and bonded in a bond method to the product wafer. The temporary bond which has been produced in this way is supposed to withstand high temperatures and forces. The bond interface is supposed to prevent the penetration of liquids and/or gases into the intermediate space of the carrier wafer and product wafer.

The most frequently used type of temporary bonding uses a bond adhesive layer. The adhesive layer can be applied over the entire area of the carrier wafer and/or of the product wafer. This layer has adhesive properties (undetachable interconnection) which are sufficient up to a certain temperature range to adequately fix the two substrates. For separation, the two substrates are heated above this temperature range and thus the cement loses the adhesive properties and these two wafers, the carrier wafer and the product wafer, are separated by application of a horizontal and a vertical force.

The adhesive layer can also be applied only on the edge of the product wafer and/or of the carrier wafer. The inner region does not necessarily contain an adhesive layer. The layer of the inner region can have any properties, but mostly is introduced as support means into the intermediate spaces of the individual bumps. The separation process is similar to the separation process of a blanket bond, in any case only the edge zones need be physically and chemically treated accordingly so that the temporary bond loses its adhesion. This is accompanied by lower temperatures, shorter process times and less material consumption of chemicals.

There are uncounted other methods for breaking a temporary bond again, for example by special lasers and by carrier wafers with small diameter holes through which a corresponding solvent is introduced into the bond over the entire surface.

Embodiments~~The object~~ of the invention seek~~is~~ to devise a device and a method to cause on the one hand a

high bond force between the substrates for all necessary process steps, on the other hand after processing of the substrate composite to enable nondestructive separation of the thin substrate from the substrate composite. In addition, the process steps which are necessary for this purpose are to be possible economically and universally for the most varied substrates/wafers.

A first aspect of the present invention provides a method for bonding of a first substrate to a second substrate with the following steps, especially the following sequence: making contact of a first contact area of the first substrate with a second contact area of the second substrate, which second area is aligned parallel to the first contact area, as a result of which a common contact area is formed, producing an, especially spot, bond interconnection between the first substrate and the second substrate outside the common contact area.

A second aspect of the present invention provides a substrate composite of a first substrate and a second substrate, in which a first contact area of the first substrate with a second contact area of the second substrate, which second area is aligned parallel to the first contact area, forms a common contact area, outside the common contact area there being an especially spot bond interconnection between the first substrate and the second substrate.

A third aspect of the present invention provides a device for bonding of a first substrate to a second substrate with the following features: contact making means for making contact of a first contact area of the first substrate with a second contact area of the second substrate, which second area is aligned parallel to the first contact area, as a result of which a common contact area is formed, bond means for producing an, especially spot, bond interconnection between the first substrate and the second substrate outside the common contact area.

~~This object is achieved with the features of Claims 1, 7 and 14.~~ Advantageous developments of the invention are given in the dependent claims. 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 t~~T~~he invention describe~~s~~ a device and a method using which a carrier wafer can be temporarily and/or permanently connected to a product wafer. Furthermore the final product, a carrier wafer-product wafer composite (substrate composite) is described.

Embodiments of t~~T~~he invention are~~is~~ based on the idea that on the carrier wafer and/or the product wafer at several positions, preferably at at least three positions, there are specially produced interconnection elements which can be melted to one another and/or detached by physical and/or chemical processes. In particular mechanically moving parts for fixing are omitted.

Embodiments of t~~T~~he invention are~~is~~ based on the further idea of improving a generic device and a generic method such that the temporary bonding of two or more substrates is economically suitable (for all process requirements, also for high temperatures and a vacuum) and re-use in subsequent processes is enabled without expensive cleaning costs of the carrier wafer. Furthermore there are fixing agents which enable a suitable interconnection at high process temperatures and easy debonding.

Embodiments of t~~T~~he invention are~~is~~ based on the general inventive idea of producing a bond interconnection

outside an active or common contact area between the substrates. Thus both mechanically movable fixing means and also exposure of the contact area between the substrates themselves are omitted, as a result of which the cleaning of the contact areas after breaking the interconnection is much simpler and more efficient. The substrates are available more promptly again for further processes or re-use. The active or common contact area is the area where, aside from possible coatings, there is direct contact between the first and the second substrate. Here ~~as claimed in the invention~~ it is especially advantageous if the interconnection is formed in spots over the area; this also comprises narrow circular ring-shaped application.

Substrates are defined as product substrates or carrier substrates which are used in the semiconductor industry. The carrier substrate is used as reinforcement of the function substrate (product substrate) for the different treatment steps, especially when back-thinning the function substrate. Substrates can be especially wafers, either flat or notched.

Embodiments of the~~An independent~~ invention provide~~is~~ a substrate composite (or a product substrate-carrier substrate combination) which consists of a carrier substrate and a product substrate which with the device ~~as claimed in the invention~~ and/or the method according to embodiments of~~as claimed in~~ the invention have been aligned, placed in contact and pre-fixed and/or bonded to one another and are characterized in particular in that the diameter D2 of the first substrate (carrier substrate) is minimally smaller than the diameter D3 of the second substrate (product substrate). Thus, ~~as claimed in the invention~~ it is ensured that the carrier substrate is not exposed to any contamination, fouling, unwanted treatment, etc. during the processing of the product substrate and therefore can be re-used more often.

According to another advantageous embodiment of the invention it is provided that the bond interconnection on the first substrate is at least partially, preferably largely formed on a first

fixing area of the first substrate, which area is angled relative to the common contact area, and/or on the second substrate at least partially, preferably largely on a second fixing area of the second substrate which is angled relative to the common contact area. Thus optimum, space-saving transmission of force for fixing of the substrates (product substrate and carrier substrate) is possible. Angled means especially angles between 3 degrees and 90 degrees, preferably between 10 degrees and 90 degrees. In some especially advantageous embodiments the first and/or the second fixing area is located essentially orthogonally, especially exactly orthogonally, to the common contact area.

To the extent the first fixing areas/or the second fixing areas are arranged rotationally symmetrical to one axis of rotation of the first substrate and/or the second substrate, the substrates are fixed on one another with an optimum distribution of the bond force.

According to another embodiment~~advantageous aspect~~ of this invention, to form the bond interconnection, cements and/or especially metallic interconnection elements are used. The bond interconnection is used especially in addition for sealing of the common contact area relative to the vicinity.

According to another advantageous embodiment of the invention it is provided that a first area ratio between the first fixing area and the first contact area is less than 1:5, especially less than 1:10, still more preferably less than 1:20, and/or a second area ratio between the second fixing area and the second contact area is less than 1:5, especially less than 1:10, preferably less than 1:20. Thus the smallest possible space is expended for fixing so that more space remains for formation of structures on the product wafer.

Advantageously the second substrate, especially before the first and second contact areas

make contact, is provided with an intermediate layer for leveling of bumps provided on the top of the second substrate. The intermediate layer is used to accommodate the bumps, the intermediate layer preferably not acting adhesively or in any case acting with low adhesion relative to the first substrate.

Moreover, embodiments of the~~this~~ invention enables repeated use of the carrier substrate without its having to be cleaned by expensive and complex processes.

Moreover it is possible to integrate/install the device according to embodiments of~~as claimed in~~ the invention in a bonder.

To the extent features of the device are disclosed here or in the following description of figures, they are also intended to apply as disclosed as features of the method and vice versa. The same applies to the substrate composite.

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

Figures 1a, 1b and 1c each show a schematic plan view of a first substrate with different outer contours before adaptation of a diameter D1 of the first substrate as claimed in the invention,

Figure 2a shows a schematic cross sectional view of the substrate according to Figure 1a,

Figure 2b shows a schematic cross sectional view of the substrate after adapting (reducing) the diameter D1,

Figure 3a shows a schematic cross sectional view of the first substrate before making contact with a second substrate with interconnection elements as claimed in the invention in a first embodiment,

Figure 3b shows a schematic cross sectional view of a substrate composite which has been