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THE ECLIPSE GROUP LLP
6345 Balboa Blvd., Suite 325
Encino, CA 91316

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BERNSTEIN, ALLISON

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte HUOPING XIN, XINGQUAN LIU, XIAOHONG SHI,
CHAN KYUNG CHOI, and JIN SOO SONG

Appeal 2010-007494
Application 11/196,856
Technology Center 2800

Before MAHSHID D. SAADAT, JASON V. MORGAN, and
JOHNNY A. KUMAR, *Administrative Patent Judges*.

MORGAN, *Administrative Patent Judge.*

DECISION ON APPEAL[1]

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[1] Appellants waived an oral hearing for this appeal scheduled for January 17, 2013.

STATEMENT OF THE CASE

Introduction

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 1 – 38. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Invention

The invention relates to high efficiency light emitting devices. *See* Spec. ¶ [0001]. These devices include multiple layers, including a top n-layer that is made highly conductive and has a very rough surface. *See* Abstract.

Exemplary Claims (Emphases Added)

> 1. A high efficiency LED [light emitting diode] structure, comprising:
>
> a substrate;
>
> a low-temperature nucleation layer that is on top of the substrate;
>
> a bottom n-type semiconductor layer on top of the low-temperature nucleation layer;
>
> an active layer on top of and in contact with the n-type semiconductor layer;
>
> a p-type semiconductor layer on top of the active layer;
>
> an n++-tunneling layer on top of the p-type semiconductor layer;
>
> a top n-layer on top of the n++-tunneling layer that enables light to exit through the top of the high efficiency LED structure, *wherein the top n-layer has a roughness greater than 0.25 nm*; and

> *an electrode contact coupled to the top n-layer* and another electrode contact coupled to the bottom n-type semiconductor layer.
>
> 12. The high efficiency LED structure of claim 11, where the top n-layer has an electron concentration in the range of 2e18 to 1e20 cm^{-3} electrons.

Rejections

The Examiner rejects claims 1 – 4, 6 – 23, and 25 – 38 under 35 U.S.C. § 103(a) as being unpatentable over Kneissl (US 6,515,308 B1; Feb. 4, 2003) and Ou (US 2005/0082562 A1; Apr. 21, 2005). Ans. 3 – 11.

The Examiner rejects claims 5 and 24 under 35 U.S.C. § 103(a) as being unpatentable over Kneissl, Ou, and Scherer (US 2005/0285128 A1; Dec. 29, 2005; filed Feb. 9, 2005). Ans. 8 – 9.

ISSUES

1. Did the Examiner err in finding that the combination of Kneissl and Ou teaches or suggests "wherein the top n-layer has a roughness greater than 0.25 nm" and "an electrode contact coupled to the top n-layer," as recited in claim 1?

2. Did the Examiner err in finding that the combination of Kneissl and Ou teaches or suggests "where the top n-layer has an electron concentration in the range of 2e18 to 1e20 cm^{-3} electrons," as recited in claim 12?

ANALYSIS

Claim 1

Claim 1 recites a number of layers, including a top n-layer, "wherein the top n-layer has a roughness greater than 0.25 nm." The Examiner finds that Kneissl, which is directed to a nitride-based vertical-cavity surface-

emitting laser or light emitting diode with P-N tunnel junction current injection, teaches or suggests most of the layers, including a top n-layer. *See* Ans. 3 (citing Kneissl fig. 1). The Examiner finds that "Kneissl does not disclose wherein the top n-layer has a roughness greater than 0.25 nm." Ans. 4. Therefore, the Examiner relies on Ou, which is directed to a high efficiency nitride based light emitting device, to teach or suggest the use of a top n-layer with a roughness greater than 0.25 nm. *See* Ans. 4 (*citing* Ou ¶ [0033]). Specifically, the Examiner relies on Ou's teaching of the use of a rough surface to increase the brightness of the LED. *See* Ans. 4; *see also* Ou ¶ [0033] ("the rough surface of the present invention promotes the extraction efficiency of the emitting light and hence increase the brightness of the LED").

Appellants contend the Examiner erred because in Ou, "the rough N-layer is separated from the P-type electrode 17 by a transparent conductive oxide layer 49." App. Br. 10; *see also* Ou fig. 6. However, the Examiner correctly concludes that a broad but reasonable construction of "coupled" includes "electrically coupled." *See* Ans. 12. The Specification does not clearly define the term "coupled" and Appellants do not provide evidence that persuasively shows that "[w]hen claiming a semiconductor device, the simple term coupling can not have the same meaning electronically coupled as used in the electrical circuits." App. Br. 10. Appellants' assertions amount to unsupported attorney argument, and therefore we give them little weight. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997). Furthermore, the Examiner correctly finds that Ou depicts an electrode 16 in direct contact with rough n-layer 122. *See* Ans. 11 (*citing* Ou Fig. 6); *see also* Ou ¶ [0028]. Therefore, we agree with the Examiner that the combination of Kneissl and

Ou teaches or suggests "wherein the top n-layer has a roughness greater than 0.25 nm" and "an electrode contact coupled to the top n-layer," as recited in claim 1.

Accordingly, we sustain the rejection of claim 1, as well as the rejections of claims 2 – 11, 13, 14, 16 – 30, 32, 33, and 35 – 38, which are not argued separately. *See* App. Br. 10 – 11.

Claim 12

Dependent claim 12 recites that "the top n-layer has an electron concentration in the range of 2e18 to 1e20 cm^{-3} electrons." Appellants argue that the claimed range produces unexpected results. *See* App. Br. 11 – 12. However, Appellants do not dispute the Examiner's finding that Ou discloses an electron concentration of more than 1e19 cm^{-3}, which overlaps and thus reads on the claimed range. *See* Ans. 12 (citing Ou ¶ [0027]). Therefore, we agree with the Examiner that the combination of Kneissl and Ou teaches or suggests "where the top n-layer has an electron concentration in the range of 2e18 to 1e20 cm^{-3} electrons," as recited in claim 12. Accordingly, we sustain the rejection of claim 12, as well as the rejection of claims 15, 31, and 34, which are not argued separately. *See* App. Br. 12 – 13.

DECISION

We affirm the Examiner's decision to reject claims 1 – 38.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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