

Trial decision

Correction No. 2015-390089

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The case of trial for correction of Japanese Patent No. 3786114 has resulted in

the following trial decision.

Conclusion

The correction of the specification and the claims of Japanese Patent No. 3786114 shall be approved as the corrected specification and claims attached to the written request for trial of the case.

Reason

No. 1 History of the procedures

Japanese Patent No. 3786114 was filed on January 5, 2004 as a divided application of Japanese Patent Application No. 2001-174903, which had been filed on June 8, 2001. The establishment of the patent right was registered on March 31, 2006, trial for correction was requested (2015-390019) on February 19, 2015, a trial decision became final and conclusive that the correction was made as the corrected specification and claims attached to the written request for trial on June 8, 2015, and the trial for correction was requested on August 3, 2015.

No. 2 Request

1 Object of the demand

The object of the demand for trial of the case is to demand correction of the scope of claims for patent of Japanese Patent No. 3786114 in each group of claims as the corrected scope of claims for patent attached to the written request.

2 Contents of correction

The contents of correction of the request for trial of the case are as follows.

A. Correction A

In Claim 1 according to the scope of claims for patent, the description "A plurality of barrier layers at the side of the n-type nitride semiconductor layer including the barrier layer B₁ is one grown by doping an n-type impurity, and a plurality of barrier layers at the side of the p-type nitride semiconductor layer including the barrier layer B_L is one grown by undoping an n-type impurity", is corrected to read

"the concentration of an n-type impurity in a plurality of barrier layers at the side of the n-type nitride semiconductor layer including the barrier layer B₁ is not less than $1 \times 10^{17}/\text{cm}^3$ and not more than $2 \times 10^{18}/\text{cm}^3$, and the concentration of an n-type impurity in a plurality of barrier layers at the side of the p-type nitride semiconductor layer

including the barrier layer B_L is less than $5 \times 10^{16} / \text{cm}^3$."

No. 3 Judgment by the body

1. Correction A

A. Purpose of correction

Correction A adds the concentration range of the respective n-type impurities as specifying matters for "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity" before correction, and deletes the descriptions of "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity".

Here, the invention according to Claim 1 of the scope of claims for patent before correction is an invention of product, but "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity" are described as production methods, and is a so-called product by process claim.

Correction A specifies the invention by describing the concentrations of n-type impurities, which are characteristics of the products of "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity", respectively, by taking the recitation of the specification of the case into consideration, in order to exclude a reason for invalidation that the invention described by the product by process claim is not clear. Therefore, it can be said that the correction aims to clarify the ambiguous statements by specifying the concentration of the respective n-type impurities described above in place of the specifications of "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity".

In this case, as regarding "one grown by doping an n-type impurity", the specification of the case describes, "...the n-type impurity is doped. At this time, the n-type impurity is doped in the barrier layer at a concentration of at least not less than $5 \times 10^{16} / \text{cm}^3$, and the upper limit thereof is $1 \times 10^{20} / \text{cm}^3$ " (paragraph [0041]). That is, the specification of the case describes a wider concentration range of n-type impurities than Correction A, which describes "the concentration of n-type impurities is not less than $1 \times 10^{17} / \text{cm}^3$ and not more than $2 \times 10^{18} / \text{cm}^3$ ". Therefore, the addition of those matters is to specify the concentration range according to Correction A, and is intended for restriction of the scope of claims for patent.

Accordingly, Correction A is intended to restrict the scope of claims for patent in accordance with item (i) of the proviso to Article 126(1) of the Patent Act and clarify an ambiguous statement in accordance with item (iii) of the same Act.

B. Ground for Correction (whether new matter exists or not)

The specification, claims, or drawings attached to the application (hereinafter, referred to as "the original specification and other materials of the patent ") include the following description.

"Best Modes for Carrying Out the Invention

[0032]

As a nitride semiconductor, GaN, Al N, or InN, or a mixed crystal thereof, which is a gallium nitride compound semiconductor ($\text{In}_x \text{Al}_y \text{Ga}_{1-x-y} \text{N}$, $0 \leq x$, $0 \leq y$, $x+y \leq 1$), is used for the nitride semiconductor device of the present invention. Also, a mixed crystal in which a part of the above gallium nitride compound semiconductor is substituted with B or P may be used.

[0033]

...(snip)...

[0040]

(Barrier layer)

In the present invention, a composition of the barrier layer is not particularly restricted, and there may be used a nitride semiconductor containing in which has a lower In mixed crystal ratio than a well layer, or a nitride semiconductor containing GaN and Al.

...(snip)...

[0041]

Except for the barrier layer which is closest to the p-type layer described later, the barrier layer may be either doped or undoped with an n-type impurity. Preferably, an n-type impurity is doped. At this time, the n-type impurity is doped in the barrier layer at a concentration of at least not less than $5 \times 10^{16}/\text{cm}^3$, and the upper limit thereof is $1 \times 10^{20}/\text{cm}^3$. Specifically, in the case of LED for example, the layer preferably contains the n-type impurity in the range of from not less than $5 \times 10^{16}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$, and the layer is preferably doped in the range of from not less than $5 \times 10^{17}/\text{cm}^3$ to not more than $1 \times 10^{20}/\text{cm}^3$, preferably in the range of from not less than $1 \times 10^{18}/\text{cm}^3$ to not more than $5 \times 10^{19}/\text{cm}^3$ in the case of higher output LED and high output LD. In the case where the layer is doped at such high concentration, preferably, the well layer does not substantially contain n-type impurity or is grown undoped.

...(snip)...

[0044]

(n-type impurity dope)

In the present invention, the active layer comprises a well layer containing at least not less than 5×10^{16} of n-type impurity and a barrier layer, and preferably at least

one or more layer(s) of well layer and/or barrier layer in the active layer are undoped or do not substantially contain an n-type impurity. Thereby, the n-type impurity is contained in the whole active layer uniformly, and efficient carrier concentration distribution can be achieved as the active layer by doping the n-type impurity on a well layer and/or barrier layer constituting a part of the active layer.

[0045]

In the present invention, "undoped" means "not being doped intentionally", where a nitride semiconductor is grown without doping with an n-type or p-type impurity at the time of growth. At this time, the concentration of the impurity is less than $5 \times 10^{16}/\text{cm}^3$. Additionally, in the present invention, "substantially not containing an n-type or p-type impurity" refers to the concentration range of less than $5 \times 10^{16}/\text{cm}^3$.

"[0118]

[Example 12]

The light emitting element shown in Fig. 9 is fabricated as follows.

[0119]

...(snip)...

[0125]

(Active layer 307)

Next, a barrier layer comprising GaN was grown at a film thickness of 250\AA , the temperature was raised to 800°C , and a well layer comprising undoped $\text{In}_{0.3}\text{Ga}_{0.7}\text{N}$ was grown at a film thickness of 30\AA using TMG, TMI, and ammonia. Then, 7 barrier layers and 6 well layers were alternated in the order of the barrier layer B₁/ well layer/ barrier layer B₂/ well layer/ barrier layer B₃/ well layer/ barrier layer B₄/ well layer/ barrier layer B₅/ well layer/ barrier layer B₆/ well layer/ barrier layer B₇ to grow an active layer 307 comprising a quantum well structure with a total film thickness of 1930\AA . At this time, the barrier layers B₁ and B₂ are doped with $1 \times 10^{17}/\text{cm}^3$ of Si and the remaining barrier layers B_i (i=3, 4, ..., 7) are formed undoped.

[0126]

...(snip)...

[0130]

...(snip)...In the obtained light emitting element, n-type impurities are doped in the barrier layer B₁ which is closest to the n-type layer and the barrier layer B₂ of the next, so that a carrier from the n-type layer is efficiently injected deeply into the active layer (p-type layer side). Therefore, as compared to Comparative Example 2, in which all the barrier layers are undoped, the photoelectric conversion efficiency is improved,

V_f and leakage current are decreased, and the light emission output is improved."

Here, it can be read from the description in the above paragraph [0045] of "undoped means "not being doped intentionally, where a nitride semiconductor is grown without doping with an n-type or p-type impurity at the time of growth. At this time, the concentration of the impurity is less than $5 \times 10^{16}/\text{cm}^3$ ", that when a nitride semiconductor is grown "undoped", " the concentration of the impurity is less than $5 \times 10^{16}/\text{cm}^3$ "; i.e., the concentration of the n-type impurity is less than $5 \times 10^{16}/\text{cm}^3$.

Next, the above paragraph [0041] describes "the barrier layer may be either doped or undoped with an n-type impurity. Preferably, an n-type impurity is doped. At this time, the n-type impurity is doped in the barrier layer at the concentration of at least not less than $5 \times 10^{16}/\text{cm}^3$, and the upper limit thereof is $1 \times 10^{20}/\text{cm}^3$. Specifically, in the case of LED for example, the layer preferably contains the n-type impurity in the range of from not less than $5 \times 10^{16}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$ ". From that description, one which "contains the n-type impurity in the range of from not less than $5 \times 10^{16}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$ " is illustrated as "being doped with the n-type impurity ". Moreover, the above paragraph [0125] describes "the barrier layers B_1 and B_2 are doped with $1 \times 10^{17}/\text{cm}^3$ of Si".

The paragraph [0041] of the original specification describes "the layer contains n-type impurities in the range of from not less than $5 \times 10^{16}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$ " in the case where "the n-type impurity is doped". By reading in conjunction with the description of the paragraph [0125], it can be said that the originally attached specification and other materials of the patent also describe "containing n-type impurities in the range from not less than $1 \times 10^{17}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$ " while increasing the lower limit value and narrowing the numerical range.

From the above description, it can be said that the originally attached specification and other materials of the patent describe those "having the concentration of n-type impurities of not less than $1 \times 10^{17}/\text{cm}^3$ to not more than $2 \times 10^{18}/\text{cm}^3$ " as "one grown by doping an n-type impurity", and those "having the concentration of n-type impurities of less than $5 \times 10^{16}/\text{cm}^3$ " as "one grown by undoping an n-type impurity".

Accordingly, Correction A is within the matters described in the originally attached specification and other materials of the patent, and therefore falls under the provisions of Article 126(5) of the Patent Act.

C. Substantial expansion and change of the scope of claims for patent by correction

As examined in the above A, Correction A intends to clarify the ambiguous statement by specifying "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity" with the concentrations of n-type impurities, which are the characteristics of product, in order to exclude a reason for invalidation that the invention described by the product by process claim is not clear. And as regarding the concentration of n-type impurities corresponding to "one grown by doping an n-type impurity", Correction A narrows the numerical range. Accordingly, Correction A does not substantially enlarge or modify the scope of claims of the patent, and therefore falls under the provisions of Article 126(6) of the Patent Act.

2. Judgment on independent requirements for patentability

As examined in the above A to C, the invention specified by the matters described in Claim 1 in the scope of claims after the correction of the case (hereinafter, referred to as "Corrected invention of the case") is intended to clarify the ambiguous statement by specifying "one grown by doping an n-type impurity" and "one grown by undoping an n-type impurity" by the concentration of n-type impurities, which is the characteristic of product, in place of the above specifications, and to limit the numerical range of the n-type impurities narrower corresponding to "one grown by doping an n-type impurity" for the invention specified by the matters described in Claim 1 according to the scope of claims for patent before correction (hereinafter, referred to as "invention before correction"). In other words, it can be said that the invention before correction is one eliminates the limitation of the numerical range of the n-type impurities from the Corrected invention.

No reason for refusal was found in the past procedure in the invention before correction, which had been granted a patent. Also, for the Corrected invention of the case, in which ambiguous statement has been clarified and the invention before correction is further limited, no other reasons were found that patent shall not be granted independently at the time of filing of the patent application.

Accordingly, Correction A conforms to the requirements defined in Article 126 (7) of the Patent Act.

No. 4 Closing

As described above, the correction of the case is intended for the matters listed in item (i) and item (iii) of the proviso to Article 126(1) of the Patent Act, and falls under the provisions of Articles 126 (5) to (7) of the Patent Act.

Therefore, the trial decision shall be made as described in the conclusion.

September 24, 2015

Chief administrative judge:	ONDA, Haruka
Administrative judge:	KONDO, Yukihiro
Administrative judge:	HOSHINO, Koichi