

CLAIMS

1. A memory device comprising:

a substrate;

5 a structure including a plurality of conductive layers stacked above the substrate; and

a pillar arranged inside the structure and including a semiconductor layer that extends in a direction perpendicular to a surface of the substrate,

10 wherein the semiconductor layer includes a first portion at a side of an upper portion of the structure above the plurality of conductive layers, and a second portion between the first portion and the substrate,

the first portion of the semiconductor layer has a
15 thickness larger than a thickness of the second portion of the semiconductor layer, and

a first inner wall of the first portion of the semiconductor layer protrudes inside more than a second inner wall of the second portion of the semiconductor layer.

20

2. The memory device according to claim 1, wherein

the semiconductor layer includes a third portion between the second portion of the semiconductor layer and the substrate,

the third portion of the semiconductor layer has a thickness smaller than a thickness of the second portion of the semiconductor layer, and

the second inner wall of the second portion of the
5 semiconductor layer protrudes inside more than a third inner wall of the third portion of the semiconductor layer.

3. The memory device according to claim 1, wherein
the first portion of the semiconductor layer has an
10 impurity concentration higher than an impurity concentration of the second portion of the semiconductor layer.

4. The memory device according to claim 1, wherein
15 the first portion of the semiconductor layer is an amorphous layer or a microcrystalline layer, and the second portion of the semiconductor layer is a polycrystalline layer.

20 5. The memory device according to claim 2, wherein
the first portion of the semiconductor layer includes at least one selected from boron (B), carbon (C), germanium (Ge), argon (Ar), xenon (Xe), fluorine (F), and BF₂.

6. The memory device according to claim 2, wherein the first portion of the semiconductor layer has a grain size smaller than a grain size of the second portion of the semiconductor layer.

5

7. The memory device according to claim 1, wherein the first portion of the semiconductor layer and the second portion of the semiconductor layer are polycrystalline layers.

10

8. The memory device according to claim 7, wherein the first portion of the semiconductor layer includes at least one selected from boron (B), phosphorus (P), argon (Ar), and BF_2 .

15

9. The memory device according to claim 7, wherein the first portion of the semiconductor layer has a grain size larger than a grain size of the second portion.

20

10. The memory device according to claim 1, wherein the pillar includes a core layer and an air gap, the air gap is arranged inside the core layer, and a top end of the air gap with respect to the direction perpendicular to the surface of the substrate is positioned

on a side of the substrate with respect to the first portion of the semiconductor layer.