the mask completely may damage the device.

[0013]

The present invention was made in view of such problems. Its object is to provide a method for producing semiconductor chips, in which damages to a device during ashing of a mask can be suppressed while dividing and separating a wafer by plasma dicing, and the like.

(MEANS FOR SOLVING PROBLEMS)

[0014]

According to an aspect of the present invention, there is provided a method for producing semiconductor chips. The method includes a step x of preparing a semiconductor wafer having a pattern at the place of streets in a pattern surface on which a semiconductor element circuit is formed; a step y of forming a surface protection tape on the side of the pattern surface of the semiconductor wafer, the surface protection tape comprising at least a substrate film and a temporary adhesive layer. The method further includes a step a of grinding a rear surface of the semiconductor wafer under the state of the surface protection tape being present; a step b of forming a mask material layer on the rear surface of the semiconductor wafer after the rear surface is ground under the state of the surface protection tape being present; a step c of cutting the mask material layer at the parts that correspond to the streets on the semiconductor wafer; a step d of plasma dicing in which SF_6 plasma etches the semiconductor wafer at the parts that correspond to the streets until the depth of reaching the pattern, and thereby the semiconductor wafer is divided and separated in accordance with said pattern formed at the streets into individual semiconductor chips; a step e of ashing in which O_2 plasma removes the mask material layer; a step f of pasting a chip fixing tape to the rear surface of the semiconductor wafer after ashing, and fixing the semiconductor wafer to a ring frame to be supported; and a step g of releasing the surface protection tape.

[0014a] It is preferable that the SF_6 plasma etching in the step d is conducted not to reach the surface protection tape.

[0014b] It is preferable that step X of preparing a semiconductor wafer includes a step of forming a pattern on a semiconductor element circuit at the place of the street.

[0015]

It is preferable that the temporary adhesive layer includes (meth) acrylic copolymer, which has an ethylenically unsaturated bond in a side chain as a principal component, and a content rate of the (meth) acrylic copolymer and cross-linked substances of the (meth) acrylic copolymer is 90 % or more.

[0016]

It is preferable that, in the temporary adhesive layer, 0.5 - 5.0 pts.mass of a curing agent including an isocyanate group or epoxy group is used for 100 pts.mass of (meth) acrylic copolymer, and at least a part of the curing agent is cross liked.

[0017]

It is preferable that a bending elastic modulus of the substrate film is between 5.0×10^8 Pa and 1.0×10^{10} Pa.

and 1.0×10^{10} Pa, and this can suppress wafer warping, which improves handling property.

[0026]

Also, the melting point of the resin forming the substrate film is 90 °C or higher, and this can prevent the surface protection film from melting when the wafer is irradiated by plasma from the rear surface side.

[0027]

Also, if the surface roughness Ra of a surface of the substrate film where the temporary adhesive layer is not formed is between 0.1 μm and 2.0 μm, the electrostatic chuck can hold the wafer with more certainty.

[0028]

Also, similarly to the above, if the surface resistivity of the surface of the substrate film where the temporary adhesive layer is not formed is less than 10^{13} Ω / sq, the electrostatic chuck can hold the wafer with more certainty.

[0029]

Also, if the storage elastic modulus of the temporary adhesive layer is between 5.0×10^4 Pa and 2.0×10^5 Pa, wafer cracking or the like in the production process can be suppressed.

[0030]

There is provided a surface protection tape that is used in the method for producing semiconductor chips according to the first invention.

[0031]

It is possible to produce semiconductor chips efficiently.

(EFFECTS OF THE INVENTION)

[0032]

The present invention can provide a method for producing semiconductor chips, in which damages to a device during ashing of a mask can be suppressed while dividing and separating a wafer by plasma dicing, and the like.

BRIEF DESCRIPTION OF DRAWINGS

[0033]

FIG. 1A is a schematic cross sectional view showing a semiconductor wafer 1 in one of steps up to pasting of a surface protection tape 3 onto the semiconductor wafer 1.

WHAT IS CLAIMED IS

1. A method for producing semiconductor chips, the method comprising:

a step x of preparing a semiconductor wafer having a pattern at the place of streets in a pattern surface on which a semiconductor element circuit is formed;

a step y of forming a surface protection tape on the side of the pattern surface of the semiconductor wafer, the surface protection tape comprising at least a substrate film and a temporary adhesive layer;

a step a of grinding a rear surface of the semiconductor wafer under the state of the surface protection tape being present;

a step b of forming a mask material layer on the rear surface of the semiconductor wafer after the rear surface is ground under the state of the surface protection tape being present;

a step c of cutting the mask material layer at the parts that correspond to the streets on the semiconductor wafer;

a step d of plasma dicing in which SF_6 plasma etches the semiconductor wafer at the parts that correspond to the streets until the depth of reaching the pattern, and thereby the semiconductor wafer is divided and separated in accordance with said pattern formed at the streets into individual semiconductor chips;

a step e of ashing in which O_2 plasma removes the mask material layer;

a step f of pasting a chip fixing tape to the rear surface of the semiconductor wafer after ashing, and fixing the semiconductor wafer to a ring frame to be supported; and

a step g of releasing the surface protection tape.

2. The method for producing semiconductor chip of claim 1, wherein SF_6 plasma etching in the step d is conducted not to reach the surface protection tape.

3. The method for producing semiconductor chip of claim 1 or 2, wherein step X of preparing a semiconductor wafer includes a step of forming a pattern on a semiconductor element circuit at the place of the street.

4. The method for producing semiconductor chips according to claim 1, wherein

the temporary adhesive layer comprises (meth) acrylic copolymer, which has an ethylenically unsaturated bond in a side chain as a principal component, and a content rate of the (meth) acrylic copolymer and cross-linked substances of the (meth) acrylic copolymer is 90 % or more.

5. The method for producing semiconductor chips according to claim 1, wherein

in the temporary adhesive layer, 0.5 - 5.0 pts.mass of a curing agent

including an isocyanate group or epoxy group is used for 100 pts.mass of (meth) acrylic copolymer, and at least a part of the curing agent is cross liked.

6. The method for producing semiconductor chips according to claim 1, wherein a bending elastic modulus of the substrate film is between 5.0×10^8 Pa and 1.0×10^{10} Pa.

7. The method for producing semiconductor chips according to claim 1, wherein a melting point of a resin forming the substrate film is 90 °C or higher.

8. The method for producing semiconductor chips according to claim 1, wherein a surface roughness Ra of a surface of the substrate film where the temporary adhesive layer is not formed is between 0.1 μm and 2.0 μm.

9. The method for producing semiconductor chips according to claim 1, wherein a surface resistivity of the surface of the substrate film where the temporary adhesive layer is not formed is less than 10^{13} Ω / sq.

10. The method for producing semiconductor chips according to claim 1, wherein a storage elastic modulus of the temporary adhesive layer is between 5.0×10^4 Pa and 2.0×10^5 Pa.