CLAIMS

1. An optical device comprising:

a substrate;

a semiconductor layer on the substrate, the semiconductor layer comprising a beam structure that is subjected to a tensile strain,

wherein the beam structure comprises a plurality of nanoholes of any suitable shape, and

wherein, for each nanohole of the plurality of nanoholes, the nanohole is configured to locally amplify the tensile strain at the nanohole to define a strain-induced artificial quantum heterostructure for quantum confinement.

2. The optical device as claimed in claim 1, wherein a period of the plurality of nanoholes is between 50 nm and 150 nm.

3. The optical device as claimed in claim 1 or 2, wherein a number of the plurality of nanoholes is between 1 and 1000.

4. The optical device as claimed in any one of claims 1 to 3, wherein each nanohole has a diameter of 50 nm or less.

5. The optical device as claimed in any one of claims 1 to 4, further comprising an optical cavity optically coupled to the beam structure.

6. The optical device as claimed in claim 5,

wherein the optical cavity is defined by a pair of distributed Bragg reflectors, and wherein the beam structure is arranged between the pair of distributed Bragg reflectors.

7. The optical device as claimed in any one of claims 1 to 6, wherein the semiconductor layer comprises a p-i-n junction comprising a p-doped region, an intrinsic region and an n-doped region, wherein the intrinsic region comprises the beam structure.

8. The optical device as claimed in any one of claims 1 to 7, wherein the semiconductor layer further comprises a pair of stressing pads extended from opposite end regions of the beam structure.

9. The optical device as claimed in claim 8, when dependent on claim 7, wherein the p-doped region comprises one stressing pad of the pair of stressing pads, and the n-doped region comprises another stressing pad of the pair of stressing pads.

10. The optical device as claimed in any one of claims 1 to 9, wherein the beam structure is suspended over the substrate.

11. The optical device as claimed in any one of claims 1 to 9, wherein at least part of the beam structure is in contact with the substrate.

12. A method of forming an optical device comprising:

forming a semiconductor layer on a substrate; and

forming a beam structure in the semiconductor layer, the beam structure being subjected to a tensile strain;

wherein the beam structure comprises a plurality of nanoholes of any suitable shape, and

wherein, for each nanohole of the plurality of nanoholes, the nanohole is configured to locally amplify the tensile strain at the nanohole to define a strain-induced artificial quantum heterostructure for quantum confinement.

13. The method as claimed in claim 12, wherein a period of the plurality of nanoholes is between 50 nm and 150 nm.

14. The method as claimed in claim 12 or 13, wherein a number of the plurality of nanoholes is between 1 and 1000.

15. The method as claimed in any one of claims 12 to 14, wherein each nanohole has a diameter of 50 nm or less.

16. The method as claimed in any one of claims 12 to ,15 further comprising optically coupling an optical cavity to the beam structure.

17. The method as claimed in claim 16, wherein optically coupling the optical cavity to the beam structure comprises forming a pair of distributed Bragg reflectors to define the optical cavity, the beam structure being arranged between the pair of distributed Bragg reflectors.

18. The method as claimed in any one of claims 12 to 17, wherein forming the semiconductor layer comprises forming a p-i-n junction in the semiconductor layer, the p-i-n junction comprising a p-doped region, an intrinsic region and an n-doped region, wherein the intrinsic region comprises the beam structure.

19. The method as claimed in any one of claims 12 to 18, wherein forming the semiconductor layer further comprises forming a pair of stressing pads extended from opposite end regions of the beam structure.

20. The method as claimed in claim 19, when dependent on claim 18, wherein the p-doped region comprises one stressing pad of the pair of stressing pads, and the n-doped region comprises another stressing pad of the pair of stressing pads.

21. The method as claimed in any one of claims 12 to 20, further comprising removing part of the substrate for the beam structure to be suspended over the substrate.

22. The method as claimed in any one of claims 12 to 20, wherein at least part of the beam structure is in contact with the substrate.