelty of claim 1 of the main request.

The Board further concludes that the subject-matter of claim 1 of the auxiliary request contravenes Article 123(2) EPC.

5. Consequently, none of the two requests is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Nachtigall H. Meinders