

Known methods for temporary bonding of a product substrate to a carrier substrate for easy stripping of the wafer are based for example on double-sided adhesive films, liquids, wax or similar substances so that the product substrate after processing can be separated from the carrier substrate as easily as possible with as little energy as possible. These methods are shown in US 5,725,923, US 2007/0184630, EP 1286385A2 and US 5,863,375.

The following technical problems prevail in temporary bonding:

1. High material consumption of partially expensive materials.
2. High temperatures in temporary bonding and for this reason high energy consumption.
3. Time-consuming stripping processes, especially in chemical separation/dissolution of the interconnect layer, especially for wet chemical processes which are generally complex, polluting and thus inefficient. In chemical dissolution it moreover happens that by incomplete dissolution of the interconnect layer before stripping of the product substrate some sites continue to act adhesively and then lead to destruction of the product wafer during stripping at these sites.
4. Cleaning of the product substrate after stripping is necessary.

Embodiments of this invention to devise a method for temporarily bonding a product substrate on a carrier substrate as nondestructively as possible and with the minimum possible energy expenditure, and with which the product substrate can again be easily detached from the carrier substrate.

According to an aspect of the present invention, there is provided a method for temporary connection of a product substrate to a carrier substrate comprising the following steps: applying an interconnect layer to a product substrate receiving side of the carrier substrate in an interconnect surface section of the product substrate receiving side, applying an antiadhesion layer with low adhesion force to one interconnect side of the product substrate in an antiadhesion

surface section of the interconnect side, the antiadhesion surface section corresponding to the interconnect surface section in terms of area, aligning the product substrate relative to the carrier substrate, bonding the interconnect layer to the antiadhesion layer on one contact surface, and stripping the carrier substrate from the product substrate, wherein a receiving space is formed that is bordered by the interconnect layer and the carrier substrate as well as the product substrate and the antiadhesion layer, the receiving space being configured to accommodate structures provided on the interconnect side of the product substrate and projecting therefrom.

All combinations of at least two of the features given in the specification, the claims and/or the figures also fall within the scope of the invention. At the

given value ranges, values within the indicated limits will also be considered to be disclosed as boundary values and will be claimed in any combination.

Embodiments of the invention are based on the idea of applying an antiadhesion layer to the product substrate instead of to the carrier substrate, especially in regions which are occupied by chips, preferably on the peripheral edge of the product substrate, even more preferably in a region on whose opposite side on the carrier substrate there is an interconnect layer.

In this way it is possible as per embodiments of the invention to form on the carrier substrate a receiving space for the structures provided on the product substrate, especially chips, by the interconnect layer and the carrier substrate.

The antiadhesion layer is dimensioned and made as ~~claimed in~~ per embodiments of the invention such that upon making contact with the interconnect layer on the carrier substrate an adhesion force which is sufficient for processing and transport of the product substrate takes effect.

The product substrate is defined as a product substrate, for example a semiconductor wafer, which is conventionally thinned to a thickness between 0.5 μm and 250 μm , the trend being toward thinner and thinner product substrates.

The carrier is for example a carrier substrate with a thickness between 50 μm and 5000 μm , in particular between 500 μm and 1000 μm .

According to one preferred embodiment of the invention it is provided that the interconnect surface section is located on the peripheral edge of the carrier substrate especially in a ring section which is concentric preferably to the product substrate receiving side. By homogeneous application and/or application of the interconnect layer and/or antiadhesion layer distributed uniformly over the

blanket manner.

To the extent the stripping takes place concentrically from one inner side of the contact surface pointing toward the receiving space, this applies to the version of centric action on the carrier substrate during stripping, especially in conjunction with the flexible carrier holder. This results in especially careful stripping which is directed piece by piece uniformly from the center to the periphery.

Conversely it is advantageously conceivable as ~~claimed in per~~ embodiments of the invention, in the version of the largely lateral stripping of the product substrate from carrier substrate or vice versa of the carrier substrate from the product substrate, to provide partial detachment by mechanical separating means, as a result of which the start of stripping takes place less jerkily and thus more carefully for the product substrate.

As per embodiments of the invention it is advantageously provided that the adhesion force which is acting between the interconnect layer and the antiadhesion layer is between 0.1 mJ/m^2 and 10 J/m^2 , especially between 1 mJ/m^2 and 1 J/m^2 , the adjustment taking place by material selection and by the size of the contact area.

Other advantages, features and details of the invention will become apparent from the following description of preferred exemplary embodiments and using the drawings.

Figure 1 shows a schematic of a method sequence as claimed in the invention,

Figure 2 shows a schematic side view of a product substrate which is joined to a carrier substrate,

Figure 3 shows a schematic of the stripping of the product substrate from the carrier

Claims

1. A method for temporary bonding of a product substrate (2) to a carrier substrate (6) with the following method steps:

- application of an interconnect layer (5) to a product substrate receiving side (6o) of the carrier substrate (6) in an interconnect surface section (13) of the product substrate receiving side (6o),
- application of an antiadhesion layer (4) with low adhesion force to one interconnect side (2u) of the product substrate (2) in an antiadhesion surface section (15) of the interconnect side (2u), which section corresponds to the interconnect surface section (13) at least partially, preferably essentially completely, in terms of area, wherein a receiving space (14) being formed which is bordered by the interconnect layer (5) and the carrier substrate (6) as well as the product substrate (2) and the antiadhesion layer (4) for accommodating structures (3) which are provided on the interconnect side (2u) of the product substrate (2) and which project from the interconnect side (2u),
- alignment of the product substrate (2) relative to the carrier substrate (6) and bonding of the interconnect layer (5) to the antiadhesion layer (4) on one contact surface (16).

2. The method as claimed in Claim 1, wherein an interconnect surface section (13) is located on the lateral periphery (6s) of the carrier substrate (6), especially in a ring section which is preferably concentric to the product substrate receiver (6o).

3. The method as claimed in one of the preceding claims, wherein the antiadhesion surface section (15) is located on the lateral periphery (2s) of the product substrate (2), especially in a ring section which is preferably concentric to the antiadhesion surface section (15).

4. The method as claimed in one of the preceding claims, wherein the structures (3) are at least partially, preferably completely, surrounded by the antiadhesion layer (4).

5. The method as claimed in one of the preceding claims, wherein the product substrate (2) is stripped from the carrier substrate (6) by applying to the carrier substrate (6) a tensile force which acts at least largely centrally or at least largely laterally on one stripping side (6u) of the carrier substrate (6), which side faces away from the product substrate receiving side (6o).

6. The method as claimed in Claim 5, wherein the tensile force is applied by means of a, preferably flexible, carrier holder (12, 12') which draws in the stripping side (6u), especially in a blanket manner.

7. The method as claimed in one of Claims 5 or 6, wherein the stripping takes place concentrically from one inner side (16i) of the contact surface (16), which side points toward the receiving space (14).

8. The method as claimed in Claim 5, wherein at the start of the at least largely lateral stripping partial detachment takes place by mechanical separating means.

9. A product-substrate-carrier substrate composite (7), consisting of the following:

- a carrier substrate (6) with an interconnect layer (5) which has been applied to a product substrate receiving side (6o) of the carrier substrate (6) in an interconnect surface section (13) of the product substrate receiving side (6o) and

- a product substrate (2) which is joined to the carrier substrate (6) along one contact surface (16) between the interconnect layer (5) and an antiadhesion layer (4) which is applied to one interconnect side (2u) of the product substrate (2) in an antiadhesion surface section (15) of the interconnect side (2u), which section corresponds at least partially in area to the interconnect surface section (13), wherein in a receiving space (14) which is bordered by the interconnect layer (5) and the carrier substrate (6) as well as the product substrate (2) and the antiadhesion layer (4) structures being accommodated which are provided on the interconnect side (2u) of the product substrate (2) and which project from the interconnect side (2u).

CLAIMS:

1. A method for temporary connection of a product substrate to a carrier substrate comprising the following steps:
 - applying an interconnect layer to a product substrate receiving side of the carrier substrate in an interconnect surface section of the product substrate receiving side,
 - applying an antiadhesion layer with low adhesion force to one interconnect side of the product substrate in an antiadhesion surface section of the interconnect side, the antiadhesion surface section corresponding to the interconnect surface section in terms of area,
 - aligning the product substrate relative to the carrier substrate,
 - bonding the interconnect layer to the antiadhesion layer on one contact surface, and
 - stripping the carrier substrate from the product substrate,wherein a receiving space is formed that is bordered by the interconnect layer and the carrier substrate as well as the product substrate and the antiadhesion layer, the receiving space being configured to accommodate structures provided on the interconnect side of the product substrate and projecting therefrom.
2. The method as claimed in claim 1, wherein the interconnect surface section is located on a lateral periphery of the carrier substrate in a ring section that is concentric to the product substrate receiving side.
3. The method as claimed claims 1 or 2, wherein the antiadhesion surface section is located on a lateral periphery of the product substrate in a ring section that is concentric to the antiadhesion surface section.
4. The method as claimed in claims 1 or 2, wherein the structures are at least partially surrounded by the antiadhesion layer.
5. The method as claimed in claim 1, wherein the step of stripping is performed by applying to the carrier substrate a tensile force that acts at least largely centrically or at least largely

laterally on one stripping side of the carrier substrate, the stripping side facing away from the product substrate receiving side.

6. The method as claimed in claim 5, wherein the tensile force is applied by means of a flexible, carrier holder that draws in the stripping side in a blanket manner.

7. The method as claimed in one of claims 5 or 6, wherein the step of stripping takes place concentrically from one inner side of the contact surface, the inner side pointing toward the receiving space.

8. The method as claimed in claim 5, wherein, at a start of the at least largely lateral step of stripping, a partial detachment takes place by mechanical separating means.