CLAIMS

1. A semiconductor structure, comprising:

a substrate;

a base layer, the base layer comprising an AlGaN layer, the base layer being arranged above the substrate; and

at least one group of layers, the at least one group of layers being arranged above the base layer, wherein each of the at least one group of layers comprises:

a first layer, the first layer being a layer of InGaN and comprising quantum dots, wherein the quantum dots have a width of 10-20 nm,

a second layer, the second layer being a layer of InGaN, the second layer being arranged on and above the first layer, wherein the second layer laterally encloses the quantum dots of the first layer, wherein a material composition of the InGaN of the second layer is different from a material composition of the InGaN of the first layer, and

a heterojunction arranged above the quantum dots of the first layer, the heterojunction being configured to form a two-dimensional electron gas.

2. The semiconductor structure according to claim 1, wherein the at least one group of layers comprises a plurality of groups of layers.

3. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, an indium content in the InGaN of the first layer is higher than an indium content of the InGaN of the second layer.

4. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, a material composition of the InGaN of the first layer is $In_xGa_{1-x}N$, wherein x is a number in the range 0.1 to 0.2 or 0.2-0.4.

5. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, a density of the quantum dots of the first layer is between 10^9 cm^{-2} and 10^{13} cm^{-2}.

6. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, a density of the quantum dots of the first layer is at least 10^{10} cm^{-2}.

7. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, a lattice constant of material in the first layer is at least 0.5 % larger than a lattice constant of material in a layer directly below said first layer at room temperature.

8. The semiconductor structure according to claim 1, wherein, for at least one of the at least one group of layers, a lattice constant of material in the first layer is at least 0.5 % larger than a lattice constant of material in the second layer at room temperature.

9. The semiconductor structure according to claim 1, wherein the base layer comprises:

a primary layer, the primary layer being a layer of semiconductor material, the primary layer comprising pillars extending in a direction perpendicular to the substrate; and

a secondary layer, the secondary layer being a layer of semiconductor material, wherein the secondary layer is configured to laterally enclose the pillars of the primary layer;

wherein the primary or secondary layer forms the AlGaN layer of the base layer.

10. The semiconductor structure according claim 1, wherein the first layer of InGaN comprising quantum dots is arranged at a distance of at least 1 micrometer from the two-dimensional electron gas.

11. The semiconductor structure according to claim 1, wherein the quantum dots are configured to have a bandgap of 1.6 - 1.8 eV.

12. A method for producing the semiconductor structure of any one of the preceding claims, the method comprising:

providing the substrate;

forming the base layer above the substrate;

forming the at least one group of layers above the base layer by forming the first layer and forming the second layer, wherein forming the at least one group of layers comprises, for at least one of the at least one group of layers, forming the quantum dots of the first layer by self-assembly, wherein the quantum dots are formed to have a width of 10-20 nm; and

forming a heterojunction above the quantum dots of the first layer, the heterojunction being configured to form a two-dimensional electron gas.

13. The method according to claim 12, wherein forming the at least one group of layers comprises, for at least one of the at least one group of layers, forming the quantum dots of the first layer by Stranski-Krastanov growth.

14. The method according to claim 12, wherein forming the at least one group of layers comprises, for at least one of the at least one group of layers, interrupting a gas flow for at least 5 seconds between forming the first layer and forming the second layer, wherein the gas flow is a gas flow comprising nitrogen.

15. The method according to claim 12, wherein forming the at least one group of layers comprises, for at least one of the at least one group of layers, ending layer formation of the first layer based on a photoluminescence signal from the quantum dots of the first layer.

16. The method according to claim 12,
wherein forming the base layer comprises:

forming a primary layer, the primary layer being a layer of semiconductor material, the primary layer comprising pillars extending in a direction perpendicular to the substrate; and

forming a secondary layer, the secondary layer being a layer of semiconductor material, wherein the secondary layer is configured to laterally enclose the pillars of the primary layer;

wherein said primary layer is formed in an atmosphere comprising hydrogen and nitrogen; and/or wherein said secondary layer is formed in an atmosphere comprising nitrogen.

17. The method according to claim 12, wherein at least part of the base layer is formed by reactive sputtering of AlN or AlGaN.

18. The method according to claim 17, wherein said at least part of the base layer formed by reactive sputtering of AlN or AlGaN has a thickness of 10-30 nm.

19. The method according to claim 12, wherein the first layer of InGaN comprising quantum dots is formed at a distance of at least 1 micrometer from the two-dimensional electron gas.

20. The method according to claim 12, wherein the quantum dots are formed to have a bandgap of 1.6 - 1.8 eV.