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**Datasheet for the decision
of 10 September 2015**

Case Number: T 0925/13 - 3.2.08

Application Number: 05077372.0

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C30B29/04, C30B33/00,
C23C16/27, C30B25/10

Language of the proceedings: EN

Title of invention:
Thick single crystal diamond layer method for making it and
gemstones produced from the layer

Applicant:
ELEMENT SIX (PTY) LTD

Headword:

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
Amendments

Decisions cited:

Catchword:



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Case Number: T 0925/13 - 3.2.08

**D E C I S I O N
of Technical Board of Appeal 3.2.08
of 10 September 2015**

Appellant:
(Applicant)

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 31 October 2012
refusing European patent application No.
05077372.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman

T. Kriner

Members:

M. Alvazzi Delfrate

D. T. Keeling

Summary of Facts and Submissions

- I. The appeal, which was lodged in the prescribed form and within the prescribed time limit, is directed against the decision of the examining division posted on 31 October 2012 refusing European patent application No. 05 077 372.0.
- II. The examining division was of the view that the optical characteristics stipulated by the properties (a) to (e) of claim 1 of the sole request then on file were originally disclosed solely in combination with electronic characteristics not comprised in the claim. Hence, it found that claim 1 contravened the requirements of Article 123(2) EPC.
- III. The appellant (applicant) requests that the decision under appeal be set aside and that a patent be granted on the basis of the main request or the auxiliary request, both filed with letter of 18 December 2012.
- IV. Claim 1 of the **main request**, which corresponds to the request underlying the decision under appeal, reads as follows:

"A layer of single crystal CVD diamond having a thickness of greater than 2 mm, wherein the layer has one or more of the following characteristics:
(a) a level of any single impurity of not greater than 1 ppm and a total impurity content of not greater than 5 ppm where impurity excludes hydrogen and its isotopic forms;
(b) a photoluminescence (PL) line related to the cathodoluminescence (CL) line at 575 nm, measured at 77 K under 514 nm Ar ion laser excitation (nominally 300

mW incident beam), which has a peak height < 1/25 of the diamond Raman peak at 1332 cm^{-1} ;

(c) a strong free exciton (FE) emission, the strength of the free exciton emission excited by 193 nm ArF excimer laser at room temperature is such that the quantum yield for free exciton emission is at least 10^{-5} ;

(d) in electron paramagnetic resonance (EPR), a single substitutional nitrogen centre $[\text{N-C}]^{\circ}$ at a concentration < 100 ppb;

(e) in EPR, a spin density < $1 \times 10^{17} \text{ cm}^{-3}$ at $g=2.0028$."

Claim 1 of the **auxiliary request** reads as follows:

"A layer of single crystal CVD diamond having a thickness of greater than 2 mm, wherein the layer has one or more of the following characteristics:

(i) a high charge collection distance at 300 K of at least 100 μm measured at an applied field of 1 V/ m;

(ii) a high value for the product of the average carrier mobility and lifetime $\mu\tau$ such that it exceeds $1.0 \times 10^{-6} \text{ cm}^2 / \text{V}$ at 300 K;

(iii) an electron mobility (μ_e) measured at 300 K greater than $2400 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$;

(iv) a hole mobility (μ_h) measured at 300 K greater than $2100 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$; and

(v) in the off state, a resistivity at 300 K greater than $10^{12} \Omega\text{cm}$ at an applied field of 50 V/ m.

and in addition one or more of the following characteristics:

(a) a level of any single impurity of not greater than 1 ppm and a total impurity content of not greater than 5 ppm where impurity excludes hydrogen and its isotopic forms;

(b) a photoluminescence (PL) line related to the cathodoluminescence (CL) line at 575 nm, measured at 77 K under 514 nm Ar ion laser excitation (nominally 300 mW incident beam), which has a peak height < 1/25 of the diamond Raman peak at 1332 cm^{-1} ;

(c) a strong free exciton (FE) emission, the strength of the free exciton emission excited by 193 nm ArF excimer laser at room temperature is such that the quantum yield for free exciton emission is at least 10^{-5} ;

(d) in electron paramagnetic resonance (EPR), a single substitutional nitrogen centre $[\text{N-C}]^{\circ}$ at a concentration < 100 ppb;

(e) in EPR, a spin density < $1 \times 10^{17} \text{ cm}^{-3}$ at $g=2.0028$."

V. The appellant's arguments can be summarised as follows:

It was true that the optical characteristics (a) to (e) were introduced in the description by stating that "in addition to the characteristics described above, the diamond layer may have one or more of the following characteristics". However, this wording did not require the preceding electronic characteristics as an essential feature in combination with the optical requirements. This would mean inserting additional wording and meaning into the language of the specification which was simply not present and ignoring wording which was expressly stated. Indeed, the use of the term "may" with respect to both the electronic and optical characteristics made it absolutely clear that these were both optional characteristics which defined

the quality of the single crystal CVD diamond material. Hence, there was a direct and unambiguous basis for claiming a single crystal CVD diamond having a thickness of at least 2 mm and having high quality as defined in terms of the optical characteristics without requiring the electronic characteristics. Accordingly, the main request, and as a consequence also the auxiliary request, satisfied the requirements of Article 123(2) EPC.

Reasons for the Decision

1. Main request

According to Article 123(2) EPC a European patent application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed. An amendment should be regarded as introducing subject-matter which extends beyond the content of the application as filed, and therefore unallowable, if the overall change in the content of the application results in the skilled person being presented with information which is not directly and unambiguously derivable from that previously presented by the application, even when account is taken of matter which is implicit to a person skilled in the art (Case Law of the Boards of Appeal of the European Patent Office, Seventh Edition September 2013, II.E.1.).

Claim 1 of the application as originally filed relates to a layer of single crystal CVD diamond of high quality having a thickness of greater than 2 mm.

Present claim 1, by contrast, does not comprise the wording "of high quality" and stipulates that the layer has one or more of the properties (a) to (e), in the following referred to as the "optical characteristics".

The examining division did not dispute that the optical characteristics are disclosed in the application as originally filed, namely in paragraph [0009], but found that this disclosure was solely in combination with electronic characteristics not comprised in the claim.

It is true that, as argued by the appellant, the wording "in addition to the characteristics described above" in paragraph [0009] does not specify that the electronic characteristics are an essential feature. However, the crucial point is not whether the electronic characteristics are disclosed as optional for a generic diamond CVD layer, but rather whether a layer which exhibits the claimed optical characteristics without necessarily exhibiting said electronic characteristics is directly and unambiguously derivable from the application as originally filed.

The person skilled in the art is aware that optical and electronic characteristics are not unrelated to each other, but depend both on the quality of diamond crystal. Moreover, as correctly pointed out by the examining division, paragraph [0009] indicates that the optical characteristics are not provided alone, but "in addition to the characteristics described above". The paragraphs preceding paragraph [0009], in particular paragraphs [0005] and [0006], describe the electronic characteristics of the diamond, represented by one or more of the properties stipulated by claim 4 as originally filed. Accordingly, the application as

originally filed explicitly discloses that the claimed optical characteristics are provided together with said electronic characteristics. Hence, the product of claim 1, which does not necessarily exhibit said electronic properties, is not directly and unambiguously derivable from the application as originally filed.

As a consequence, claim 1 of the main request does not meet the requirements of Article 123(2) EPC.

2. Auxiliary request

Claim 1 of the auxiliary request comprises the features relating to the electronic characteristics, which are defined by at least one of the properties (i) to (v), as they are disclosed in the application as originally filed (paragraph [0005] or claim 4). Accordingly, it complies with the requirements of Article 123(2) EPC.

No description adapted to this claim has been filed for the time being. Moreover, although the first examiner indicated in a telephone conversation on 17 September 2012 that a corresponding request could form the basis for a grant, no decision of the examining division on this request has been taken.

Under these circumstances, the Board considers it appropriate to remit the case to the examining division for further prosecution on the basis of the auxiliary request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution on the basis of the auxiliary request filed with letter of 18 December 2012.

The Registrar:

The Chairman:



V. Commare

T. Kriner

Decision electronically authenticated