viscosity in general increases again to a very high value, having a negative effect on the cleaning, by a dropping of the temperature between the debonding process and the cleaning process. In the case of debonding processes, which are performed at room temperature, the temporary bonding adhesive never reaches a low viscosity value.

In general, in order to be able to clean the vias, the product substrates must be put in a chemical bath after the debonding and be exposed in particular to ultrasound. Both treatment steps lay claim to the product substrate, in particular take time, and thus increase costs.

Embodiments of this invention disclose a method with which the processing of semiconductor substrates with cavities, in particular vias, is optimized.

According to a first aspect of the present invention, there is provided a method for temporarily coating a semiconductor substrate having at least one substrate surface and one or more cavity surfaces that define cavities formed in the semiconductor substrate, said method comprising: applying a temporary coating material to the semiconductor substrate before performing processing steps for processing the at least one substrate surface, wherein the temporary coating material applied to the semiconductor substrate includes a high-adhesive part, which removably adheres to the one or more cavity surfaces, and a low-adhesive part, which faces interior regions of the cavities and thus comes into contact with contaminants.

All combinations that consist of at least two features indicated in the specification, in the claims and/or the drawings also fall within the scope of the invention. In the indicated ranges of values, values as boundary values that lie within

Claims

1. A method for temporarily coating a semiconductor substrate having at least one substrate surface and one or more cavity surfaces that define cavities formed in the semiconductor substrate, said method comprising:

applying a temporary coating material to the semiconductor substrate before performing processing steps for processing the at least one substrate surface,

wherein the temporary coating material applied to the semiconductor substrate includes (i) a high-adhesive part, which removably adheres to the one or more cavity surfaces, and (ii) a low-adhesive part, which faces interior regions of the cavities and thus comes into contact with contaminants.

2. The method according to claim 1, wherein the step of applying the temporary coating material to the semiconductor substrate includes applying the temporary coating material at least to an inner periphery surface and a base surface of the cavity surfaces, said temporary coating material applied with a coating thickness (d) that is smaller than half a mean diameter (D) of each of the cavities.

3. The method according to claim 1, wherein the step of applying the temporary coating material to the semiconductor substrate includes applying the temporary coating material to intermediate surfaces of the substrate surfaces, said intermediate surfaces extending between the cavities.

4. The method according to claim 3, wherein the method further comprises:

removing the temporary coating material from the intermediate surfaces after applying the temporary coating material to the semiconductor substrate, without removing the temporary coating material applied to the one or more cavity surfaces.

5. The method according to claim 4, wherein the temporary coating material is removed from the intermediate surfaces by centrifuging.

6. The method according to claim 1, further comprising:

cleaning the semiconductor substrate after performing the processing steps for processing the at least one substrate surface.

7. The method according to claim 1, furthered comprising:

removing the temporary coating material from the cavities after performing the processing steps for process the at least one substrate surface; and

immediately after the removing of the coating materials, permanently coating the one or more cavity surfaces and/or equipping the cavities.

8. The method according to claim 6, wherein the method further comprises removing the temporary coating material after cleaning the semiconductor substrate.

9. The method according to claim 7, wherein the temporary coating material is removed by introducing the coated semiconductor substrate into a solvent bath filled with a solvent for dissolving the temporary coating material.

10. The method according to claim 9, wherein the semiconductor substrate is exposed to ultrasound in the solvent bath.

11. The method according to claim 4, wherein the temporary coating material is completely removed from the intermediate surfaces.

12. The method according to claim 5, wherein the temporary coating material is removed from the intermediate surfaces by centrifuging in connection with applying a solvent for at least partially dissolving the temporary coating material.

13. The method according to claim 7, wherein the temporary coating material is removed after cleaning of the semiconductor substrate.

14. The method according to claim 13, wherein the temporary coating material is removed by introducing the coated semiconductor substrate into a solvent bath filled with a solvent for dissolving the temporary coating material.

15. The method according to claim 14, wherein the semiconductor substrate is exposed to ultrasound in the solvent bath.

16. The method according to claim 1, wherein the cavities are recesses.

17. The method according to claim 1, wherein the cavities are vias.

18. The method according to claim 17, wherein each via is one of the following: a bore hole, a clearance hole, or a contact hole.

19. The method according to claim 13, wherein the temporary coating material is removed by plasma.

20. The method according to claim 1, wherein an energy per unit of surface area of the high-adhesive part that is needed to separate the high-adhesive part from the one or more cavity surfaces is greater than 0.00001 J/m2, and

wherein an energy per unit of surface area of the low-adhesive part at which the low-adhesive part adheres to the contaminants is less than 2.5 J/m2.