<table>
<tr><td rowspan="2">Patent Right</td><td>Date</td><td>March 19, 2020</td><td rowspan="2">Court</td><td rowspan="2">Intellectual Property High Court, Third Division</td></tr>
<tr><td>Case number</td><td>2019 (Gyo-Ke) 10100</td></tr>
<tr><td colspan="5">- A case in which, with regard to an invention titled "NITRIDE SEMICONDUCTOR LAMINATE AND LIGHT EMITTING ELEMENT USING THE SAME", the well-known art mentioned in the patent revocation decision of the present case cannot be found, and it cannot be deemed that the invention would be easily conceivable on the basis of another reason, and therefore, the opposition decision was rescinded.</td></tr>
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Case type: Rescission of Patent Revocation Decision

Result: Granted

References: Article 29, paragraph (2) of the Patent Act

Related rights, etc.: Patent No. 6252092

Decision of JPO: Opposition No. 2018-700519

Summary of the Judgment

1. The present case is a lawsuit for seeking rescission of a patent revocation decision with regard to the Plaintiff's patent right related to an invention titled "NITRIDE SEMICONDUCTOR LAMINATE AND LIGHT EMITTING ELEMENT USING THE SAME".

   The issue is whether or not the invention has an inventive step.

2. The present judgment held that the patent revocation decision of the present case erred in denying an inventive step of the invention of the present case, as follows.

   (1) Finding that a technology of the present case is a well-known art

   In Cited Documents 4 to 6 which Defendant points out, it can be deemed that a technology of a composition gradient layer is adopted under different technical significance as a part of the specific semiconductor laminate structure constituting each element. Thus, it has to be deemed that from the matters disclosed in each cited document, by abstracting the semiconductor laminate structure and the technical significance to form a superordinate concept, in order to solve a problem of lowering a drive voltage in the technical field of semiconductor light emitting element, to derive adopting a composition gradient layer in which a ratio of Al in AlGaN layer is made a gradient (the technology of the present case) is an argument based on hindsight. Therefore, it cannot be found that this is a well-known technical matter.

   In this regard, there is room for finding that this is a well-known technical matter to the extent that in order to lower a drive voltage by lowering heterogap between two adjacent layers, the above layers are made composition gradient layers. However, it cannot be found that there is motivation to make an undoped layer of Cited Invention A to be a composition gradient layer in order to lower a drive voltage to intend to lower heterogap.

(2) Assertion that there is motivation to use a composition gradient layer in order to relax a difference in lattice constants

Even if it is true that relaxing a difference in lattice constants between semiconductor layers by using a composition gradient layer in a semiconductor laminate is a well-known technical matter, it cannot be found that the difference in lattice constants between semiconductor layers is almost unacceptable to a person ordinarily skilled in the art, and if this exists, the person ordinarily skilled in the art would naturally attempt to apply a composition gradient layer. In order to persuade that it would be easily conceivable to apply a composition gradient layer, a trigger to do so should be necessary, such as the fact that a problem based on the difference in lattice constants occurs in Cited Invention A.

It is not found that Cited Document 1 discloses that a difference in lattice constants between each semiconductor layer is recognized as a problem. In addition, under this circumstance, it is difficult to consider that a person ordinarily skilled in the art will assume a composition ratio of each semiconductor layer, and further even divide cases to reveal the differences in the lattice constants between the semiconductor layers, as Defendant asserts. Even if a person ordinarily skilled in the art would recognize the differences in the lattice constants as Defendant asserts, it is also not apparent whether such differences are those sufficient to consider that it is necessary to relax lattice mismatch by using a composition gradient layer.

According to the above, it cannot be found that there is motivation for a person ordinarily skilled in the art who has read Cited Invention A to make both of an undoped layer and a doping layer to be a composition gradient layer in order to relax a difference in lattice constants.

Judgment rendered on March 19, 2020
2019 (Gyo-Ke) 10100 A case of seeking rescission of a decision to revoke a patent
Date of conclusion of oral argument: January 30, 2020

Judgment

Plaintiff: NICHIA CORPORATION

Defendant: Commissioner of the Japan Patent Office

Main text

1. The decision made by the Japan Patent Office (JPO) on June 7, 2019 on the Opposition No. 2018-700519 shall be rescinded.
2. Defendant shall bear the court costs.

Facts and reasons

No. 1 Claims
Same as the main text

No. 2 Facts to be grounds
1. Outline of procedures at the JPO
(1) Plaintiff is a patentee of Patent No. 6252092 (Patent Application on October 17, 2013, Registration on December 8, 2017, number of claims: 11. Hereinafter, referred to as the "present patent") of the invention titled "NITRIDE SEMICONDUCTOR LAMINATED BODY AND LIGHT EMITTING ELEMENT USING THE SAME".
(2) An opposition to the present patent was made by the non-party A, and the JPO judged this as Opposition No. 2018-700519 and then, decided that "the patent according to Claims 1 to 11 of the Patent No. 6252092 shall be revoked." on June 7, 2019 (hereinafter, referred to as the "present revoked decision"), and a certified copy thereof was delivered to Plaintiff on the 17th day of the same month.
(3) Plaintiff instituted this lawsuit seeking rescission thereof on July 12, 2019.

2. Description in the Scope of Claims

The description in the Scope of Claims according to the present patent is as follows (hereinafter, the invention described in the Scope of Claims is referred to as the "present invention", and in the case of individual specification, it is referred to as "Present Invention 1" and the like in accordance with the number of the claim).

[Claim 1]

A nitride semiconductor laminated body comprising:

a template substrate on which a buffer layer made of aluminum nitride with a thickness of 2 μm or more and 4 μm or less is formed in contact with a ground substrate upper surface made of sapphire having a c surface as an upper surface;

a superlattice layer formed in contact with the template substrate upper surface and made by alternately laminating an aluminum gallium nitride layer and an aluminum nitride layer;

a first composition graded layer formed in contact with an upper surface of the superlattice layer, made of undoped aluminum gallium nitride, and having an aluminum ratio $m_{Al}1$ of the undoped aluminum gallium nitride sequentially decreased toward an upper direction from the superlattice layer side;

a second composition graded layer formed in contact with an upper surface of the first composition graded layer, made of an n-type impurity doped aluminum gallium nitride, and having an aluminum ratio $m_{Al}2$ of the n-type impurity doped aluminum gallium nitride sequentially decreased toward an upper direction from the first composition graded layer side;

an active layer formed in contact with an upper surface of the second composition graded layer, made of III-group nitride semiconductor, and having a light emitting layer emitting deep UV light; and

a p-side layer formed in contact with an upper surface of the active layer.

[Claim 2]

The nitride semiconductor laminated body according to Claim 1, wherein

a ratio $m_{Al}1^u$ / $m_{Al}2^b$ between $m_{Al}1$(≡ of $m_{Al}1^u$) on the first composition graded layer upper surface and $m_{Al}2$(≡ of $m_{Al}2^b$) on the second graded layer lower surface is 1.00 or more and 1.02 or less.

[Claim 3]

The nitride semiconductor laminated body according to Claim 1 or 2, wherein

the n-type impurity in the second composition graded layer is silicon.

[Claim 4]

The nitride semiconductor laminated body according to any one of Claims 1 to 3, wherein the p-side layer has an electronic barrier layer made of p-type impurity doped aluminum gallium nitride.

[Claim 5]

The nitride semiconductor laminated body according to Claim 4, wherein

the p-type impurity in the electronic barrier layer is magnesium.

[Claim 6]

The nitride semiconductor laminated body according to any one of Claims 1 to 5, wherein

the p-side layer has a third composition graded layer made of p-type impurity doped aluminum gallium nitride and having aluminum ratio $m_{Al}3$ of the p-type impurity doped aluminum gallium nitride sequentially decreased toward an upper direction from the active layer side.

[Claim 7]

The nitride semiconductor laminated body according to Claim 6, wherein

the p-type impurity in the third composition graded layer is magnesium.

[Claim 8]

The nitride semiconductor laminated body according to any one of Claims 1 to 7, wherein

the upper surface of the ground substrate is inclined by 0.2° or more and 2° or less in an a-axis direction or an m-axis direction from a c surface.

[Claim 9]

The nitride semiconductor laminated body according to any one of Claims 1 to 8, wherein

the aluminum nitride in the buffer layer is aluminum nitride single crystal.

[Claim 10]

A nitride semiconductor light emitting element, comprising:

the nitride semiconductor laminated body according to any one of Claims 1 to 9;

an n-electrode electrically connected to the first composition graded layer of the nitride semiconductor laminated body; and

a p-electrode electrically connected to the p-side layer of the nitride semiconductor laminated body.

[Claim 11]

A nitride semiconductor light emitting element, comprising:

the nitride semiconductor laminated body according to any one of Claims 1 to 9;

an n-electrode electrically connected to the second composition graded layer of the nitride semiconductor laminated body; and a p-electrode electrically connected to the p-side layer of the nitride semiconductor laminated body.

3. Gist of reasons for the present decision of revocation

(1) The reasons for the present decision of revocation are as described in a copy of the attached written decision. As described below in short, since any of the present inventions could have been easily made by a person ordinarily skilled in the art, the present patent was made by violating the provisions in Article 29, paragraph (2) of the Patent Act and should be revoked.

A. Present Inventions 1, 2, and 3 could have been easily made by a person ordinarily skilled in the art on the basis of the invention described in Cited Document 1 (hereinafter, referred to as the "Cited Invention") and the well-known arts illustrated in Cited Documents 4 to 6.

B. Present Invention 4 could have been easily made by a person ordinarily skilled in the art on the basis of the arts described in the Cited Invention and Cited Document 2, and the aforementioned well-known arts.

C. Present Inventions 5, 6, and 7 could have been easily made by a person ordinarily skilled in the art on the basis of the arts described in the Cited Invention and Cited Document 2, the aforementioned well-known arts, and the well-known arts illustrated in Cited Documents 7 to 9.

D. Present Invention 8 could have been easily made by a person ordinarily skilled in the art on the basis of the arts described in the Cited Invention and Cited Document 2, the invention described in Cited Document 3, and the aforementioned well-known arts.

E. Present Inventions 9, 10, and 11 could have been easily made by a person ordinarily skilled in the art on the basis of the arts described in the Cited Invention and Cited Document 2, the invention described in Cited Document 3, the aforementioned well-known arts, and the well-known art described in Cited Document 10.

(2) The publications cited by the present decision of revocation are as follows.

Cited Document 1: Akira Fujioka et al., "Improvement in Output Power of 280-nm Deep Ultraviolet Light-Emitting Diode by Using AlGaN Multi Quantum Wells", Applied Physics Express 3 (2010) 041001 (Exhibit Ko 1)

Cited Document 2: Jianchang Yan et al., "Improved performance of UV-LED by p-AlGaN with graded composition", Physica Status Solidi C 8, No. 2, 461-463 (2011) / DOI 10.1002 (Exhibit Ko 9)

Cited Document 3: International Publication 2013/021464 (Published on February 14, 2013, Exhibit Ko 7)

Cited Document 4: Unexamined Patent Application Publication No. 2000-196143 (Exhibit Ko 10)

Cited Document 5: Unexamined Patent Application Publication No. 2001-44497 (Exhibit Ko 11)

Cited Document 6: Unexamined Patent Application Publication No. 1993-343739 (Exhibit Ko 12)

Cited Document 7: Unexamined Patent Application Publication No. 2012-146847 (Exhibit Ko 5)

Cited Document 8: Unexamined Patent Application Publication No. 1999-186601 (Exhibit Ko 6)

Cited Document 9: Unexamined Patent Application Publication No. 2013-80925 (Published on May 2, 2013, Exhibit Ko 13)

Cited Document 10: Unexamined Patent Application Publication No. 2010-258097 (Exhibit Ko 8)

(3) The cited inventions found by the present decision of revocation, and common features and different features between Present Invention 1 and the cited inventions are as follows.

A. Cited Invention

"A deep ultraviolet light emitting diode, comprising:

an AlN template on which an AlN layer with a thickness of 3 μm is deposited on a c-surface sapphire substrate;

an AlN/AlGaN superlattice buffer for relaxing stress, provided on the AlN template;

an n-type contact layer of undoped $Al_{0.6}Ga_{0.4}N$ with a thickness of 0.5 μm and Si doping $Al_{0.6}Ga_{0.4}N$ with a thickness of 2.5 μm on the AlN/AlGaN superlattice buffer;

an active layer made of two sets of a well layer of $Al_{0.45}Ga_{0.55}N$ with a thickness of 4 nm and a barrier layer of $Al_{0.56}Ga_{0.44}N$ with a thickness of 2.5 nm;

an undoped AlN layer with a thickness of 10 Å and a p-type cladding layer on the active layer; and

a p-type GaN contact layer with a thickness of 3000 Å".

Hereinafter, the "AlN template on which an AlN layer with a thickness of 3 μm is deposited" will in some cases be referred to as the "AlN layer", the "AlN/AlGaN superlattice buffer" as the "superlattice buffer", the "n-type contact layer of undoped $Al_{0.6}Ga_{0.4}N$ with a thickness of 0.5 μm ..." as the "undoped layer", the "n-type contact layer of Si-doped $Al_{0.6}Ga_{0.4}N$ with a thickness of 2.5 μm" as the "doped layer", and the "barrier layer of $Al_{0.56}Ga_{0.44}N$ with a thickness of 2.5 nm" as the "barrier layer".

B. Common features

"A nitride semiconductor laminated body comprising:

a template substrate on which a buffer layer made of aluminum nitride with a thickness of 2 μm or more and 4 μm or less is formed in contact with a ground substrate upper surface made of sapphire having a c surface as an upper surface;

a superlattice layer formed in contact with the template substrate upper surface and made by alternately laminating an aluminum gallium nitride layer and an aluminum nitride layer;

a first layer formed in contact with an upper surface of the superlattice layer and made of undoped aluminum gallium nitride;

a second layer formed in contact with an upper surface of the first layer and made of n-type impurity doped aluminum gallium nitride;

an active layer formed in contact with an upper surface of the second layer, made of a III-group nitride semiconductor, and having a light emitting layer emitting deep UV light; and

a p-side layer formed in contact with an upper surface of the active layer."

C. Different features

(A) Different feature 1

The first layer is "a first composition graded layer having an aluminum ratio $m_{Al}1$ sequentially decreased toward an upper direction from the superlattice layer side" in Present Invention 1, while it is not such in the Cited Invention.

(B) Different feature 2

The second layer is "a second composition graded layer having an aluminum ratio $m_{Al}2$ sequentially decreased toward an upper direction from the first composition graded layer side" in Present Invention 1, while it is not such in the Cited Invention.

4. Reasons for rescission

Error in judgment of inventive step.

(omitted)

No. 5 Judgment of this court

1. Present Invention 1

(1) Scope of Claims

As described in the aforementioned No. 2, 2.

(2) Description in the Description

The description and drawings of the present patent have the following descriptions (obvious clerical errors were corrected.).

A. Technical Field

[0001] The present invention relates to a nitride semiconductor laminated body. It particularly relates to a nitride semiconductor laminated body using III-group nitrides and used for a semiconductor light emitting element emitting deep ultraviolet light.

B. Problems to be Solved by the Invention

[0009] In the semiconductor light emitting element, the lower the defect density in the semiconductor layer constituting the element, the higher the light emission efficiency. When a thickness of a buffer layer is increased, possibility of integration between the crystal defects and extinction such as dislocation or the like increases during growth of the buffer layer and thus, defects of the semiconductor layer formed on the buffer layer can be also decreased. However, if the thickness of the buffer layer is increased, a strong stress is applied between the buffer layer and a layer immediately above it, which incurs occurrence of a crack or deterioration in crystallinity in the layer above the buffer layer. Occurrence of a crack ultimately incurs deterioration in efficiency (internal quantum efficiency) of recombination of a hole injected into a light emitting layer and free electrons. Moreover, in order to take out light emission from the light emitting layer to the outside, a bandgap in each semiconductor layer needs to be made larger than energy of a light emitting photon. If the bandgap of the semiconductor layer becomes larger, a level of a doped impurity is formed to a deep energy level in the bandgap, and activation energy of a carrier is increased and thus, electric conductivity of the semiconductor layer is not increased easily even if doped with the impurity (becoming the n-type or the p-type becomes difficult). As a result, surface resistivity and contact resistance between the electrode and the semiconductor layer in contact with the electrode become larger, thereby incurring a rise in a forward driving voltage (Vf). In order to lower the surface resistivity and the contact resistance in the semiconductor layer with a large bandgap, the semiconductor layer needs to be made as a composition graded layer so as to increase impurity concentration. However, if doping of Si and the like is performed, a crack can occur more easily than in the case of not doping. Thus, in the light emitting element which emits light with large photon energy such as deep ultraviolet light ... prevention of occurrence of a crack and prevention of the rise in Vf cannot be realized at the same time.

[0010] The present invention was made in view of the aforementioned circumstances, and an object of the present invention is to provide a semiconductor laminated body which can realize a semiconductor light emitting element emitting the deep ultraviolet light with high internal quantum efficiency and low Vf.

C. Means for Solving the Problems

[0011] In order to achieve the aforementioned object, the inventor has keenly examined the problem and finally completed the present invention. The inventor has found that a deep ultraviolet light emitting element with less cracking and low Vf can be obtained by using a semiconductor laminated layer in which a buffer layer made of aluminum nitride with a certain thickness or more is provided in contact with an upper surface of a specific sapphire substrate so as to have a template substrate, a superlattice layer is provided in contact with an upper surface of the template substrate, a specific composition graded layer is provided in contact with an upper surface of the superlattice layer, and each layer for emitting deep ultraviolet light is provided thereon.

D. Advantageous Effect of the Invention

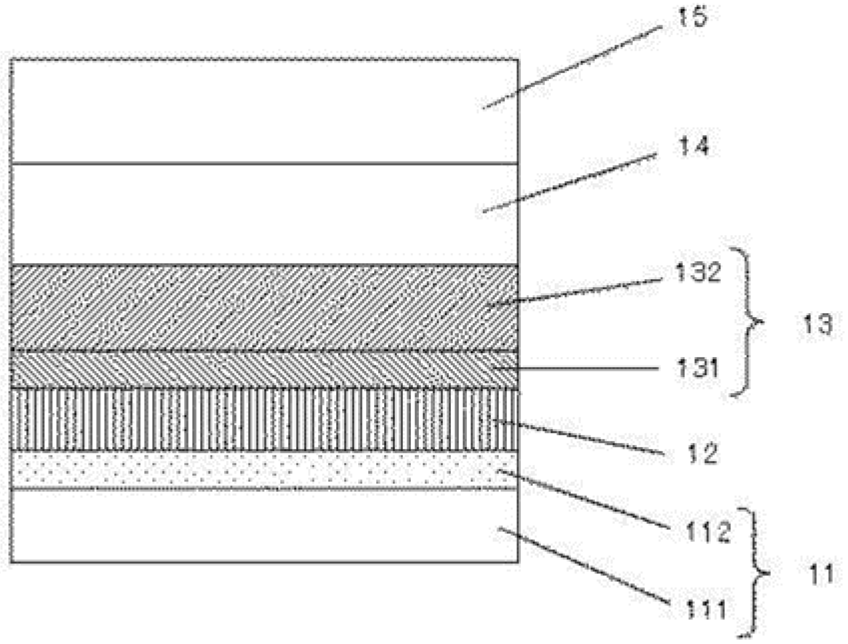
[0013] Since the nitride semiconductor laminated body of the present invention includes the aforementioned features, even if a nitride semiconductor layer with a large bandgap is used for the n-side layer, the surface resistivity or the contact resistance with the n-side electrode can be reduced. Thus, Vf in the nitride semiconductor light emitting element can be reduced. Moreover, even if the nitride aluminum layer with a large thickness is used for the buffer layer, occurrence of a crack or deterioration in crystallinity in layers thereabove can be prevented and thus, internal quantum efficiency is improved. By means of these effects, the light emitting efficiency of the entire nitride semiconductor light emitting element can be improved.

E. Brief Description of the Drawings

[0014] Figure 1 illustrates an example of a working example of a nitride semiconductor laminated body of the present invention.

[Figure 1]

1



F. Reference Signs List

[0077]

1 nitride semiconductor laminated body

11 template substrate

111 ground substrate

112 buffer layer

12 superlattice layer

13 n-side layer

131 first composition graded layer

132 second composition graded layer

14 active layer

142 light emitting layer

15 p-side layer

(3) Features of the present invention

According to the above, the features of the present invention are found to be as follows.

A. The present invention relates to a nitride semiconductor laminated body using III-group nitride and used for a semiconductor light emitting element emitting deep ultraviolet light ([0001]).

B. In the semiconductor light emitting element, if the thickness of the buffer layer is increased, defects in the semiconductor layer formed on the buffer layer can be lowered, but a strong stress is applied between the buffer layer and a layer immediately thereabove, which incurs occurrence of a crack in layers above the buffer layer. Occurrence of a crack incurs deterioration in efficiency (internal quantum efficiency) of recombination of a hole injected into a light emitting layer and free electrons. Moreover, in order to lower the surface resistivity and the contact resistance so as to prevent a rise in the forward driving voltage (Vf) of the element in the semiconductor layer with a large bandgap, the semiconductor layer needs to be made as a composition graded layer so as to increase impurity concentration. However, if doping of Si and the like is performed, a crack can occur more easily than in the case of not doping. Thus, in the light emitting element which emits light with large photon energy such as deep ultraviolet light, prevention of occurrence of a crack and prevention of the rise in Vf cannot be realized at the same time ([0009]).

C. In order to solve the problem, the present invention uses, as specified in Claim 1, a semiconductor laminated body in which a buffer layer made of aluminum nitride with a certain thickness or more is provided in contact with an upper surface of a sapphire substrate so as to have a template substrate, a superlattice layer is provided in contact with an upper surface of the template substrate, a specific composition graded layer is provided in contact with an upper surface of the superlattice layer, and each layer for emitting deep ultraviolet light is provided thereon ([0011]).

D. By means of such structure, in the nitride semiconductor laminated body of the present invention, even if a nitride semiconductor layer with a large bandgap is used for the n-side layer, the surface resistivity or the contact resistance with the n-side electrode can be reduced and thus, Vf in the nitride semiconductor light emitting element can be reduced. Moreover, even if the nitride aluminum layer with a large thickness is used for the buffer layer, occurrence of a crack or deterioration in crystallinity in layers thereabove can be prevented and thus, internal quantum efficiency is improved. By means of these effects, the light emission efficiency of the entire nitride semiconductor light emitting element can be improved ([0013]).

2. Cited Invention A

(1) Description in Cited Document 1 (Translation is the abstract of the Exhibit Ko 1. However, addition and modification were made on the basis of the allegations of the party.)

"Some groups have reported nitride-based DUVLED so far. Although a light emission wavelength can be adjusted up to 210 nm for a short one, efficiency tends to lower as the wavelength becomes shorter. Visible LED has achieved extremely high external quantum efficiency (EQE) in excess of 70%, while the EQE of the DUVLED stays at 2% or less. Therefore, further improvement of light emission efficiency is indispensable for replacement of a mercury lamp with an LED."

"A major factor of the low EQE is high-density threading dislocation which is present in an epitaxial layer. Pantha et.al reported that by increasing a thickness of the AlN epi layer, the threading dislocation density decreases, and crystal quality improves. This method is direct and can be easily applied to LED growth as compared with a method such as buried growth in a lateral direction."

"In this study, we produced a 280-nm light emission, FC-type DUVLED and proved that its external quantum efficiency is 2% or more. This result is caused by a high crystal quality AlN template, an AlGaN multiquantum well structure, and an AlN electronic blocking layer."

"All the epitaxial membranes were grown on the c-surface sapphire substate of a 2-inch size. ... Figure 1 illustrates a schematic diagram of the LED structure. First an AlN layer having a thickness of 3 μm was disposed on the sapphire substrate."

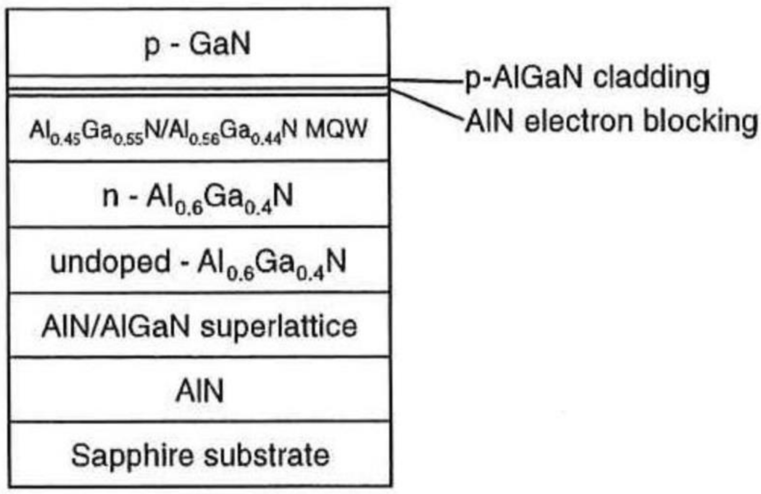


Fig. 1. Schematic structure of DUV LED.

"AlN template"

" In front of an n-type contact layer of undoped $Al_{0.6}Ga_{0.4}N$ with a thickness of 0.5 μm and Si doped $Al_{0.6}Ga_{0.4}N$ with a thickness of 2.5 μm, a superlattice buffer of AlN and AlGaN which relaxes stress was employed. An electron supply layer having a thickness of 50 nm was grown as a first barrier layer. An active layer is constituted by two sets of a well layer of $Al_{0.45}Ga_{0.55}N$ having a thickness of 4 nm and a barrier layer of $Al_{0.56}Ga_{0.44}N$ having a thickness of 2.5 nm. As the electron blocking layer, a thin (10 Å) undoped AlN layer was inserted between the last active well layer and a p-type cladding layer. We used a considerably thick (3000 Å) p-type GaN contact layer for diffusion of an electric current."

"The light emission wavelength, saturated optical output, forward voltage at 20 mA measurement, half value width, and external quantum efficiency were 281.0 nm, 2.45 mW, 7.53 V, 10.6 nm, and 2.78%, respectively.

(2) Contents of Cited Invention A

Plaintiff did not dispute the finding on the different features between the Cited Invention and Present Invention 1 in the present decision of revocation (aforementioned No. 2, 3. (3)) and did not dispute that there was no change in the different features even for Cited Invention A (aforementioned No. 4, 1.) in which the electron supply layer was added to the Cited Invention. When reposted, the different features between Cited Invention A and Present Invention 1 are the following Different Features 1 and 2.

[Different Feature 1]

The first layer in Present Invention 1 is the "first composition graded layer having aluminum ratio $m_{Al}1$ sequentially decreased toward an upper direction from the superlattice layer side", while it is not such in Cited Invention A.

[Different Feature 2]

The second layer in Present Invention 1 is the "second composition graded layer having aluminum ratio $m_{Al}2$ sequentially decreased toward an upper direction from the first composition graded layer", while it is not such in Cited Invention A.

3. Whether the present art is found to be well-known art

The present decision of revocation found that employment of the composition graded layer in which the Al ratio of the AlGaN layer was graded (present art) in order to solve the problem of lowering the driving voltage in the art of the semiconductor light emitting element is well known on the basis of Cited Documents 4 to 6 and thus, this point will be examined.

(1) Cited Document 4

A. Description in Cited Document 4 (obvious clerical errors were corrected.)

(A) Technical Field of the Invention

[0001] The present invention relates to a semiconductor light emitting element and particularly to a semiconductor laser element having a semiconductor light emitting element efficiently emitting light of a visible wavelength by a gallium nitride-based material and a low threshold value current so as to realize high reliability.

(B) Problems to be Solved by the Invention

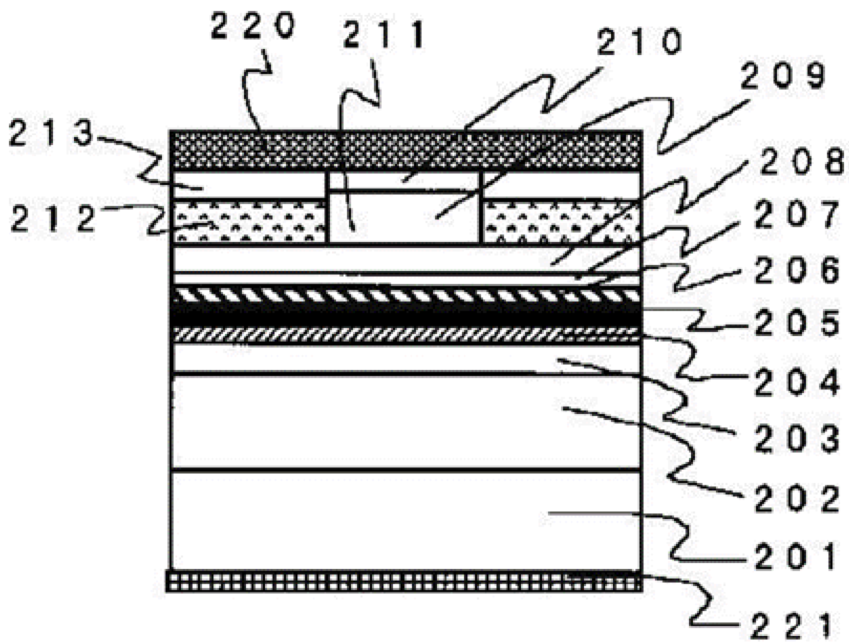
[0006] As described above, in the GaN-based semiconductor light emitting element of the conventional art, in the case of an LED, an optical output is as small as 1.5 mW, and a full width at half maximum of a light emission spectrum is as wide as 23 nm, which incurs a problem of poor monochromatism.

[0007] Moreover, in the case of the semiconductor laser, the threshold current value is as high as 78 mA, and the driving current is 120 mA, which exceeds 100 mA and thus, the driving voltage becomes as high as 5.3 V and as a result, an element life is 35 hours, and a practical time (5000 hours or more) cannot be obtained.

(C) Working Example 2

[0032] Subsequently, an example in which the present invention was applied to the semiconductor laser will be explained by using a sectional structural diagram in Figure 6. Reference numeral 201 denotes an n-type GaN substrate, 202 an n-type AlGaN cladding layer, 203 an n-type guide layer of GaN, 204 an n-side buffer layer made of n-type InGaN, 205 an active layer of multiquantum well structure, 206 a p-side buffer layer made of p-type InGaN, 207 a p-type AlGaN protective layer, 208 a p-type guide layer made of GaN, 209 a p-type cladding layer made of AlGaN, 210 a p-type GaN contact layer, 211 a mesa stripe, 212 an n-type AlGaN current constriction layer, 213 a p-type GaN second contact layer, 220 a p-type electrode, and 221 an n-type electrode.

[Figure 6]



[0037] As is obvious from comparison between the characteristics of this working example element and the characteristics of the laser element in Conventional Example 2, it is known that a full-width at half maximum of a gain spectrum in the active layer 205 was narrowed to 74% that of the conventional example element by inserting the upper and lower n-side buffer layers 204 and the p-side buffer layer 206, and light emission intensity increased by a factor of 2.7 times. Thus, it is presumed that, by means of a synergetic action of these two effects, the optical output per wavelength could be improved by 3.6 times, and the threshold current of laser oscillation could be effectively reduced to half or less that of the conventional element. Moreover, the reduction in the driving voltage of Working Example 2 could be realized for a portion of the voltage consumed by a serial resistance of the laser element by reduction of the driving current by 60 mA by the aforementioned effect. By means of the reduction of the driving current and reduction of the driving voltage, input electric power to the laser element at an optical output of 35 mW could be reduced to 260 mW in this working example, which is half or less that of the conventional example element (640 mW). This led to suppression of heat generation inside the laser element and ensuring of long-time reliability in high-temperature operation.

[0038] As described above, by forming the n-side buffer layer 204 and the p-side buffer layer 206 in contact with the quantum well layer of the active layer 205 with the multiquantum well structure, improvement of the light emission efficiency and narrowing of the full width at half maximum of the light emission spectrum (gain spectrum in the case of the laser element) can be realized, thereby enabling obtainment of the nitride-based semiconductor laser element with low threshold current, low driving current, low driving voltage and a long life. Desirable thicknesses of the n-side buffer layer 204 and the p-side buffer layer 206 in the aforementioned Working Example 2 and desirable concentrations of the n-type impurity and the p-type impurity were the same as those in Working Example 1, respectively.

(D) Working Example 4

[0044] This working example has a layer structure similar to that of Working Example 2 but compositions and thicknesses of individual layers and impurity doping concentration were set as follows. After formation up to the n-type AlGaN cladding layer 202 by the same process as that employed in Working Example 2, the n-type guide layer 203 was changed to a graded composition layer doped with Si at 9×10^{17} cm^{-3} having a thickness of 0.15 μm in which the Al mixed crystal ratio is gradually decreased from $Al_{0.2}Ga_{0.8}N$ to GaN in a growth direction, the n-side buffer layer 204 to n-type $In_{0.06}Ga_{0.94}N$ with a layer doped with Si at 5 × 10^{17} cm^{-3} having a thickness of 15 nm, the active layer 205 to an $In_{0.18}Ga_{0.82}N$ single quantum well layer doped with Si at 1 × 10^{17} cm^{-3} having a thickness of 2.0 nm, the p-side buffer layer 206 to an $In_{0.03}Ga_{0.97}N$ layer doped with Mg at 3 × 10^{18} cm^{-3} having a thickness of 5 nm, and the p-type guide layer 208 to a graded composition layer doped with Mg at 5 × 10^{19} cm^{-3} having a thickness of 0.15 μm in which the Al composition is gradually increased from GaN to $Al_{0.2}Ga_{0.8}N$. After this, it is a semiconductor laser element with a structure in which the p-type cladding layer 209 and the p-type GaN contact layer 210 are formed by the method similar to that of Working Example 2.

[0045] In this working example element, it was confirmed that threshold current was 18 mA, operating current was 50 mA at room temperature and on 35 mW output, driving voltage was 4.5 V, and life was 18,000 hours under conditions of 60 °C and 35 mW. These characteristics are a remarkable improvement from the threshold current = 59 mA, 35 mW operating current = 102 mA, the operating voltage = 5.2 V, and the element life = 300 hours in the case of the semiconductor laser element not using the n-side buffer layer 204 and the p-side buffer layer 206 of this structure.

[0046] Moreover, further lower current and longer life were achieved over Working Example 2, and this is an effect that crystal lattice distortion in the n-side buffer layer 204 as well as the p-side buffer layer 206 and the active layer 205 with the quantum well structure was relaxed by applying the graded composition layer to the n-type guide layer 203 and the p-type guide layer 208. Moreover, the n-type guide layer 203 and the p-type guide layer 208 with the graded composition also have an effect of reducing a crystal crack in the n-type cladding layer 202 and the p-type cladding layer 209 made of the hardest AlGaN and an effect of reducing crystal distortion of the n-side buffer layer 204 and the p-side buffer layer 206, and element production yield could be improved from 45% to 78% in this working example element over Working Example 2. ...

(E) Advantageous Effect of the Invention

[0051] As described above, the semiconductor light emitting element (LED) having large light emission intensity and excellent monochromatism can be realized by applying the present invention. Moreover, by applying the present invention to the gallium nitride-based semiconductor laser, a laser element with low threshold current/operating voltage and high reliability under a high-temperature/high output condition can be obtained. Furthermore, by applying the graded composition layer to the guide layer of the semiconductor laser, further lower current and longer life could be realized, and improvement of the production yield could be realized at the same time.

B. Technical matter described in Cited Document 4

According to the above, Cited Document 4 discloses the invention characterized in that the light emission efficiency can be improved and the full width at half maximum of the gain spectrum can be narrowed by forming the n-side buffer layer and the p-side buffer layer in contact with the quantum well layer of the active layer with the multiquantum well structure, as Working Example 4 in that, in the semiconductor layer element having the nitride semiconductor laminated body structure in which the n-type AlGaN cladding layer 202, the n-type GaN guide layer 203, the n-side buffer layer 204 made of n-type InGaN, the active layer 205 made of the Si-doped InGaN single quantum well layer, the p-side buffer layer 206 made of p-type InGaN, the p-type GaN guide layer 208, the p-type AlGaN cladding layer 209, and the p-type GaN contact layer 210 are laminated in sequence on the n-type GaN substrate 201, it is found to be described, by making the composition graded layers of the n-type guide layer 203 and the p-type guide layer 208, the crystal lattice distortion in the n-side buffer layer 204 as well as the p-side buffer layer 206 and the active layer 205 with the quantum well structure is relaxed, and further lower current and longer life are achieved.

(2) Cited Document 5

A. Description in Cited Document 5 (obvious clerical errors were corrected.)

(A) Industrial Application Field

[0001] The present invention relates to a nitride semiconductor element and particularly relates to a nitride semiconductor element including a relatively thick AlN contained layer made to grow on a low-temperature deposition buffer layer.

(B) Problems to be Solved by the Invention

[0006] ... An object of the present invention is to form a nitride semiconductor element including a relatively thick AlN contained layer without occurrence of a crack and with a simple structure. ...

(C) Embodiment of the Invention

[0014] A crack of the laser element 10 of the conventional art illustrated in Figure 1 occurs by lattice incompatibility between an n-type AlGaN layer 14 which is an AlGaN cladding layer and an n-type GaN layer 13 for current injection, and largely lowers a yield in laser element production. In order to prevent occurrence of the crack, the AlGaN cladding layer had limits of an AlN mole fraction of 0.06 and a film thickness of 0.6 μm. ...

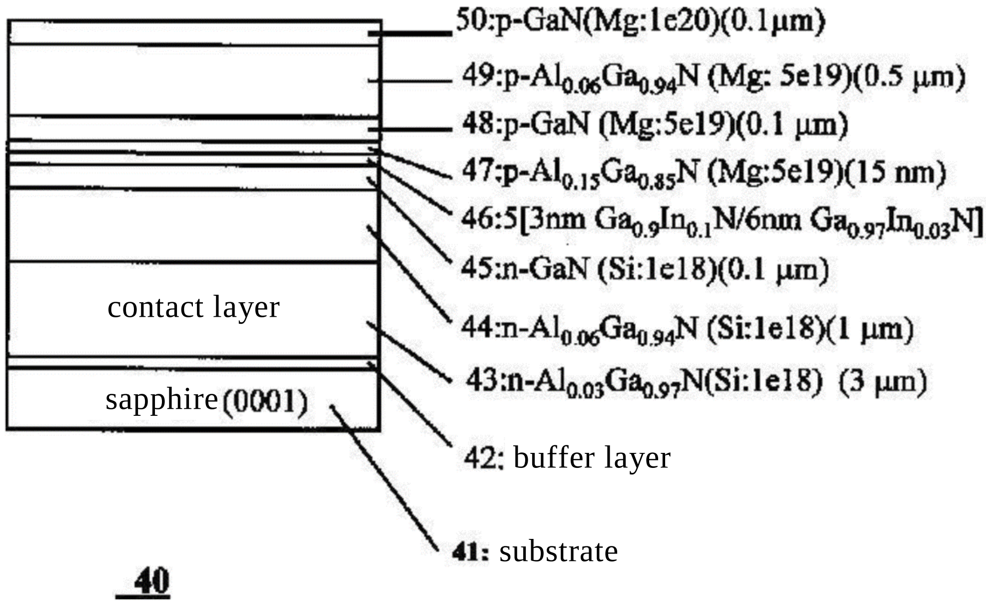
[0015] Thus, in the previous invention, crack occurrence was prevented by inserting a low-temperature deposition buffer layer (film thickness: 30 nm) immediately below the n-type AlGaN cladding layer 14, and the AlN mole fraction and the film thickness of the AlGaN cladding layer were greatly improved to 10% and 1 μm. If the n-type GaN layer 13 for current injection acting as a contact layer is replaced with the n-type AlGaN cladding layer 14 by extension, it was presumed that closure of light can be improved without inserting the low-temperature deposition buffer layer provided immediately below the n-type AlGaN cladding layer 14. ... On the other hand, the n-type AlGaN layer increases its bulk resistance and contact resistivity increase as the AlN mole fraction. Therefore, when an n-electrode is formed on the n-type AlGaN layer grown on the low-temperature deposition layer and made a lateral-direction current injection layer, the driving voltage rises due to high resistance of the n-type AlGaN layer with high AlN mol fraction, which incurs deterioration of the element characteristics.

[0016] Thus, in the present invention, there was employed a double-layer structure; that is, a layer capable of current injection with the n-type AlGaN layer acting as the contact layer with low resistance and having a small AlN mol fraction and a large film thickness and a layer with a large AlN mol fraction and a small film thickness for sufficient light confinement. By having this double-layer structure, a light confinement coefficient could be increased without generating a crack in a composition layer while inter-terminal resistance of the laser element is sufficiently reduced. ...

(D) Working Example 1

[0017] Figure 2 illustrates a structure of a laser element 40 of a working example of the present invention. ...

[Figure 2]



[0018] As illustrated in Figure 2, on a C surface of a sapphire substrate 41, by means of the organometallic vapor phase epitaxy method (MOVPE method), an AlGaN low-temperature deposition buffer layer 42 (500 °C, film thickness: 30 nm, mole fraction: 0.03), an Si-doped n-type AlGaN layer 43 (1050 °C, film thickness: 3 μm, Al mole fraction: 0.03), an Si-doped n-type AlGaN cladding layer 44 (1050 °C, film thickness: 1 μm, Al mole fraction: 0.06), an Si-doped n-type GaN optical waveguide layer 45 (1050 °C, film thickness: 0.10 μm), $\{Ga_{0.9}In_{0.1}N$(3 nm) / $Ga_{0.97}In_{0.03}N$(6 nm)$\}^5$ active layer 46 (800°C, film thickness: 45 nm), an Mg-doped p-type $Al_{0.15}Ga_{0.85}N$ electron blocking layer 47 (1050 °C, film thickness: 15 nm), an Mg-doped p-type GaN optical waveguide layer 48 (1050 °C, film thickness: 0.10 μm), an Mg-doped p-type $Al_{0.06}Ga_{0.94}N$ cladding layer 49 (1050 °C, film thickness: 0.5 μm), and an Mg-doped p-type GaN contact layer 50 (1050 °C, film thickness: 0.1 μm) are sequentially grown/formed so that a laser element 40 of a working example of the present invention is assembled. ...

[0042] In the aforementioned working example, as a method of changing the AlN mole fraction and the thickness of the AlGaN cladding layer or the AlGaN contact layer, there can be created a graded composition AlGaN layer in which the AlN mole fraction is changed linearly or parabolically. Reduction of element resistance by reduction in hetero gap is expected.

(E) Advantageous Effect of the Invention

By working the present invention, a laser structure which prevents occurrence of a crack and has an n-type or p-type AlGaN layer with a sufficient film thickness and AlN mole fraction from a viewpoint of light confinement is obtained with a simple structure. At that time, by dividing the AlGaN layer into two layers; that is, an optical confinement layer (cladding layer) with a large AlN mole fraction and a current injection layer (contact layer) with a small AlN mole fraction and low resistance, there can also be obtained a method of realizing a laser element in which (1) no crack occurs, and a yield is high; (2) optical confinement is sufficient, and a far-field pattern becomes unimodal, and moreover, (3) the driving voltage is sufficiently low. ...

B. Described matter of Exhibit Otsu 6-3

Defendant made an allegation based on the description in Exhibit Otsu 6-3 in understanding the description in Cited Document 5, and Exhibit Otsu 6-3 has the following description.

"AlGaN/AlGaN UV LED needs to pay particular attention to the following points (page 196, line 6).

"- Heterojunction barrier: band discontinuity of a conductive band and a valence band which is heterojunction becomes larger than in a semiconductor with a small bandgap in general due to a large bandgap energy. By employing composition gradient on a heterojunction interface, resistance of the heterojunction barrier can be reduced." (page 197, lines 7 to 10)

"AlGaN UV LED often has a forward voltage of Vf >> hν/e. Depending on the structure of the device, this excess forward voltage is caused by p-type electrode contact resistance, a p-type AlGaN optical confinement layer, lateral conductivity of an n-type AlGaN layer or heterojunction of either one of polarities." (page 198, lines 18 to 20)

C. Technical matter described in Cited Document 5

According to the above, Cited Document 5 describes the invention of a nitride semiconductor element which can increase an optical confinement coefficient without occurrence of a crack in a structural layer while inter-terminal resistance of the laser element is sufficiently reduced by making the n-type AlGaN layer acting as a contact layer into a double-layer structure of a layer with low resistance, small AlN mole fraction capable of current injection, and large film thickness (Si-doped n-type AlGaN contact layer) and a layer with a large AlN mole fraction for sufficient optical confinement and a small film thickness (Si-doped n-type AlGaN cladding layer), or, more specifically, discloses a semiconductor laser element having a nitride semiconductor laminated body structure in which, on a C surface of a sapphire substrate, an AlGaN low-temperature deposition buffer layer, an Si-doped n-type AlGaN contact layer (film thickness: 3 μm, Al mole fraction: 0.03), an Si-doped n-type AlGaN cladding layer (film thickness: 1 μm, Al mole fraction: 0.06), an Si-doped n-type GaN optical waveguide layer, a $\{Ga_{0.9}In_{0.1}N(3\ nm) / Ga_{0.97}In_{0.03}N(6\ nm)\}^5$ active layer, an Mg-doped p-type $Al_{0.15}Ga_{0.85}N$ electron blocking layer, an Mg-doped p-type GaN optical waveguide layer, an Mg-doped p-type $Al_{0.06}Ga_{0.94}N$ cladding layer, and an Mg-doped p-type GaN contact layer are sequentially laminated. And as a variation working example, in the semiconductor laser element, as a method of changing the AlN mole fraction and the thickness of the AlGaN cladding layer or the AlGaN contact layer, a composition graded AlGaN layer in which the AlN mole fraction is changed linearly or parabolically can be produced, and reduction of element resistance by reduction in hetero gap is expected. According to Exhibit Otsu 6-3, since it can be considered to be common general technical knowledge that the heterojunction is one of the causes of excess forward voltage, and the heterojunction barrier resistance can be reduced by employing the composition gradient on the heterojunction interface, in the element structure described in Cited Document 5, the reduction in the element resistance by reduction of the hetero gap realized by employment of the composition graded AlGaN layer is found to lead to the reduction of the driving voltage.

(3) Cited Document 6

A. Description in Cited Document 6 (obvious clerical errors were corrected.)

(A) Industrial Application Field

[0001] The present invention relates to improvement of a semiconductor multilayer film reflection mirror used in a surface light-emission type light emission diode, a surface light emitting layer, and the like.

(B) Prior Art

[0002] The semiconductor multilayer film reflection mirror in which two types of semiconductors with different compositions are laminated alternately and which reflects incident light by interference of light wave is used in a surface light-emission type light emission diode, a surface light emission laser, and the like. ...

(C) Problems to be Solved by the Invention

[0003] However, in such a semiconductor multilayer film reflection mirror in which two types of semiconductors with different compositions are laminated alternately, electric resistance becomes high by discontinuity of a band on a layer interface of the both semiconductors and thus, driving voltages of the light emission diode and the semiconductor layer need to be made higher, and it also had a problem that element life deteriorates by heat generation. Moreover, in the case of battery driving restricted by the driving voltage, a sufficient optical output cannot be obtained in some cases.

[0004] The present invention was made in view of the aforementioned circumstances and has an object to suppress the increase in the electric resistance caused by the band discontinuity.

(D) Operation and Advantageous Effects of the Invention

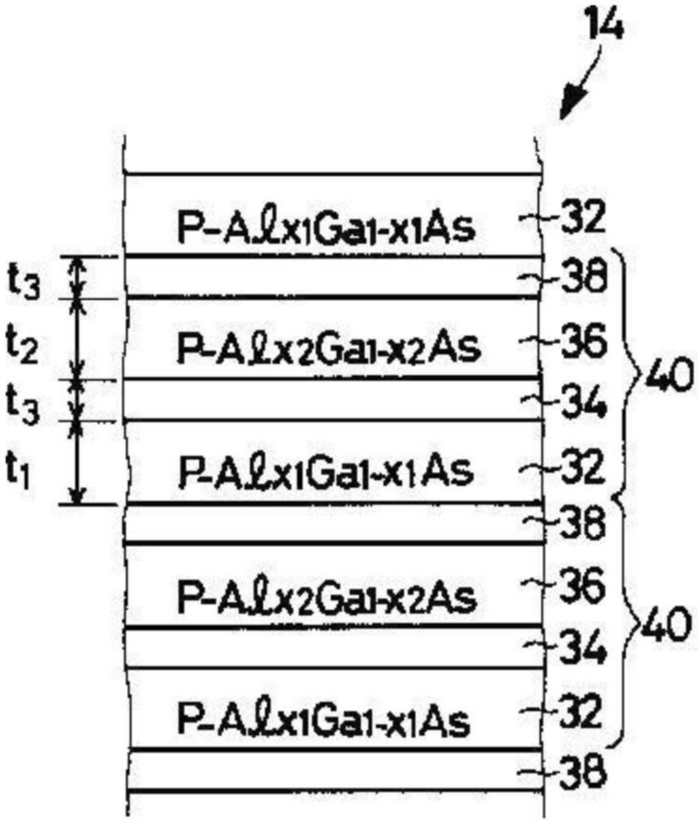
[0006] In such semiconductor multilayer film reflection mirror, a graded composition layer having the composition changed so that the bandgap continuously gets closer from one of the semiconductors to the other semiconductor is provided on a boundary between the first semiconductor and the second semiconductor and thus, the band discontinuity between those semiconductors is relaxed, the electric resistance is reduced, the driving voltage of the light emission diode or the like becomes smaller, and deterioration of the element life caused by heat generation is suppressed. Particularly in the present invention, since the thickness of the graded composition layer is determined so that a height of a potential barrier caused by the bandgap discontinuity is 50 meV or less; that is, approximately twice or less the thermal noise at room temperature, a sufficient effect of reduction of the electric resistance is obtained, and the electric resistance falls to approximately 5Ω or less. ...

[0007] On the other hand, as the thickness of the graded composition layer becomes larger, the function as the reflection mirror deteriorates, and a band width W_R of a reflection light spectrum with a reflectance of 90% or more, for example, is ... narrowed as the thickness t of the graded composition layer becomes larger. Thus, in the light emission diode emitting light at a predetermined wavelength band, the thickness t of the graded composition layer is desirably determined within a range in which a height P of the potential barrier caused by the bandgap discontinuity is 50 meV or less and the bandwidth W_R of the reflection light spectrum with the reflectance of 90% or more is larger than a half value of width W_H of the incident light spectrum. ...

(E) Working Example

[0012] ...in the reflection mirror 14, as illustrated in Figure 3, a unit semiconductor 40 in which a first semiconductor 32 made of p-$Al_{X1}Ga_{1-X1}As$, a graded composition layer 34, a second semiconductor 36 made of p-$Al_{X2}Ga_{1-X2}As$, and a graded composition layer 38 are sequentially laminated is repeatedly laminated. ... the graded composition layers 34 and 38 have the composition changed so that the bandgap continuously gets closer from the one semiconductor to the other semiconductor. ...

[Figure 3]



B. Technical matter described in Cited Document 6

According to the above, it is found that Cited Document 6 describes that, in the semiconductor multilayer film reflection mirror in which the two types of semiconductors with different compositions are laminated alternately and which reflects incident light by interference of light wave, the increase in the electric resistance caused by the band discontinuity is suppressed, and the driving voltage of the element is reduced by providing the composition graded layer between the two types of the semiconductors. Note that the AlGaAs is exclusively referred to as the specific structure of the semiconductor, and there is no description on AlGaN.

(4) Examination

A. As described above, the light emitting elements described in Cited Documents 4 to 6 all have the AlGaN layer or the AlGaAs layer as the composition graded layer, and in Cited Document 4, the guide layer adjacent to the buffer layer is made a composition graded layer for the purpose of relaxation of the crystal lattice distortion in the buffer layer and the active layer, in Cited Document 5, for the purpose of reduction of the hetero gap between the adjacent two layers (the contact layer and the cladding layer), the two layers themselves are made the composition graded layer, and in Cited Document 6, for the purpose of reduction of the hetero gap between the adjacent two semiconductor layers, a new composition graded layer is provided between the two layers. As above, in Cited Documents 4 to 6 pointed out by Defendant, it can be considered that the art of the composition graded layer is employed on the basis of different technical meanings as a part of the specific semiconductor laminated body structure constituting the respective elements and thus, to abstract the semiconductor laminated body structure and the technical meanings so as to make them generic concept from the matters described in each of the cited documents and to introduce the employment of the composition graded layer in which the ratio of Al in the AlGaN layer is graded (present art) in order to solve the problem that the driving voltage thereof is to be lowered in the technical field of the semiconductor light emitting element should be considered as an argument based on a hindsight, and this cannot be found to be a well-known technical matter.

Thus, the judgment of the present decision of revocation that the present art is a well-known technical matter, and the structure related to Different Features 1 and 2 could have been easily conceived of has an error.

B. Note that, from the Exhibit Otsu 6-3 and Cited Document 5, in the AlGaN semiconductor laminated body, there is a room for admitting the well-known technical matter with the limitation that the layer is made the composition graded layer for the purpose of reducing the driving voltage by reducing the hetero gap between the adjacent two layers.

However, in Cited Invention A, the undoped layer and the doped layer are both constituted by $Al_{0.6}Ga_{0.4}N$, and it is considered that there is no hetero gap between the two. Moreover, even if attention is paid to the hetero gap between the superlattice buffer and the undoped layer, in Cited Invention A, the n-side electrode is formed in the doped layer or the undoped layer which are contact layers and thus, the hetero gap with the superlattice buffer which is a layer below that (on a side opposite to the p-side electrode) is considered to have little influence on the driving voltage.

Thus, with regard to the undoped layer of Cited Invention A, it cannot be found that there is motivation to have the composition graded layer in order to reduce the hetero gap for the purpose of reduction in the driving voltage both in the relationship with the adjacent doped layer and in the relationship with the superlattice buffer. Thus, even if the aforementioned art is well known, it is not easy to conceive the structure at least related to Different Feature 1.

In this regard, Defendant alleges that since the undoped layer and the doped layer are both contact layers, they should be considered to be one body. However, the two layers are different in presence/absence of doping and moreover, in view of the fact that the film thickness is described for each of the two layers, and the two layers are also described distinctly in Figure 1 in the main text of Cited Document 1, it is obvious that the two layers are treated as separate layers, and it cannot be considered that a person ordinarily skilled in the art would have motivation to change the compositions of the both only because they are both contact layers and thus, the allegation by Defendant cannot be employed.

4. Allegation of lattice incompatibility

Defendant alleges that use of the composition graded layer for relaxation of the lattice incompatibility of the semiconductor laminated body is a well-known technical matter, and since a person ordinarily skilled in the art can recognize occurrence of the lattice incompatibility in the semiconductor laminated body of Cited Invention A, there is motivation to make the composition graded layer of an undoped layer and a doped layer in order to relax such lattice incompatibility in Cited Invention A.

However, since the structure in which semiconductor layers with different compositions are laminated is usually employed in the semiconductor laminated body, it is a matter of common general technical knowledge that an element cannot be constituted only by semiconductor layers without a lattice constant difference, and there is no evidence sufficient to find that the composition graded layer is usually employed for such semiconductor laminated body, or rather, the composition graded layer is only an additional structure in Cited Documents 4 and 5, and most of working examples do not have it provided. Moreover, according to the entire import of the oral argument, provision of the composition graded layer has a harmful influence that film formation is difficult, and it is found that a design allowing the lattice constant difference or means other than the composition graded layer such as provision of a stress relaxing layer might be employed on the basis of the sizes of film thickness and the lattice constant difference. If so, even if relaxation itself of the lattice constant difference between the semiconductor layers by use of the composition graded layer in the semiconductor laminated body is a well-known technical matter, the lattice constant difference between the semiconductor layers would not be allowable for a person ordinarily skilled in the art, and it is not found that this would naturally lead to trial of application of the composition graded layer. In order for the application of the composition graded layer to have been easily conceived of, a trigger such as occurrence of a problem based on the lattice constant difference or the like would be needed in Cited Invention A.

In Cited Document 1, it is described that the superlattice buffer is employed for "relaxing stress", but no description is found that the lattice constant difference between the respective semiconductor layers is recognized as a problem in the semiconductor laminated body including such superlattice buffer. Moreover, even so, it is hard to expect that a person ordinarily skilled in the art would assume a composition ratio of each of the semiconductor layers and make a difference in the lattice constant between the semiconductor layers apparent even by dividing cases as alleged by Defendant and even if a person ordinarily skilled in the art recognizes the lattice constant difference as alleged by Defendant, it is not obvious whether it is such a difference that is considered to require relaxation of the lattice incompatibility by using the composition graded layer. Moreover, Defendant alleges that it is likely that there is no lattice constant difference between the superlattice buffer and the undoped layer, but in such a case, even if the doped layer is made as a composition graded layer for the lattice compatibility with the electron supply layer, as described in the aforementioned 3.(4)B, there is no motivation to make even the undoped layer which is a layer different from the doped layer as the composition graded layer.

According to the above, it is not found that there is motivation for a person ordinarily skilled in the art who contacted Cited Invention A to make both the undoped layer and the doped layer as the composition graded layer for the purpose of relaxation of the lattice constant difference.

Thus, Defendant's allegation cannot be employed.

5. Conclusion

As described above, since the structure related to Different Features 1 and 2 could not have been easily conceived of, the present decision of revocation denying the inventive step of Present Invention 1 is an error.

Moreover, since Present Inventions 2 to 11 directly or indirectly cite Present Invention 1 and moreover, limit it, the statement on the judgment error of the inventive step for Present Invention 1 is similarly applicable.

Therefore, Plaintiff's claim is grounded and thus, it is approved, and judgment is rendered as in the main text.

Intellectual Property High Court, Third Division
Presiding judge: TSURUOKA Toshihiko
Judge: TAKAHASHI Aya
Judge: ISHIGAMI Yugo