

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG INNOTEK CO., LTD.,
Petitioner,

v.

LEXINGTON LUMINANCE LLC,
Patent Owner.

Case IPR2017-00052
Patent 6,936,851 B2

Before JUSTIN T. ARBES, MIRIAM L. QUINN, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

HOWARD, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

LG Innotek Co., Ltd. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) to institute an *inter partes* review of claims 1–4 and 15–18 of U.S. Patent No. 6,936,851 B2 (Ex. 1001, “the ’851 Patent”) pursuant to 35 U.S.C. §§ 311–19. Lexington Luminance LLC (“Patent Owner”) filed a Patent Owner Preliminary Response. Paper 6 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). *Inter partes* review may be instituted if “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Based on the record before us, we are not persuaded that the information presented in the Petition demonstrates a reasonable likelihood that Petitioner would prevail in proving that at least one challenged claim would have been obvious under 35 U.S.C. § 103(a) based on the cited references. Accordingly, we deny the Petition and do not institute an *inter partes* review.

A. *Related Proceedings*

The parties indicate that the ’851 Patent is being asserted in the following actions: *Lexington Luminance LLC v. TCL Multimedia Tech. Holdings, Ltd.*, No. 1-16-cv-11458, filed July 13, 2016 (D. Mass); *Lexington Luminance LLC v. Samsung Elecs. Co., Ltd.*, No. 1-16-cv-11138, filed June 17, 2016 (D. Mass); *Lexington Luminance LLC v. LG Elecs., Inc.*, No. 1:12-cv-12175, filed October 27, 2016 (D. Mass.). Pet. 1; Paper 4, 2.

Patent Owner also identifies various district court proceedings that are no longer pending in which the '851 Patent was asserted: (1) *Lexington Luminance LLC v. Feit Electric Co., Inc.*, No. 1:12-cv-11554 (D. Mass.) (the “Feit litigation”); (2) *Lexington Luminance LLC v. Osram Sylvania, Inc.*, No. 1:12-cv-11551 (D. Mass.); (3) *Lexington Luminance LLC v. Lighting Sci. Group Corp.*, No. 1:12-cv-11552 (D. Mass.); (4) *Lexington Luminance LLC v. Amazon.com Inc.*, No. 1:12-cv-12216 (D. Mass.) (the “Amazon litigation”); and (5) *Lexington Luminance LLC v. Google, Inc.*, No. 1:12-cv-12218 (D. Mass.) (the “Google litigation”). Paper 4, 2–3. Patent Owner also identifies a decision by the United States Court of Appeals for the Federal Circuit — *Lexington Luminance LLC v. Amazon.com Inc.*, 601 F. App'x 963 (Fed. Cir. 2015) — and *ex parte* Reexamination Control No. 90/012,964 involving the '851 Patent.¹ *Id.* at 3.

Additionally, Samsung Electronics Company, Ltd. filed two petitions for *inter partes* review challenging the '851 Patent: IPR2017-00539 and IPR2017-00540.

B. The '851 Patent (Ex. 1001)

The '851 Patent relates to semiconductor devices, such as light-emitting devices (“LEDs”) in misfit systems. Ex. 1001, 1:8–10. According to the '851 Patent, prior art manufacturing methods “allow[] for the free propagation of dislocations into the active layer.” *Id.* at 1:60–62. Although multiple epitaxial lateral overgrowth steps could reduce the defects, this requires multiple steps with long cycle times and poor process yields. *Id.* at 1:62–64. The defects can be reduced by “depositing the layers

¹ Patent Owner's identification of the reexamination control number contains a typographical error, which we corrected above.

over etched surface features with a specific inclination angle”; however, that process “is highly sensitive to the etching defects,” which can “expose random nucleation sites causing adverse microfaceting and layer deterioration . . . [that] will multiply and propagate into the active region during operation.” *Id.* at 1:64–2:8.

The '851 Patent proposes reducing the propagation of those defects “by using the substrate member comprising a textured surface district . . . [that] comprises a plurality of smooth trenches without a prescribed angle of inclination.” *Id.* at 2:12–25. “As the inclined growth proceeds, the extended defects such as misfit dislocation are guided to designated locations and the overall defect density in the misfit system is reduced.” *Id.* at 3:43–46.

Figure 2B of the '851 Patent follows:

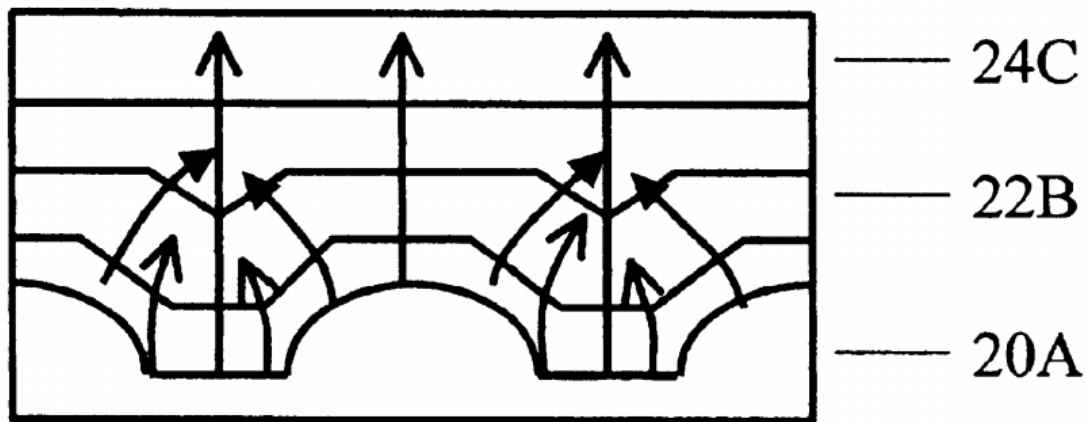


Fig. 2B

Figure 2B shows “layer deposition and defect propagation over the textured surface district in accordance” with an embodiment of the '851 Patent. *Id.* at 2:64–67. The arrows in Figure 2B indicate “the direction of defect propagation” and show how “[t]he defect level is much reduced after the

counter propagating threading dislocations combine in the trench region.”
Id. at 5:16–20.

C. The Challenged Claims

Petitioner challenges claims 1–4 and 15–18. Claims 1, 3, and 15 are independent claims. Claim 1, reflecting the additions and deletions made during reexamination, is illustrative of the challenged claims and is reproduced below:

1. A semiconductor light-emitting device comprising:
a substrate;
a textured district defined on the surface of said substrate comprising a plurality of etched trenches having a sloped etching profile with a smooth rotation of microfacets without a prescribed angle of inclination;
a first layer disposed on said textured district, comprising a plurality of inclined lower portions, said first layer and said substrate form a lattice-mismatched misfit system, said substrate having at least one of a group consisting of group III-V, group IV, group II-VI elements and alloys, ZnO, spinel and sapphire;
and
a light-emitting structure containing an active layer disposed on said first layer, whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer.

Ex. 1001, Reexamination Certificate US 6,936,851 C1, issued December 5, 2014, 1:25–43.

D. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Reference(s)	Basis ²	Challenged Claims
Tadatomo ³	§ 103(a)	1, 2, 4, and 15–18
Tadatomo and Krames ⁴	§ 103(a)	4
Niki ⁵	§ 103(a)	1–3 and 15–18

Pet. 3.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016). Consistent with that standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). There are, however, two exceptions

² The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 100 *et seq.* effective on March 16, 2013. Because the ’851 Patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

³ PCT Publication No. WO 02/075821 (published Sept. 26, 2002) (Ex. 1007, 53–102, “Tadatomo”). Petitioner provides an English language translation of Tadatomo. Ex. 1007, 1–52 (“Petition Translation”).

⁴ U.S. Patent No. 5,779,924 (issued July 14, 1998) (Ex. 1017, “Krames”).

⁵ U.S. Patent No. 6,870,191 B2 (filed July 24, 2002, issued March 22, 2005) (Ex. 1008, “Niki”).

to that rule: “1) when a patentee sets out a definition and acts as his own lexicographer,” and “2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). Although it is improper to read a limitation from the specification into the claims, *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993), claims still must be read in view of the specification of which they are a part. *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1347 (Fed. Cir. 2004).

Petitioner proposes construction of five terms: “etched trenches,” “micro-facets,” “a sloped etching profile with a smooth rotation of micro-facets,” “a sloped etching profile . . . without a prescribed angle of inclination,” and “lattice-mismatched misfit system.” Pet. 7–13. Patent Owner proposes constructions for these terms and others, including “whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer.” Prelim. Resp. 6–17 (emphasis omitted).

We address the construction of “a sloped etching profile . . . without a prescribed angle of inclination” and “whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer” below, and note that our constructions are consistent with those made by the Federal Circuit and various district courts in related patent infringement litigation. See Exs. 1014, 1015, 1016. Having

considered the evidence presented, for all other terms we conclude that no express claim construction is necessary for our determination of whether to institute review of the challenged claims. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

1. “A Sloped Etching Profile . . . Without a Prescribed Angle of Inclination”

Petitioner asserts that the broadest reasonable construction of “a sloped etching profile . . . without a prescribed angle of inclination” is broad enough to encompass sloped etched sides without a specified angle of inclination. Pet. 12. Petitioner’s construction is the same as the construction of the term by the district court in the Amazon litigation. *Id.* (citing Ex. 1015, 26).

Patent Owner asserts the broadest reasonable construction of the limitation requires “the entire portion of the etching profile that is sloped to be curved.” Prelim. Resp. 15. Patent Owner argues that its proposed construction is based on the Federal Circuit’s decision, the claim construction decision in the Amazon litigation relied on by Petitioner, and a separate claim construction decision in the Google litigation. Prelim Resp. 14–15 (citing Ex. 1014, 15; Ex. 1016, 11; Ex. 1015, 22–23).

In analyzing this limitation, the Federal Circuit held the phrase “without a prescribed angle of inclination” “modifies the ‘sloped etching profile’ rather than ‘trenches.’” Ex. 1014, 14–15. Accordingly, the Federal Circuit construed the claim broadly such that “the claimed trenches can have, in addition to sloped areas, areas of a flat bottom as well as corners

where the flat bottom and the inclined slope intersect with each other, as shown in Figures 2B and 4B.” *Id.* at 15.

Following the Federal Circuit decision, in the Amazon litigation, Patent Owner argued that no interpretation of the limitation was necessary, but “otherwise” the limitation should be interpreted to mean “sloped etched sides without a constant angle of inclination.” Ex. 1015, 20. The district court held that “[b]oth the intrinsic and extrinsic evidence support construing ‘prescribed’ to mean ‘specified’” and interpreted the limitation to mean “sloped etched sides without a specified angle of inclination.” *Id.* at 22–23 (citing Ex. 1001, 3:37–39, 4:62–63). In the Google litigation, Patent Owner proposed an interpretation of “sloped etched sides without a constant angle of inclination.” Ex. 1016, 9. The district court agreed with Patent Owner that “the term ‘without a prescribed angle of inclination’ modifies the entire etching profile, and not only its constituent segments,” noting how the applicant of the ’851 Patent distinguished art where “the trench sides are made up of multiple straight line segments with different slopes” during prosecution. *Id.* at 10. The district court construed “without a prescribed angle of inclination” to have substantially the same meaning as in the Amazon litigation: “without a predetermined angle of inclination.” Ex. 1016, 11. Neither Petitioner nor Patent Owner have identified any meaningful differences between the two district court constructions. *See* Pet. 12; Prelim. Resp. 14–15.

We are not persuaded that Patent Owner’s proposed construction is consistent with the broadest reasonable construction of the claim limitation. None of the claim constructions cited by Patent Owner state that the sloped etching profile must have a “curved” slope. *See* Ex. 1014, 15; Ex. 1015, 14–

15; Ex. 1016, 10. We recognize, though, that the phrase “without a prescribed angle of inclination” modifies the entire “etching profile” recited in the claims, not constituent segments, as Patent Owner contends. *See* Ex. 1014, 15; Ex. 1016, 10.

Accordingly, for purposes of this Decision, and after review of the record, we agree with the district courts’ analyses and adopt the claim construction issued in the Amazon litigation, which is the broadest reasonable construction in light of the specification. Thus, for the purpose of this Decision, we construe the phrase “a sloped etching profile . . . without a prescribed angle of inclination” to mean “sloped etched sides without a specified angle of inclination.”

2. *“Whereby Said Plurality of Inclined Lower Portions Are Configured to Guide Extended Lattice Defects Away From Propagating Into the Active Layer”*

Relying on the district court’s claim construction in the Google litigation, Patent Owner argues the broadest reasonable construction of the whereby limitation is “a structure ‘such that the inclined lower portions are shaped to reduce the propagation of extended lattice defects into the active layer.’” Prelim. Resp. 17 (quoting Ex. 1016, 18). Although Petitioner did not propose a construction for this limitation, Petitioner treats the whereby clause as a structural limitation. Pet. 27–28, 47–48. Petitioner’s analysis — which identifies lower portions of a first layer as producing a lower density of defects in the active layer — is consistent with the construction proposed by Patent Owner. *See Id.*

The Federal Circuit guides that “when the ‘whereby’ clause states a condition that is material to patentability, it cannot be ignored in order to change the substance of the invention.” *Hoffer v. Microsoft Corp.*, 405 F.3d

1326, 1329 (Fed. Cir. 2005). In *Hoffer*, the Court focused on whether the claimed “capability is more than the intended result of a process step; it is part of the process itself.” *Id.* at 1330. Such a determination can be made by examining the specification and the prosecution history. *Id.*

The Specification of the ’851 Patent states that the goal of the disclosed invention is reducing the defect density of the system by guiding defects away from the active layer. *See* Ex. 1001, 1:10–15, 2:15–22, 3:33–46, 5:7–11, Abstract. The whereby clause recites that it is the configuration of the plurality of inclined lower portions that produces the reduction in the defect density in the active layer by guiding the defects away from the active layer. Therefore, based on the record before us, we determine that the capability recited in the whereby clause constitutes a structural limitation. *Accord* Ex. 1015 at 16–20 (determining in the Amazon litigation that the whereby clause is a structural limitation); Ex. 1016 at 16–18 (determining in the Google litigation that the whereby clause is a structural limitation).

Accordingly, for purposes of this Decision, and after review of the record, we conclude that the whereby clause is a structural limitation that limits the structure of the inclined lower portions of the first layer. No further explicit construction is necessary at this juncture. *Vivid*, 200 F.3d at 803 (claims need only be construed “to the extent necessary to resolve the controversy”).

B. Legal Principles of Obviousness

An invention is not patentable “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

35 U.S.C. § 103(a). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and, (4) where in evidence, so-called secondary considerations, including commercial success, long-felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441, F.3d 977, 988 (Fed. Cir. 2006)). We analyze the grounds based on obviousness in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)). In a given case, “one or more factors may predominate.” *Id.*

Petitioner asserts a person having ordinary skill in the art at the time of the invention would have had the following level of skill:

at least a master’s degree (or a substantively equivalent degree) in materials science or physics, (or a substantively related field), in addition to two years of post-graduate work experience, whether in industry or conducting research, in the field of

semiconductor design or engineering, in particular experience in epitaxial growth of compound semiconductor materials on a crystalline substrate.

Pet. 13. Petitioner further asserts that “[a]dditional education in a relevant field, such as electrical engineering, or industry experience, may compensate for a deficit in aspects of the requirements stated above.” *Id.*

According to Patent Owner, a person having ordinary skill in the art would have had the following level of skill: “a Master’s degree in Material Science and Engineering, or in a related field, and about two years’ experience with semiconductor fabrication; particularly in group III-V compound semiconductor materials fabrication.” Prelim. Resp. 17–18.

The parties’ definitions of one of ordinary skill in the art are substantially similar, and neither party states how any difference in the parties’ articulated levels of skill impacts the proceeding. For purposes of this Decision and based on the current record, we agree with and apply Petitioner’s definition of the level of ordinary skill in the art.

D. Obviousness over Tadatomo

Petitioner asserts that the subject matter of claims 1, 2, 4, and 15–18 would have been obvious to a person of ordinary skill in the art at the time of invention in light of the teachings of Tadatomo. Petitioner relies on an English translation of Tadatomo submitted as Exhibit 1007, and the Declaration of W.R. Bottoms, Ph. D. (Ex. 1003).

1. Summary of Tadatomo

Tadatomo describes “a semiconductor light-emitting device . . . wherein the light-emitting layer thereof is made from a GaN-based semiconductor crystal (a GaN-based crystal).” Ex. 1007 ¶ 1. Tadatomo describes two goals achieved with the use of the invention. *Id.* ¶¶ 8–9.

First, Tadatomo “provide[s] a light-emitting device with a novel structure that directs, to the outside, the lateral-direction light that is produced in the light-emitting layer, and [is] able to prevent the production of standing waves.” *Id.* ¶ 8. Second, Tadatomo prevents a reduction in “output when InGaN is used as the material for the light-emitting layer and ultraviolet radiation is to be emitted.” *Id.* ¶ 9.

The general structure of the LED is shown in Figure 1(a), reproduced below:

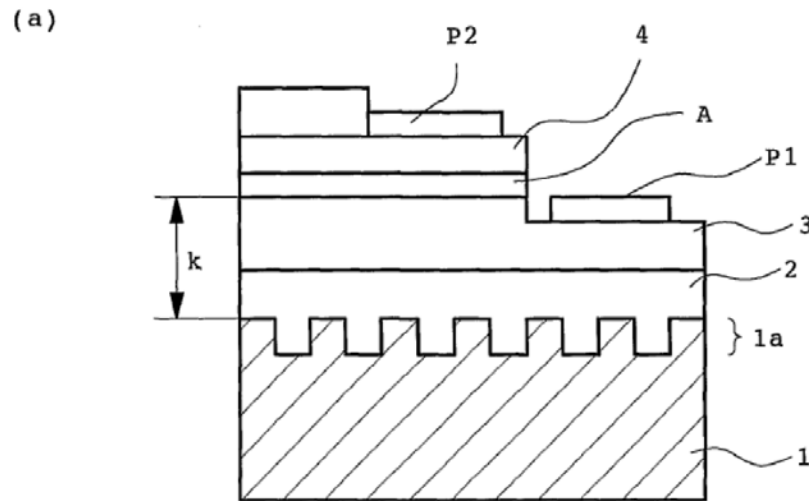
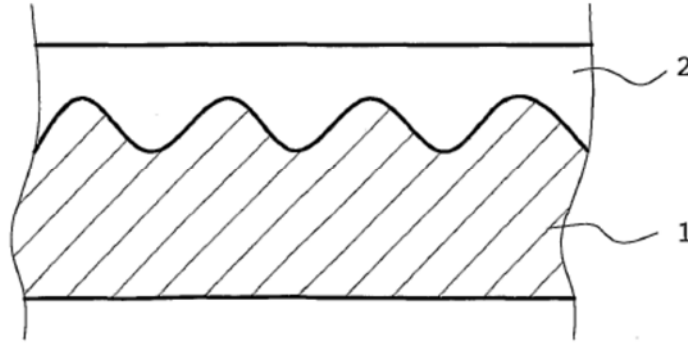


Figure 1(a) “is a schematic diagram illustrating an example of a structure of a light emitting device.” Ex. 1007 ¶ 43. The light emitting device includes a first crystal layer, in which a rectangular wave has been formed. *Id.* ¶ 56. A second crystal layer is formed above the first crystal layer and “is made from a material having a refractive index that is different from that of the [first] crystal layer.” *Id.* The light emitting device also includes an active light-emitting layer A, which is layered through crystal growth. *Id.*

An LED of the general design as shown in Figure 1(a) but with a crystal substrate having a non-rectangular cross-section is shown in Figure 3(c) below:

(c)



Ex. 1007, Fig. 3(c). Figure 3(c) is a schematic diagram showing an LED having “inclined surfaces[] in the surface of the crystal substrate.” *Id.* ¶ 45.

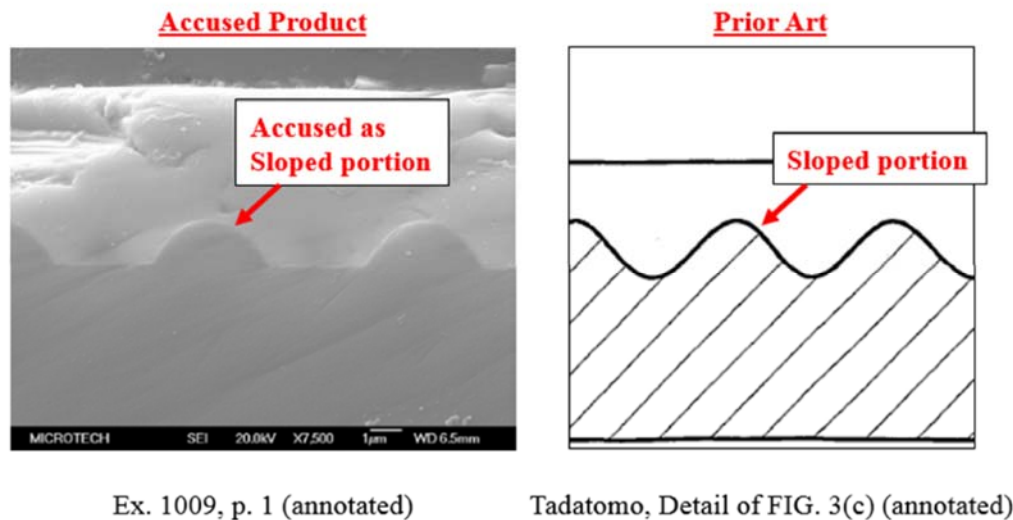
2. Analysis

Independent claim 1 of the '851 Patent recites a “textured district defined on the surface of said substrate comprising a plurality of etched trenches having a *sloped etching profile . . . without a prescribed angle of inclination.*” Ex. 1001, Reexamination Certificate, 1:28–30 (emphasis added). Independent claim 15 recites substantially the same limitation. *Id.* at 2:23–25.

Petitioner contends Tadatomo “teaches that the etched trenches shown in FIG. 1(a) may be formed to have various ‘cross-sectional shape[s]’ including ‘a square wave (or trapezoidal) shape,’ ‘a triangle wave’ shape, ‘or [a] sinusoidal shape, as in FIG. 3(c)[.]” Pet. 18 (quoting Ex. 1007 ¶ 67) (emphasis omitted). Petitioner further contends that because the sides of the etched trenches shown in Figure 3(c) have a sinusoidal shape, “Tadatomo’s etched trenches are thus ‘without a specified angle of inclination’ because

the angle of inclination changes gradually with the curve.” Pet. 19 (citing Ex. 1003 ¶ 20).

Petitioner also relies on what it alleges are similarities between the shape of a product accused of infringing the ’851 Patent in the Feit litigation (Ex. 1009, 1) and Figure 3(c) of Tadamoto. Pet. 19–22. The following are the annotated figures Petitioner relies on:



Pet. 22. The figures above are a picture of the accused product from the Feit litigation (Ex. 1009, 1) on the left and Tadamoto Figure 3(c) on the right, with both pictures annotated by Petitioner to identify what Petitioner states are sloped portions. *Id.* According to Petitioner, “[b]ecause the etched trenches of Tadamoto include sloped portions comparable to those of the accused product, according to Patent Owner’s litigation expert, Dr. Bour, the etched trenches of Tadamoto also ‘have a gradual, incremental rotation in slope from microfacet to microfacet’ like the accused product in the *Feit* case.” Pet. 22.

Patent Owner contends that the Petition Translation “is [b]iased” and “was deliberately made to bolster [Petitioner’s] case for institution.” Prelim

Resp. 22. Patent Owner provides two different translations in support of its argument. First, Patent Owner provides the specification filed in the prosecution history of U.S. Patent No. 7,053,420 B2 (Ex. 2012, “the Tadatomo U.S. Patent”).⁶ Ex. 2002 (hereinafter the “Specification Translation”). Second, Patent Owner provides a copy of a translation of Tadatomo that was submitted during the reexamination of the ’851 Patent. Ex. 2003 (hereinafter the “Reexamination Translation”).

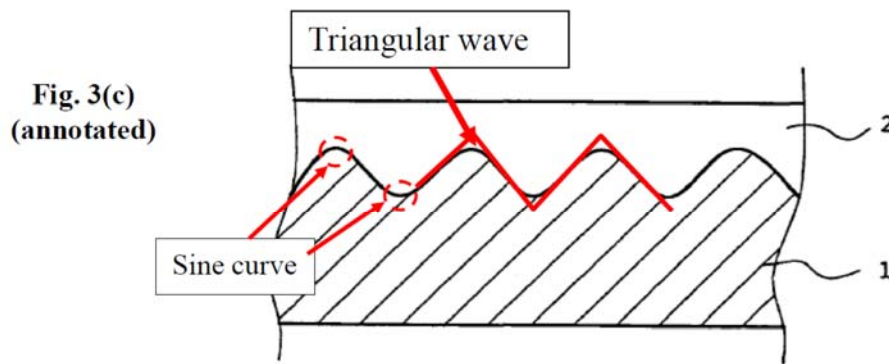
As an example of alleged inconsistencies between Petitioner’s translation and the earlier translations, Patent Owner focuses on the sentence of Tadatomo that Petitioner relies on as allegedly describing Figure 3(c) as sinusoidal. Prelim Resp. 24. Specifically, Petitioner states that Tadatomo, in the Petition Translation, discloses “‘a triangle wave’ shape, ‘or [a] sinusoidal shape, as in FIG. 3 (c),’”⁷ whereas the Reexamination Translation discloses “a triangular wave and a sine curve as shown in FIG. 3(c).”⁸

Instead of a sinusoidal shape, Patent Owner argues that Tadamoto’s Figure 3(c) has a cross-section having components of both a triangular wave and a sine curve. Prelim. Resp. 32–36. Patent Owner’s Preliminary response includes an annotated version of Tadatomo Figure 3(c):

⁶ As discussed *infra*, the Tadatomo U.S. Patent issued from a United States national stage application claiming the benefit of the Tadatomo PCT application.

⁷ Pet. 18 (citing Ex. 1007 ¶ 67) (emphasis omitted).

⁸ Prelim Resp. 32 (quoting Ex. 2003, 11:6) (emphasis omitted).



Prelim. Resp. 35. The annotated version of Tadatomo Figure 3(c) above identifies which features of the substrate's surface Patent Owner contends correspond to a "Triangular wave" and to a "Sine curve." *Id.*

Relying on the Reexamination Translation, Patent Owner argues the text of Tadatomo repeatedly refers to Figure 3(c) as having elements of both a triangular wave and a sine curve. Prelim. Resp. 32 (citing Ex. 2003, 11:6, 16:27–28, 17:8–9). According to Patent Owner, Tadatomo does not mention "a 'sine wave,' 'sinusoidal wave,' 'sinusoidal pattern,' or 'sinusoidal shaped trench.'" Prelim Resp. 32. Instead, Patent Owner argues Tadatomo "emphasizes and requires the substantially flat portions of the sides of the concaves and convexes by describing the grooves as a pseudo-facet plane and as a facet plane." Prelim Resp. 32–35; Ex. 2013 ¶¶ 59, 86, 92–93.

Regarding the comparison between Tadatomo Figure 3(c) and the product accused of patent infringement in the Feit litigation, Patent Owner argues that "Petitioner improperly attempts to generalize findings involving a specific previously-accused LED." Prelim Resp. 27; *see also* Prelim Resp. 11–14. Additionally, Patent Owner contends the comparison is improper because various experts rejected Petitioner's inherency argument and Tadatomo Figure 3(c) is not drawn to scale. Prelim. Resp. 28.

We agree with Patent Owner that Petitioner has not shown adequately that Tadamoto teaches “a sloped etching profile . . . without a prescribed angle of inclination,” as required by claims 1 and 15, or that Tadamoto supports the Petition’s and Dr. Bottoms’ relevant representations regarding its teachings. Our reasoning follows.

Petitioner focuses on a single sentence in the Petition Translation for its characterization of the surface of the substrate shown in Figure 3(c) as a sinusoidal shape. Pet. 18 (citing Ex. 1007 ¶ 67); *see also* Ex. 1003 ¶ 18 (citing Ex. 1007 ¶ 67). However, Petitioner’s argument is inconsistent with the entirety of the Petition Translation, which describes Figure 3(c) as having inclines or a triangular shape.

For instance, the Petition Translation repeatedly refers to the Figure 3 embodiment as having inclined straight lines or a triangular wave. Ex. 1007 ¶¶ 45 (“inclined surfaces”), 101 (“triangular waves”), 102 (“triangle wave”), 103 (“inclined planes”), 105 (“inclined planes”). For example, Figure 3 is generically described as being “a schematic diagram illustrating a method for processing the texturing, having *inclined surfaces*, in the surface of the crystal substrate.” *Id.* ¶ 45 (emphasis added). Inclined means “making an angle with a line or plane.” Ex. 3001.⁹ In other words, the surface of the substrate includes a straight section that is inclined. The Petition Translation further describes Figure 3 as “[a]n example of a form wherein the cross-sectional shape of the texturing is triangle waves” and that the process results in “a cross-sectional shape that, as a whole, ultimately approaches

⁹ Merriam-Webster’s Collegiate Dictionary (2003), *available at* <http://www2.merriam-webster.com/cgi-bin/mwdictfol?book=Dictionary&va=inclined> (last accessed Mar. 20, 2017).

that of a *triangle wave*, as illustrated in FIG. 3 (b).” Ex. 1007 ¶¶ 101, 102 (emphasis added).¹⁰ Again, this description describes the figure as having straight lines on the sides of the trench.

The use of inclined surfaces or planes, and triangular waves, in Figure 3 is inconsistent with Petitioner’s description of Figure 3(c) as sinusoidal or curved shape. Neither Petitioner nor Dr. Bottoms addresses this inconsistency. As explained above, the claims require the entire etching profile to be “without a prescribed angle of inclination,” and we interpret “a sloped etching profile . . . without a prescribed angle of inclination” to mean “sloped etched sides without a specified angle of inclination.” Accordingly, we are not persuaded by the Petition and Dr. Bottoms’s testimony that Figure 3 has an entirely curved cross-section and teaches “a plurality of etched trenches having a sloped etching profile . . . without a prescribed angle of inclination,” as recited in claims 1 and 15.¹¹

We also are not persuaded by Petitioner’s reliance on a comparison between Tadatomo Figure 3(c) and the product accused of patent infringement in the Feit litigation. First, Petitioner has not cited relevant legal authority where we can consider evidence of alleged infringement to determine unpatentability in an *inter partes* review. Rather, the test for

¹⁰ Figure 3(c) differs from Figure 3(b) in that it shows crystal layer 2 grown on layer 1. See Ex. 1007 ¶ 106. However, the relevant layer 1 is identical in both figures.

¹¹ Because the Petition Translation does not persuade us that Tadatomo teaches “a plurality of etched trenches having a sloped etching profile . . . without a prescribed angle of inclination,” we need not address Patent Owner’s contentions that the Petition Translation is biased and the Reexamination Translation is accurate.

unpatentability under section 103 in an *inter partes* review is performed by examining the differences between the prior art consisting of patents and printed publications and the words of the claim. *Graham*, 383 U.S. at 17–18; 35 U.S.C. § 103(a); 35 U.S.C. § 311(b) (*inter partes* review limited to “prior art consisting of patents or printed publications”).

Second, even if such a comparison was appropriate, the evidence presented in the Petition is not persuasive. Dr. Bottoms does not testify that the accused product and the prior art have an identical shape. Ex. 1003 ¶ 23. Instead, Dr. Bottoms merely notes an alleged “consistency” between the two figures. *Id.*

For the reasons explained above, the arguments and evidence presented in the Petition fail to provide sufficient reasoning and evidence to support Petitioner’s contention that Tadatomo teaches “a plurality of etched trenches having a sloped etching profile . . . without a prescribed angle of inclination” as recited in claims 1 and 15. Therefore, the Petition has not demonstrated a reasonable likelihood of success in challenging claims 1 and 15 on this ground of unpatentability.

Each of the remaining challenged claims in this ground depends from claim 1 or claim 15. The Petition does not present any information with respect to dependent claims 2, 4, and 16–18 that addresses the deficiencies discussed above regarding the independent claims. Thus, the Petition also has not demonstrated a reasonable likelihood of success in challenging the dependent claims as obvious in view of the teachings of Tadatomo. *See In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) (“Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.”).

E. Obviousness over Tadatomo in view of Krames

Petitioner asserts that the subject matter of claim 4 would have been obvious to a person of ordinary skill in the art at the time of invention in light of teachings from Tadatomo in view of Krames. Claim 4 depends from claim 1. The Petition does not present any information with respect to dependent claim 4 that persuasively addresses the deficiencies discussed above regarding independent claim 1. *See* Pet. 32–35. Thus, the Petition also has not demonstrated a reasonable likelihood of success in challenging claim 4 as obvious over Tadatomo in view of Krames. *See Fine*, 837 F.2d at 1075.

F. Obviousness over Niki

Petitioner asserts that the subject matter of claims 1–3 and 15–18 would have been obvious to a person of ordinary skill in the art at the time of the invention in light of teachings from Niki. Petitioner relies on Niki (Ex. 1008) and the Declaration of Dr. Bottoms (Ex. 1003).

1. Summary of Niki (Ex. 1008)

Niki is directed to an LED with a light emitting active layer and two semiconductor layers formed on the surface of a substrate. Ex. 1008, 2:34–38. The LED includes “a recess or a protruding portion [that] is provided in [the] substrate so that defects do not occur in the semiconductor and, thereby, the direction of guided light is changed in a semiconductor layer to increase the external quantum efficiency.” *Id.* at 1:6–12; *see also id.* at 2:39–44 (“The LED is characterized in that at least one recess and/or protrusion is formed on the surface of the substrate so that the light generated in the light-emitting region is scattered or diffracted, and that the recess and/or protrusion prevents crystal defects from occurring in the

semiconductor layers.”). The recess or protrusion “prevents crystal defects from occurring in the semiconductor layers.” *Id.* at 2:39–44. Niki further explains that “‘prevent[ing] crystal defects from occurring’ means that the recess or protrusion causes neither [a] morphological problem, such as ‘pits’, nor increase of dislocations in the semiconductor layers.” *Id.* at 2:45–48.

Niki teaches various shapes for the cross-sections of the recesses or protrusions. *E.g.*, Ex. 1008, Figs. 8A-8C. One such cross-section is provided in Figure 8B, reproduced below.

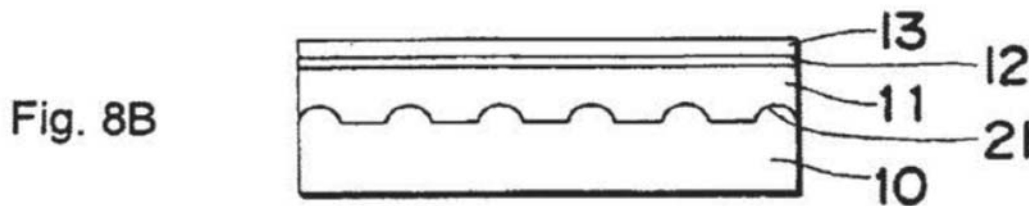


Figure 8B shows a semiconductor LED with protruding portions having a semicircular shape cross-section formed in the substrate. *Id.* at 10:23–32.

2. Analysis

Claim 1 recites “whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer.” Ex. 1001, Reexamination Certificate, 1:40–43. Independent claims 3 and 15 recite the same limitation. *Id.* at 2:16–19, 2:33–36.

Petitioner argues “Niki teaches that the ‘recesses or protruding portions’ (the etched trenches) ‘are provided at the interface between the semiconductor layer’ (the first layer) ‘and the substrate[.]’” Pet. 47–48 (citing Ex. 1008, 2:65–3:1). Petitioner further argues that Niki’s configuration prevents crystal defects from occurring and maintains the crystallinity of the light emitting region (active layer) in good condition. *Id.* at 48 (citing Ex. 1008, 2:45–48, 3:1–4). More particularly, Petitioner asserts

that “[t]he crystallinity of the active layer in Niki is maintained because crystal defects formed at the interface between the semiconductor layer and the substrate are prevented from propagating to the active layer by the inclined lower portions of the semiconductor layer (the first layer).” *Id.* (citing Ex. 1003 ¶ 61). Therefore, Petitioner asserts Niki teaches that defects “are prevented, by the inclined lower portions [of the] first layer, from propagating into the upper portions of the first layer, and thus to the active layer above the first layer” and, accordingly, “said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer,” as recited in the independent claims. *Id.* (citing Ex. 1008, 2:34–34; Ex. 1003 ¶ 61).

Patent Owner argues Niki does not teach or suggest that the inclined lower portions of the first layer are responsible for preventing propagation or formation of defects. Prelim Resp. 62–64. Instead, Patent Owner argues that any improved crystallinity of the light emitting region is due to having a thicker n-side nitride layer compared to the p-side nitride layer. *Id.* at 63–64.

We agree with Patent Owner that Petitioner has not shown adequately that Niki teaches “whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer,” as recited in the independent claims. Niki teaches that the improved crystallinity and decreased defects are due to a thicker n-side nitride semiconductor layer compared to the p-side nitride semiconductor layer:

One of the characteristics of the present invention is in that the recesses and/or protrusions, having such shapes as to prevent defects from growing in a semiconductor layer on the substrate,

are formed on the surface of the substrate. The recesses and/or protrusions are formed not at the interface between the semiconductor layer and the electrode, but at the interface between the semiconductor layer and the substrate. This improves the crystallinity of the light emitting region (active layer) and increase the output power of the device. In particular, in the case of a gallium nitride-based component semiconductor light emitting device, a substrate, an n-side nitride semiconductor layer, a light emitting region (active layer) and a p-side nitride semiconductor layer are layered, in this order, *wherein the film thickness of the p-side nitride semiconductor layer is less than that of the n-side nitride semiconductor layer*. Therefore, recesses or protruding portions are provided at the interface between the semiconductor layer and the substrate rather than at the interface between the semiconductor layer and the electrode and thereby, *the effect due to unevenness is mitigated by the thick n-side nitride semiconductor layer so that the crystallinity of the light emitting region (active layer) can be maintained in an good condition*.

Ex. 1008, 2:48–3:4 (emphases added). In other words, Niki teaches that having protrusions and recesses where the p-side nitride semiconductor layer is *less thick* than that of the n-side nitride semiconductor layer reduces the creation of defects. Niki does not credit the *shape* of the lower inclines of the first layer as preventing defects from growing.

Petitioner relies on the section of Niki discussed above in support of its arguments. See Pet. 47–48. Accordingly, the arguments and evidence presented in the Petition fail to provide sufficient reasoning and evidence to support Petitioner’s contention that Niki teaches “whereby said plurality of inclined lower portions are configured to guide extended lattice defects away from propagating into the active layer,” as recited in claims 1, 3, and 15. Therefore, Petitioner has not demonstrated a reasonable likelihood of

prevailing in its challenge to claims 1, 3, and 15 on this ground of unpatentability.

Each of the remaining challenged claims depends from claim 1 or claim 15. The Petition does not present any information with respect to dependent claims 2 and 16–18 that addresses the deficiencies discussed above regarding the independent claims. *See* Pet. 49, 53–54. Thus, Petitioner also has not demonstrated a reasonable likelihood of prevailing in its challenge to the dependent claims as obvious in view of the teachings of Niki.

III. CONCLUSION

For the foregoing reasons and on the present record, we determine that the information presented in the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of claims 1–4 and 15–18 of the '851 Patent.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is denied as to challenged claims 1–4 and 15–18 of the '851 Patent.

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