

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TATSUYA KUNISATO, HIROKI OHBO,
NOBUHIKO HAYASHI, and TAKASHI KANO

Appeal 2007-4298
Application 09/968,886
Technology Center 2800

Decided: April 11, 2008

Before: KENNETH W. HAIRSTON, JOSEPH F. RUGGIERO,
and KEVIN F. TURNER, *Administrative Patent Judges.*

TURNER, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 12-21. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF CASE

Appellants disclose a nitride-based semiconductor element and methods of preparing a nitride-based semiconductor element. (Spec. 1: 6-8). The application details that a semiconductor element is prepared such that the nitride-based semiconductor layer has only a small number of

dislocations and crystal defects resulting from the desorption process.

(Spec. 8: 8-19).

Claims 1-21 are pending in the application, where claims 1-11 have been withdrawn pursuant to 37 C.F.R. § 1.142(b), and claims 12-21 remain rejected over prior art.

Independent claim 12, which is deemed to be representative, reads as follows:

12. A nitride-based semiconductor element comprising:

a mask layer formed on the upper surface of a substrate to partially expose the upper surface of said substrate;

a buffer layer formed on said exposed part of the upper surface of said substrate and the upper surface of said mask layer;

a nitride-based semiconductor layer formed to cover said buffer layer; and

a nitride-based semiconductor element layer, formed on said nitride-based semiconductor layer, having an element region, wherein a thickness of the buffer layer is not more than a thickness of the mask layer.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Kubota	US 5,805,627	Sep. 8, 1998
Furukawa	US 5,981,977	Nov. 9, 1999
Kiyoku	US 6,153,010	Nov. 28, 2000
Sakai	US 6,475,882 B1	Nov. 5, 2002

The Examiner rejected claims 12-15, 17, and 18 under 35 U.S.C. § 103(a) as unpatentable over Sakai and Furukawa. The Examiner also rejected claim 16 under 35 U.S.C. § 103(a) as unpatentable over Sakai, Furukawa, and Kiyoka, and claims 19-21 under 35 U.S.C. § 103(a) as unpatentable over Sakai, Furukawa, and Kubota.

Appellants have only separately argued the patentability of claim 12 and have acknowledged that claims 13 through 21 stand or fall with claim 12 (App. Br. 3). We take claim 12 to be representative.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Brief, the Reply Brief, and the Answer for their respective details. Only those arguments actually made by Appellants have been considered in this decision. Arguments that Appellants did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ISSUE

Have Appellants shown that the Examiner erred in finding claim 12 obvious in view of Sakai and Farakawa?

FINDINGS OF FACT

1. The application details a nitride-based semiconductor element with a mask layer formed on the upper surface of the substrate and partially exposing the upper surface. A buffer layer is formed on the exposed part of the upper surface of the substrate on the upper surface of the mask layer, and a nitride-based semiconductor layer is formed thereon. In specific

embodiments, the thickness of the buffer layer is not more than the thickness of the mask layer. (Spec. 19: 5-23; Fig. 5, elements 1-4).

2. Sakai discloses methods for producing GaN-based compound semiconductor devices. A SiN buffer body (12) is formed on a sapphire substrate (10), and a GaN buffer layer (14) is formed on the body and the substrate. A GaN semiconductor layer (16) is formed on the buffer layer, where a subsequent InGaN layer is formed thereon to form a device. (Abstract; col. 2, ll. 1-3, col. 4, ll. 5-13; Fig. 1, elements 10, 12, 14, 16).

3. Sakai does not disclose the thickness of the SiN buffer body. Sakai makes clear that, in specific embodiments, the GaN buffer layer (14) has a thickness of about 20 nm and the GaN semiconductor layer (16) has a thickness of about 2 μ m. Given the disclosed ratio of the layers (14 & 16), Fig. 1 of Sakai is a schematic and is not intended by Sakai to indicate proportional thicknesses of the layers. (Col. 4, ll. 5-13; Fig. 1).

4. Furukawa discloses a nitride compound semiconductor light emitting element. The structure includes a mask layer (18) having a thickness of 100-700 nm and covered with a buffer layer (40) having a thickness of 10-100 nm. (Abstract; col. 4, ll. 35-38, col. 6, ll. 51-53; Fig. 1A).

5. Kiyoku discloses methods for growing nitride semiconductor crystals with very few crystal defects. The methods include the formation of a selective growth mask having properties which retard the growth of nitride semiconductor, including high melting point metals. (Abstract; col. 8, ll. 7-15).

6. Kubota discloses laser diode structures with embedded layers formed through mask layers having specific shapes, including trapezoid or inverse trapezoid shapes. (Abstract; col. 10, ll. 52-64; Fig. 10C).

PRINCIPLES OF LAW

The Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that burden is met, then the burden shifts to the Appellant to overcome the prima facie case with argument and/or evidence. *In re Mayne*, 104 F.3d 1339, 1342 (Fed. Cir. 1997). “Section 103 forbids issuance of a patent when ‘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.’” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007).

The claims on appeal should not be confined to specific embodiments described in the Specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (*en banc*). During *ex parte* prosecution, claims must be interpreted as broadly as their terms reasonably allow since applicants have the power during the administrative process to amend the claims to avoid the prior art. *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989).

ANALYSIS

Appellants arguments raised fall largely into three categories: that Sakai does not teach or suggest a structure with the buffer layer having a thickness not more than the thickness of the mask layer, that Furukawa

cannot properly be used to modify Sakai to reach the subject matter of claim 12 and that the requisite motivation to combine Sakai and Furukawa has not been supplied by the Examiner in the obviousness rejection.

Appellants argue that in the embodiment illustrated in Fig. 1 of Sakai, the buffer layer “is considerably thicker than the mask layer 12.” (App. Br. 4, Reply Br. 2). However, we can find no support for such a position in Sakai. (FF 3). Given the disclosure of Sakai, the ratio of the thicknesses of the buffer and mask layers is at best indeterminate. Appellants argue that the buffer layer must be thicker than the mask because the buffer layer is not conformal and forms an overburden, and additionally “teaches away from the claimed invention.” (App. Br. 4). We find no disclosure in Sakai that specifies that the buffer layer should or should not be conformal or provide an overburden. While Sakai discusses the growth of the buffer layer at length, (col. 4, ll. 26-52), nothing thereon specifies that the buffer layer must have the properties dictated by Appellants. Also, we do not find any disclosure in Sakai that could be said to criticize, discourage or otherwise discredit the formation of a buffer layer having a thickness not more than the thickness of the mask layer. Thus, while we agree with Appellants that it is undisputed that Sakai fails to disclose a semiconductor element as claimed in claim 12, we do not find compelling Appellants’ arguments that additional aspects must be read into the disclosure of Sakai.

In the rejection of claim 12, the Examiner applies Furukawa to the disclosure of Sakai to show that the thickness of a buffer layer need not be more than the thickness of the mask layer in a similar device. (Ans. 3).

Appellants argue that the structure of Furukawa is “completely different from that of Sakai,” and that the buffer layer in Furukawa is not formed on the substrate as provided in Sakai. (App. Br. 4, Reply Br. 4-5). While we acknowledge the differences between Sakai and Furukawa, we do not find that one of ordinary skill in the art at the time the invention was made could not have been informed by their respective disclosures. The rationale provided in Furukawa for growing a buffer layer within a specific thickness range, (Furukawa, col. 6, ll. 45-54), would have provided a basis for growing a similar layer in Sakai, based on the growth techniques and the resulting semiconductor devices sought by the inventors of both Sakai and Furukawa. We also do not find the fact that the buffer layer in Furukawa is not formed on the substrate to be dispositive. Given the rationale supplied by Furukawa, one of ordinary skill in the art would have utilized such a buffer layer irrespective of whether it was grown directly on the substrate. As such, we do find Appellants’ argument that Furukawa could not be applied to modify the processes in Sakai to be compelling.

Appellants also argue that the Examiner has not established the requisite motivation to combine Sakai and Furukawa in the rejection of claim 12. (App. Br. 5-10, Reply Br. 5-9). Appellants argue that the Examiner failed to specifically identify where the prior art discloses any factual basis for the provided motivation. As discussed above, we find motivation in Furukawa and we agree with the Examiner that the motivation to combine references need not come expressly from the references themselves. (Ans. 9). Additionally, we concur with the Examiner that it would have been well known in the art, at the time the invention was made,

that adjustments in the thicknesses of layers used to make light emitting devices would affect crystal defects present in those layers, which can affect the function of the devices. Indeed, Appellants' Specification, describing the prior art, discloses that the increased growth in epitaxial lateral overgrowth can provide for reduced numbers of dislocations. (Spec. 2: 5-21). As such, we find that the rejection of claim 12 provided the requisite motivation to combine Sakai and Furukawa and we find no error in the rejection of claim 12.

Additionally, Appellants have raised no arguments with respect to claims 13-21 other than their dependence on independent claim 12. Thus, we affirm the rejections of those claims as well.

CONCLUSION OF LAW

We conclude that Appellants have not shown that the Examiner erred in rejecting claims 12-21, and we affirm the Examiner's rejection of those claims under 35 U.S.C. § 103(a).

DECISION

The decision of the Examiner is affirmed.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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