

one another, to stack them above one another, to connect them permanently to one another and to cross-link them with one another by means of corresponding strip conductors.

One of the key technologies for the implementation of such structures is temporary bonding. Temporary bonding is understood to mean methods with the aid of which substrates can be connected to one another in such a way that their separation is possible without destroying the substrates.

In the prior art, there are a number of methods for debonding/detaching two substrates (product substrate and carrier substrate). Most methods employ so-called bonding adhesives in order to achieve a temporary, relatively easily detachable bond between two substrates. Bonding adhesives are mainly polymers, in particular thermoplastics.

It has however emerged that the use of polymers as a temporary bonding adhesive is disadvantageous, in particular due to the environmental pollution due to the chemicals used for cleaning as well as the cost of the consumable materials. Furthermore, it is a drawback with all polymeric temporary bonding adhesives that the temperature resistance is far lower than the other processing temperatures of the product substrate. Temporary bonding by means of polymers thus represents a technological limitation for the processing of the product substrate.

~~The problem~~Embodiments of the invention, therefore, is to at least partially eliminate, in particular completely eliminate, the drawbacks listed in the prior art. In particular, ~~it is a problem~~embodiments of the invention ~~to specify~~disclose improved methods for bonding and debonding.

~~The present problem is solved with the features of the coordinated claims.~~
~~Advantageous developments of the invention are specified in the sub-claims.~~

According to a first aspect of the present invention, there is provided a method for the temporary bonding of a product substrate with a carrier substrate, including at least the steps of: producing a metallised temporary bonding layer on the product substrate and/or on the carrier substrate, bonding the product substrate with the carrier substrate at the metallised temporary bonding layer, wherein the carrier substrate is formed structured, wherein the carrier substrate comprises elevations and cavities, wherein the elevations are stably connected to the product substrate via metallic contacts and the cavities are arranged between the elevations.

According to a second aspect of the present invention, there is provided a substrate stack produced using the above method, including a product substrate and a carrier substrate, characterised in that the product substrate and the carrier substrate are connected by a metallised temporary bonding layer.

According to a third aspect of the present invention, there is provided a device for the temporary bonding of a product substrate with a carrier substrate using

the above method, wherein a metallised temporary bonding layer can be produced on the product substrate and/or on the carrier substrate, the product substrate can be bonded with the carrier substrate at the metallised temporary bonding layer.

According to a fourth aspect of the present invention, there is provided a method for debonding a product substrate from a carrier substrate, wherein the product substrate and the carrier substrate are connected by a metallised temporary bonding layer using the above method and form a substrate stack, including at least the steps of: mounting and fixing the substrate stack on a substrate holder, focusing debonding radiation, in particular a laser beam, through the carrier substrate onto the metallised temporary bonding layer and thus melting, evaporating and/or sublimating the metallised temporary bonding layer, detachment of the product substrate from the carrier substrate.

According to a fifth aspect of the present invention, there is provided a device for debonding a product substrate from a carrier substrate using a method according to at least one of the preceding claims, wherein the product substrate and the carrier substrate are connected by means of a metallised temporary bonding layer and form a substrate stack, wherein the device at least comprises: a substrate holder for mounting and fixing the substrate stack, a radiation source for focusing debonding radiation, in particular a laser beam, through the carrier substrate onto the metallised temporary bonding layer and thus melting, evaporating and/or sublimating the metallised temporary bonding layer, detachment means for detaching the product substrate from the carrier substrate.

All combinations of at least two features indicated in the description, in the claims and/or the drawings also fall within the scope of the invention. In stated value ranges, values lying inside the stated limits should also be deemed to be disclosed as limiting values and can be claimed in any combination.

The Embodiments of the invention relates to a method for the temporary bonding of a product substrate with a carrier substrate, comprising at least the following steps:

- producing a metallised temporary bonding layer on the product substrate and/or on the carrier substrate,
- bonding the product substrate with carrier substrate at the metallised temporary bonding layer.

The Embodiments of the invention further relates to a substrate stack, in particular produced using a method according to the invention, comprising a product substrate and a carrier substrate, wherein the product substrate and the carrier substrate are connected by a metallised temporary bonding layer.

The temporary bonding layer is preferably the only layer that is used for the bonding and/or debonding method according to the invention. A further advantage thus arises over the prior art, in which a plurality of polymer layers, one for bonding and one for the debonding, are usually used above one another.