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]

~~To achieve the above object, a first invention is~~ 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 ~~a~~ the semiconductor wafer ~~wherein the semiconductor wafer includes a pattern surface on which a surface protection tape is pasted, the surface protection tape includes at least a substrate film and a temporary adhesive layer, and the rear surface is ground with a~~ under the state of the surface protection tape being present ~~pasted~~; a step b of forming a mask material layer on the rear surface of the semiconductor wafer after the rear surface is ground ~~with~~ under the state of the surface protection tape being present ~~pasted~~; a step c of cutting the mask material layer at the parts that correspond to the streets ~~of the semiconductor wafer to open the streets from a side of the mask material layer of~~ 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 ~~divides and separates~~ 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]

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

[0031]

~~According to the second invention, i~~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 ~~a~~ the semiconductor wafer~~, the semiconductor wafer comprising a pattern surface on which a surface protection tape is pasted, the surface protection tape comprising at least a substrate film and a temporary adhesive layer, and the rear surface being ground with a~~ under the state of the surface protection tape being present ~~pasted,~~;

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

a step c of cutting the mask material layer at the parts that correspond to the streets ~~of the semiconductor wafer to open the streets from a side of the mask material layer of~~ 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 ~~divides and separates~~ 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.

~~2~~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.

~~3~~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.

~~4~~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.

~~5~~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.

~~6~~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.

~~7~~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.

~~8~~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.

~~9. A surface protection tape that is used in the method for producing semiconductor chips according to claim 2.~~