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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte GEOFFREY ALAN SCARSBROOK,
PHILIP MAURICE MARTINEAU,
DANIEL JAMES TWITCHEN,
ANDREW JOHN WHITEHEAD,
MICHAEL ANDREW COOPER, and
BARBEL SUSANNE CHARLOTTE DORN

Appeal 2011-010618
Application 11/565,753
Technology Center 1700

Before CATHERINE Q. TIMM, ROMULO H. DELMENDO, and GEORGE C. BEST, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

Appellants request rehearing of our Decision of December 21, 2012. In that Decision, we sustained all of the rejections maintained by the Examiner based on our review of the issues as they applied to claims 1 and 24, the claims Appellants focused on in their arguments (Decision 4).

Appellants contend that a number of findings we made in the Decision were clearly erroneous and the Decision is not supported by substantial evidence (Request 2).

In a request for rehearing, an appellant is charged with stating the points believed to have been misapprehended or overlooked by the Board. 37 C.F.R. § 41.52. We review the points of the Decision contested by Appellants and determine whether we, in fact, made an error in fact finding or applying the law, and further determine whether any error changes the outcome of the Decision when viewing all the evidence and arguments anew in light of the preponderance of the evidence standard. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) ("patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument"); *Gardner v. TEC Sys., Inc.*, 725 F. 2d 1338, 1344 (Fed. Cir. 1984) (any error concerning nonessential facts is harmless and not a basis for reversal). We do not give our original Decision any deference, whether under the "clearly erroneous," "arbitrary and capricious," or "substantial evidence" standards of review.

Appellants first take issue with our discussion of Appellants' invention, and, specifically, with our discussion of the plasma etch of the substrate. In this regard, Appellants reproduce a paragraph of our Decision found at page 2 with language relating to the plasma etch in bold print. We reproduce the language as found in our Decision with the bolded emphasis provided by Appellants:

> To obtain a substrate having a low density of defects, Appellants select a low defect stock material, process the stock material to form a substrate using methods that minimize surface defects, **and plasma etch the substrate surface to reveal surface defects** (Spec. 11:19 to 13:15; and 16:11-23).

> The plasma etch can be, for instance, an oxygen etch using predominately hydrogen with a small amount of O_2 (Spec. 12:4-26).

(Decision 2 (Appellants' emphasis added); Request 2.)

According to Appellants, "the plasma etch is not for revealing surface defects." (Request 2.) Appellants contend that "the oxygen plasma etch is for removing defects and is specifically designed to not reveal extended defects by extensively etching along the defects." (*Id.*) Appellants argue that we appear to have conflated two distinct and different etching processes described in the Specification, i.e., (i) the oxygen plasma etch designed to remove surface defects; and (ii) a plasma or chemical etching optimized to reveal defects (a revealing plasma etch). Appellants contend the latter revealing plasma etch is not part of the synthesis process (*id.*).

We have reviewed the entirety of the Specification. Starting at page 11, the Specification discusses using a plasma or chemical etch optimized to reveal defects, i.e., a revealing etch (Spec. 11:19-21). This etch reveals two types of defects: (1) defects intrinsic to the substrate material quality; and (2) those resulting from polishing, including dislocation structures and microcracks along polishing lines (Spec. 11:21-30). This etch occurs before a step of characterizing the defect density of the diamond surface by optical evaluation (Spec. 11:19-20 as informed by Spec. 11:9-18).

The Specification then discusses minimizing the defect level at or below the substrate surface by careful preparation of the substrate from the time the bulk diamond material is obtained (by mining or synthesizing) and during the steps of converting that bulk material into a suitable substrate by sawing, lapping, polishing, and other methods (Spec. 12:4-13). One of the

steps of minimizing surface damage is said to include an *in situ* plasma etch of the substrate surface (Spec. 12:18-19).

We agree with Appellants that we mistakenly referred to the revealing etch in our discussion of the invention on page 2 of the Decision. The Specification indicates that the plasma etch for minimizing surface damage is different than the revealing etch used to reveal defects before optically characterizing the defect density.

There is, however, no dispute that the plasma etch recited in claim 1 refers to "an oxygen etch using predominately hydrogen with a small amount of O_2" as we state in the above reproduced paragraph of the Decision (Decision 2). While we did conflate the two etching processes in our discussion of the invention, there is no dispute that we correctly relied on the teaching of the oxygen plasma etch discussed in the Specification on pages 12 and 13 to inform our interpretation of "plasma etch" as recited in claim 1.

Our error has no bearing on our Decision with respect to claims 24-27. Those claims do not require the plasma etch recited in claim 1. The error also has no bearing on our Decision with respect to the first issue we decided, i.e., "whether the prior art provides evidence that one of ordinary skill in the art would have selected a single-crystal diamond substrate 'substantially free of crystal defects' as required by claims 1 and 24." (Decision 4-7.) However, the interpretation of the plasma etch limitation is relevant to the second issue on appeal, i.e., "whether Kimoto teaches away from using oxygen in the plasma etching gas of that reference as required by claim 1 in a manner rendering the claimed invention unobvious." (Decision 7.)

In deciding the second issue, we stated:

> Appellants contend that Kimoto teaches away because that reference cautions that the presence of O_2 is undesirable for etching diamond substrates (Br. 6-7). However, the Examiner has acknowledged that Kimoto teaches that O_2 causes surface roughening of diamond substrates, and has cited Sumiya as evidence that it was known that one need not completely remove oxygen to prevent surface roughening, the partial pressure of the oxygen need merely be adjusted to at most 10 Torr (Ans. 4-5; Sumiya, col. 9, 11. 31-33). While Sumiya is not performing an etch in order to prepare the diamond surface to receive a boron-doped layer, Sumiya is still relevant for showing that O_2 was known to cause surface roughening in a hydrogen plasma treatment in the field of forming semiconductor substrates from diamond single-crystal (Sumiya, col. 1,11.8-14; col. 9, 11. 31-40). When one views the evidence as a whole, there is no teaching away that precludes a conclusion of obviousness.

(Decision 7.)

Appellants contend that, in our review of the issue of whether Kimoto teaches away from using oxygen in the plasma etching gas, it appears that we overlooked an argument in the Reply Brief regarding the teachings of Sumiya (Request 4). We did not overlook this argument.

The argument Appellants refer to is as follows:

> Sumiya et al discloses a heat treatment anneal after HPHT diamond growth to improve crystallinity of the final product in a **non-oxidizing** atmosphere as a temperature of 1100 to 1600°C (column 8, lines 51 to column 9, line 46; emphasis added). It is disclosed that the atmosphere should have little or no oxygen content (at most 10 Torr) because when the partial pressure of oxygen exceeds 10 Torr, graphitization or etching of the diamond surface results. As such, an oxygen plasma etch is specifically avoided. In this regard, it must be noted that present Claim 1 requires not only the presence of oxygen but the presence of oxygen in sufficient qualities to

> provide an oxygen plasma etch. This is specifically excluded in the heat treatment of Sumiya et al when the aim is not to etch any of the HPHT diamond product but rather provide an inert atmosphere in which to anneal the HPHT diamond product.

(Reply Br. 11 as reproduced at Request 4 (emphasis in original).)

We acknowledged in our Decision that "Sumiya is not performing an etch in order to prepare the diamond surface to receive a boron-doped layer" (Decision 7). However, we found that "Sumiya is still relevant for showing that O_2 was known to cause surface roughening in a hydrogen plasma treatment in the field of forming semiconductor substrates from diamond single-crystal (Sumiya, col. 1, 11.8-14; col. 9, 11. 31-40)."

Appellants have not persuaded us that we erred in making the above findings. As acknowledged by the above paragraph from the Reply Brief, Sumiya only requires that oxygen be maintained at a concentration under 10 Torr. While Sumiya discloses that, when the partial pressure of oxygen exceeds 10 Torr during the heat treatment, "graphitization or etching of the diamond surface *rapidly proceeds* to result in a roughened or deformation of the crystal shape", there is no convincing evidence that absolutely no etching occurs at partial pressures less than 10 Torr (Sumiya, col. 9, ll. 36-40 (emphasis added)).

As we already stated, the claimed "oxygen etch" is merely disclosed in the Specification as an oxygen etch using predominately hydrogen with a small amount of O_2 (Spec. 12:27-28). While the Specification discloses "typical" oxygen etch conditions including an oxygen content of 1 to 4 percent, the "typical" concentration is not limiting, it is merely an example (Spec. 12:28-32). Nor is there any guidance with regard to what minimum amount of oxygen must be present in order for the etch to be an "oxygen

etch." Under the circumstances, we decline to confine claim 1 to any particular oxygen concentrations that would exclude concentrations less than 10 Torr. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) ("[L]imitations are not to be read into the claims from the specification.") and *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005)(en banc) ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.").

Should Appellants wish to limit claim 1 to concentrations of oxygen above levels taught by the prior art, they are free to amend the claims during further prosecution. The "broadest reasonable interpretation" rule recognizes that "before a patent is granted the claims are readily amended as part of the examination process." *Burlington Indus., Inc. v. Quigg,* 822 F.2d 1581, 1583 (Fed. Cir. 1987). A patent applicant has the opportunity and responsibility to remove any ambiguity in claim term meaning by amending the claim. *In re Prater,* 415 F.2d 1393, 1404-05 (CCPA 1969).

Appellants have not convinced us that we made a reversible error in either interpreting the plasma etch language of claim 1 or finding that the prior art does not teach away from the process of the claim.

Appellants further contend that a finding we made in reviewing the first issue, i.e., "whether the prior art provides evidence that one of ordinary skill in the art would have selected a single-crystal diamond substrate 'substantially free of crystal defects' as required by claims 1 and 24" was also in error (Request 5-6).

The statement in our Decision Appellants take issue with is:

> Because the substrate is also a part of the semiconducting device, it is evident that the substrate must also meet the quality

> requirements of such semiconductor devices. Therefore, it follows that the ordinary artisan would have used a substrate that has a low density of crystal defects for that reason.

(Decision 6.)

Appellants contend that this finding is in error because their inventive process is not used to form a semiconductor device, but concerns a synthesis process of single crystal CVD diamond material (Request 5). However, our statement above was made in the context of a discussion of the prior art references, and specifically a discussion of Saito, which is directed to forming diamond semiconducting devices (Decision 6 (citing Saito, col. 2, ll. 50-52)). Because the prior art references are directed to forming semiconducting devices, those of ordinary skill in the art would have sought to meet the quality requirements for such devices.

While Appellants have persuaded us that we erred in conflating the plasma etch with the reveal etch disclosed in the Specification, Appellants have not convinced us that this error led to a reversible error in our Decision. Appellants have not convinced us of an error in the other points of our Decision raised by them.

The subject Request has been granted to the extent that the Decision has been reconsidered, but is denied with respect to making any changes therein.

DENIED

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