

Claims

What is claimed is:

1. A semiconductor structure, comprising:

a first substrate; and

a first adhesive/bonding stack on a surface of said first substrate, wherein said first adhesive/bonding stack comprises at least one first adhesive layer and at least one first bonding layer, and materials of said first adhesive layer and said first bonding layer are different, a material of said first bonding layer comprises dielectric material of silicon, nitrogen and carbon, and a material of said first adhesive layer comprises dielectric material of silicon and nitrogen,

wherein thickness of said first bonding layer is larger than thickness of said first adhesive layer.

2. The semiconductor structure of claim 1, wherein said surface of said first substrate contacts said first adhesive layer, and a surface of said first adhesive/bonding stack is a surface of said first bonding layer.

3. The semiconductor structure of claim 1, wherein an atomic concentration of carbon in said first bonding layer is larger than 0% and smaller than 50%.

4. The semiconductor structure of claim 1, wherein an atomic concentration of carbon in said first bonding layer is uniform, or said atomic concentration of carbon in said first bonding layer gradually changes along with the increase of thickness of said first bonding layer.

5. The semiconductor structure of claim 1, wherein said first adhesive layer further comprises carbon, and an atomic concentration of carbon in said first adhesive layer is uniform, or said atomic concentration of carbon in said first adhesive

layer gradually changes along with the increase of thickness of said first adhesive layer.

6. The semiconductor structure of claim 5, wherein an atomic concentration of carbon in said first adhesive/bonding stack gradually changes in a direction of thickness of said first adhesive/bonding stack.

7. The semiconductor structure of claim 1, wherein a compactness of each layer in said first adhesive/bonding stack gradually changes in a direction of thickness of said first adhesive/bonding stack.

8. The semiconductor structure of claim 1, wherein a thickness of said first bonding layer is larger than 100 Å, and a thickness of said first adhesive layer is larger than 10 Å.

9. The semiconductor structure of claim 1, further comprising a second substrate, wherein a second adhesive/bonding stack is formed on a surface of said second substrate, and a surface of said second adhesive/bonding stack is correspondingly bonded to a surface of said first adhesive/bonding stack.

10. The semiconductor structure of claim 9, wherein said second adhesive/bonding stack and said first adhesive/bonding stack have the same material and structure.

11. The semiconductor structure of claim 9, further comprising:
a first bonding pad penetrating through said first adhesive/bonding stack; and

a second bonding pad penetrating through said second adhesive/bonding stack, wherein said first bonding pad is correspondingly bonded to said second bonding pad.

12. A method of forming a semiconductor structure, comprising:
providing a first substrate; and

forming a first adhesive/bonding stack on a surface of said first substrate, wherein said first adhesive/bonding stack comprises at least one first bonding layer and at least one first adhesive layer, and materials of said first adhesive layer and said first bonding layer are different, a material of said first bonding layer comprises dielectric material of silicon, nitrogen and carbon, and a material of said first adhesive layer comprises dielectric material of silicon and nitrogen,

wherein thickness of said first bonding layer is larger than thickness of said first adhesive layer.

13. The method of forming a semiconductor structure of claim 12, wherein an atomic concentration of carbon in said first bonding layer is larger than 0% and smaller than 50%.

14. The method of forming a semiconductor structure of claim 12, wherein an atomic concentration of carbon in said first bonding layer is uniform, or said atomic concentration of carbon in said first bonding layer gradually changes along with the increase of thickness of said first bonding layer.

15. The method of forming a semiconductor structure of claim 12, wherein said first adhesive layer further comprises carbon, and an atomic concentration of carbon in said first adhesive layer is uniform, or said atomic concentration of carbon in said first adhesive layer gradually changes along with the increase of thickness of said first adhesive layer.

16. The method of forming a semiconductor structure of claim 15, wherein an atomic concentration of carbon in said first adhesive/bonding stack gradually changes in a direction of thickness of said first adhesive/bonding stack, or a compactness of each

layers in said first adhesive/bonding stack gradually changes in a direction of thickness of said first adhesive/bonding stack.

17. The method of forming a semiconductor structure of claim 12, wherein a thickness of said first bonding layer is larger than 100 Å, and a thickness of said first adhesive layer is larger than 10 Å.

18. The method of forming a semiconductor structure of claim 12, further comprising:

providing a second substrate;

forming a second adhesive/bonding stack on a surface of said second substrate; and

correspondingly bonding a surface of said second adhesive/bonding stack to a surface of said first adhesive/bonding stack.

19. The method of forming a semiconductor structure of claim 18, wherein said second adhesive/bonding stack and said first adhesive/bonding stack have the same material and structure.

20. The method of forming a semiconductor structure of claim 18, further comprising:

forming a first bonding pad penetrating through said first adhesive/bonding stack;

forming a second bonding pad penetrating through said second adhesive/bonding stack; and

correspondingly bonding said first bonding pad and said second bonding pad when bonding said surface of said second adhesive/bonding stack to said surface of said first adhesive/bonding stack.