

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today
(1) was not written for publication in a law journal and
(2) is not binding precedent of the Board.

Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SCOTT R. SUMMERFELT

Appeal No. 96-0176
Application 08/012,556¹

ON BRIEF

Before WARREN, OWENS and KRATZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. ' 134 from the decision of the examiner finally rejecting claims 1 through 15, 28 and 30 and refusing to allow claims 29 and 31 as amended subsequent to the final rejection. Claims 1 through 12, 14 and 28 through 31 remain for consideration on appeal because the examiner withdrew the sole ground of rejection of claims 13 and 15 in the supplemental examiner=s answer (Paper No. 11; page 5). Claims 16 through 27 are also of record and stand withdrawn from consideration under 37 CFR ' 1.142(b). Claim 1 is illustrative of the claims on appeal:

¹ Application for patent filed February 2, 1993.

1. A method for heteroepitaxial growth, said method comprising the steps of:

(a) cutting and polishing a single crystal ceramic substrate at from about 1 to about 10 degrees off axis to produce a substantially flat surface;

(b) redistribution atoms on said surface to produce surface steps of at least three lattice spacings; and

(c) then growing a layer of semiconductor over said substrate.

The appealed claims as represented by claim 1² are drawn to a method for heteroepitaxial growth comprising at least the steps of preparing an off-axis single crystal ceramic substrate having a substantially flat surface, redistributing atoms on said surface to produce surface steps of at least three lattice spacings, and growing a layer of semiconductor over said surface. In the method of claim 28, the step of redistributing atoms produces surface steps of at least three lattice spacings which are parallel to at least two crystallographic directions. According to appellant, these methods minimize the effect of crystallographic misfits (specification, e.g., pages 1 and 5).

The references relied on by the examiner are:

H.S. Kong, J.T. Glass and R.F. Davis (Kong), AChemical vapor deposition and characterization of 6H-SiC thin films on off-axis 6H-SiC substrates,@ 64 *Journal of Applied Physics*, no. 5, 2672-2679 (September 1988).

Kazumasa Hiramatsu, Hiroshi Amano, Isamu Akasaki, Hisaki Kato, Norikatsu Koide and Katsuhide Manabe (Hiramatsu), AMOVPE growth of GaN on a misoriented sapphire substrate,@ 107 *Journal of Crystal Growth* 509-512 (1991).

The examiner has rejected appealed claims 1, 3, 7, 9 and 28 through 31 under 35 U.S.C. ' 102(b) as being anticipated by Kong. The examiner has further rejected appealed claims 1 through 12, 14 and 28 through 31 under 35 U.S.C. ' 103 as being unpatentable over as being unpatentable over Hiramatsu in view of the admission of prior art at page 17, line 23, to page 18, line 13 of the specification.³

² Appellant states in the brief (page 3) that the appealed claims do not stand or fall together@ and separately argues claims 1 and 28, as to both grounds of rejection based on prior art, as well as claims 3, 7 and 29 through 31, with respect to the ground of rejection based on Kong. Thus, we decide this appeal based on appealed claims 1, 3, 7 and 28 through 31. 37 CFR ' 1.192(c)(5) and (6)(1993).

³ The cite to page 17, line 23, refers to the specification as it stood prior to the amendment of page 17, line 12, in amendment of March 13, 1995 (Paper No. 10).

We affirm the ground of rejection under ' 102(b) and reverse the ground of rejection under ' 103.⁴

Rather than reiterate the respective positions advanced by the examiner and appellant, we refer to the examiner=s answer and to appellant=s principal and supplemental reply briefs for a complete exposition thereof.⁵

Opinion

The principal issue with respect to both grounds of rejection is the construction to be made of the method step of Aredistributing atoms on said surface@ of the off-axis, substantially flat surfaced single crystal ceramic substrate, in order to Aproduce surface steps of at least three lattice spacings,@ as in method step (b) of claim 1, with said Aat least three lattice spacings@ being further Aparallel to at least two crystallographic directions@ in method step (c) of claim 28. We are mindful that we must give the broadest reasonable interpretation to this claim language consistent with appellant's specification as it would be interpreted by one of ordinary skill in this art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). It is disclosed in the specification that the Aredistribution [of atoms] can occur by many processes including,@ *inter alia*, Aannealing at high temperatures@ (specification, page 9, line 24, to page 10, line 2).⁶ It is further disclosed in the Apreferred@ embodiment that the cut and polished,

⁴ We noted above that the examiner withdrew the ground of rejection of claims 13 and 15 under 35 U.S.C. ' 112, first paragraph, in the supplemental examiner=s answer (*see supra* p. 1). The examiner did not maintain on appeal the ground of rejection of claim 29 under 35 U.S.C. ' 112, second paragraph (answer, Paper No. 8; page 5).

⁵ The supplemental answer repeats the content of the answer, adding only that the ground of rejection of claims 13 and 15 under ' 112, first paragraph, had been withdrawn. Appellant=s reply brief (Paper No. 9) only responded to the ground of rejection under ' 112, first paragraph.

⁶ We are not persuaded of a different construction by appellant=s notion that the effect of the disclosure of the invention in the Asummary@ section of the specification at Apage 9, line 24-page 10, line 2@ is one of Aallegation@ that is Anot necessarily intended to provide all of the details that would produce the steps of the claimed invention at page 14, line 6, et seq.,@ and that the AExaminer has never shown that this allegation alone, presuming arguendo it was true, would produce the redistributed atoms on the surface to produce steps@ having the characteristics specified in the claims (supplemental reply brief, page 2). If, indeed, appellant is disclaiming the clear disclosure at Apage 9, line 24-page 10, line 2,@ then this matter should be considered with respect to the provisions of 35 U.S.C. ' 112,

off-axis sapphire surface is annealed to form the desired surface structure, this being at, for example, 1300°C for 24 hours (specification, page 19), while original claim 13, which is ultimately dependent on claim 1, provides that the step of redistributing atoms on said surface is by heating said substrate to at least 1200°C for at least 1 hour. Thus, we find that one of ordinary skill in this art would have concluded from appellant's specification as filed that the step of redistributing atoms to obtain surface steps having the specified number of lattice spacings and direction can be accomplished by heating the surface to at least 1200°C for at least one 1 hour.

We have compared claims 1 and 28, as we have construed these claims above, with the disclosure of Kong and find that the examiner has reasonably concluded that, *prima facie*, the process wherein an off-axis, cut and polished 6H-SiC ceramic substrate is heated at 1473K [that is, 1200°C,] in a flowing dry oxygen atmosphere for 1.5 [hours] to oxidize approximately 50 nm of the polished surface in order to remove the subsurface damage caused by the mechanical polishing disclosed in Kong (page 2673), is an anticipation under § 102(b) of the methods encompassed by these claims wherein an off-axis, cut and polished, substantially flat ceramic substrate surface is heated to at least 1200°C for at least 1 hour. *In re Best*, 562 F.2d 1252, 1254-55, 195 USPQ 430, 432-33 (CCPA 1977). Accordingly, the burden has shifted to appellant to provide effective argument and/or evidence that the process of Kong does not in fact inherently redistribute atoms on the surface under the conditions disclosed therein. *See, e.g., Best*, 562 F.2d at 1254, 195 USPQ at 433.

Appellant submits that Kong provides no indication that the process step disclosed therein, that is, oxidation at 1200°C for 1.5 hours, would perform the claimed steps to obtain the specified surface steps and that such a result has not been shown by the examiner (principal brief, page 5). We cannot agree with appellant that the facts that (1) Kong does not discuss the surface characteristics resulting from the oxidizing heat treatment and (2) the examiner does not show or demonstrate the effect of the treatment step in the reference on surface characteristics, are fatal to the examiner's position. It is well settled that mere argument that a prior art reference is silent with respect to a

first paragraph, written description and enablement requirements, upon any further prosecution of the claims of this application before the examiner.

particular characteristic used by appellant to describe the claimed invention will not patentably distinguish the claimed invention over an embodiment disclosed in that reference which may inherently satisfy the requirements of the appealed claims. *Best*, 562 F.2d at 1254, 195 USPQ at 433; *In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975). It is also well settled that a *prima facie* case of anticipation is established where the examiner has reasonably concluded from the evidence of record that the embodiment disclosed in that reference may inherently satisfy the requirements of the appealed claims even though the examiner cannot conclusively show or demonstrate the inherent characteristic(s) with such evidence. *Best, supra; compare Skoner*, 517 F.2d 947, 950-51, 186 USPQ 80, 82-83. We have also considered appellant's contention that the combination of steps and/or substrates and/or semiconductors specified in claims 3, 7, 29, 30 and 31 are not taught by Kong (principal brief, page 7). However, we are not persuaded by the contention that the teachings of Kong do not anticipate these claims because Kong teaches that both 6H-SiC and SiC film is deposited on the prepared 6H-SiC substrate (e.g., page 2673, left column, and page 2674).

Accordingly, in the absence of effective argument and/or evidence patentably distinguishing the claimed invention of claims 1, 3, 7, 9 and 28 through 31 from the teachings of Kong under ' 102(b), we affirm this ground of rejection.

We have further compared claims 1 and 28 as we have construed these claims above with the disclosure of Hiramatsu in view of the admission of prior art at page 17, line 23, to page 18, line 13, of the specification, and find that we cannot agree with the examiner that the claimed method encompassed by these claims would have been obvious over the applied prior art to one of ordinary skill in this art at the time the claimed invention was made. We find that appellant has admitted *only* that heteroepitaxial growth on the surface of certain forms of sapphire was improved by heating to A1200EC for 30 min,@ citing Smith et al., and by Aa high temperature 1050EC heat treatment,@ citing Nakamura. We find that these admissions do *not* provide a factual basis on which to *reasonably* conclude that (1) one of ordinary skill in this art would have been reasonably motivated to heat treat the off-axis sapphire substrate of Hiramatsu prior to depositing the AlN ceramic buffer layer by the heat treatments specifically set forth in appellant's specification at page 17, line 23, to page 18, line 13; and (2) the heat treatments specifically set forth in appellant's specification at page 17, line 23, to page 18,

line 13, would result in a distribution of atoms on the surface of the off-axis sapphire substrate of Hiramatsu that would provide a surface steps@ having the characteristics specified in the claims. As to the latter, we observe that the treatment attributed to Smith et al. is for 0.5 and not 1 hour as in original claim 13, and that the time period for the treatment attributed to Nakamura is not specified.⁷

Accordingly, we reverse this ground of rejection.

The examiner=s decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR ' 1.136(a).

AFFIRMED-IN-PART

CHARLES F. WARREN)	
Administrative Patent Judge)	
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TERRY J. OWENS)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
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PETER F. KRATZ)	
Administrative Patent Judge)	

⁷ We emphasize that we have considered *only* appellant=s characterization of the heat treatments of Smith et al. and Nakamura and *not* the actual content of these documents. Indeed, the best evidence is the full Smith et al. and Nakamura documents which were made of record by the examiner in the Form 892, executed A4/7/94,@ attached to the final rejection of April 11, 1994 (Paper No. 4). The full documents should be considered with respect to this matter upon any further prosecution of the claims of this application before the examiner.

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