carrier substrate and a method for transferring a transfer layer from the carrier substrate to a product substrate, wherein the transfer layer is not destroyed or damaged, in particular by electromagnetic radiation.

According to a first aspect of the present invention, there is provided a carrier substrate for transferring a transfer layer from the carrier substrate to a product substrate, comprising at least the following layers in the following sequence: a carrier base substrate, a protective layer and a transfer layer, wherein the carrier substrate comprises at least one release layer arranged between the carrier base substrate and the protective layer, wherein the transfer layer is grown on the protective layer, wherein the protective layer shields the transfer layer.

According to a second aspect of the present invention, there is provided a method for the production of the above carrier substrate for transferring the transfer layer from the carrier substrate onto the product substrate with the steps of: provision of a carrier base substrate, application of a protective layer on the carrier base substrate, growing of a transfer layer, in particular a graphene layer, on the protective layer.

According to a second aspect of the present invention, there is provided a method for transferring the above transfer layer from the above carrier substrate and/or produced according to the above process onto a product substrate, wherein the carrier substrate is contacted by the product substrate, so that the transfer layer is facing the product substrate, and wherein at least one debonding means acts on the carrier substrate, so that the transfer layer together with the protective layer is detached from a carrier base substrate.

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

In the following text, a transfer layer or a layer to be transferred, in particular in the form of a graphene layer, is understood to mean the layer on the carrier substrate that is to be transferred onto the product substrate. In particular, the transfer layer has been grown on a protective layer or a growth layer of the carrier substrate. Protective layer and growth layer are thus used synonymously in the subsequent text.

The growth layer and the protective layer can however be two different layers. The growth layer is in contact with the transfer layer, so that the protective layer is located between the growth layer and the carrier substrate. In the subsequent text, it is assumed for the sake of simplicity that the growth layer and the protective layer are identical. This state is also the more sensible economically, since in this case only one layer has to be deposited and the process costs can thus be kept lower.

Accordingly, embodiments the invention relate to a carrier substrate for transferring a transfer layer from the carrier substrate to a product substrate, comprising at least the following layers in the sequence: a carrier base substrate, a protective layer and a transfer layer, wherein the transfer layer is grown on the protective layer.

Claims

1. A carrier substrate (1) for transferring a transfer layer (6) from the carrier substrate (1) to a product substrate (2, 2’, 2’’, 2e), comprising at least the following layers in the following sequence:

- a carrier base substrate (3),

- a protective layer (5) and

- a transfer layer (6),

characterised in that the carrier substrate (1) comprises at least one release layer (4) arranged between the carrier base substrate (3) and the protective layer (5), wherein the transfer layer (6) is grown on the protective layer (5), wherein the protective layer (5) shields the transfer layer (6).

2. The carrier substrate (1) according to claim 1, wherein the transfer layer (6) is a graphene layer (6).

3. The carrier substrate (1) according to at least one of the preceding claims, wherein a roughness of the protective layer (5), in particular on the surface facing the transfer layer (6), is less than 100 µm, preferably less than 10 µm, still more preferably less than 1 µm, most preferably less than 100 nm, with utmost preference less than 10 nm.

4. The carrier substrate (1) according to at least one of the preceding claims, wherein the transfer layer (6) comprises at least one release layer (4) arranged between the carrier base substrate (3) and the protective layer (5).

5. The carrier substrate (1) according to at least one of the preceding claims, wherein the transfer layer (6) can be detached from the carrier base substrate (3) together with the protective layer (5) by means of a debonding means (11) acting on the release layer (4) and/or on a release area.

6. The carrier substrate (1) according to at least one of the preceding claims, wherein the protective layer (5) comprises a material with a solubility for carbon.

7. The carrier substrate (1) according to at least one of the preceding claims, wherein the protective layer (5) is designed impermeable for electromagnetic radiation.

8. The carrier substrate (1) according to at least one of the preceding claims, wherein a contact layer (8, 8'), in particular made of a dielectric material, preferably of silicon oxide, is arranged on the side of the transfer layer (6) facing away from the protective layer (5).

9. The carrier substrate (1) according to at least one of the preceding claims, wherein the protective layer (5) is a monocrystalline metal layer, preferably made of nickel.

10. A method for the production of a carrier substrate (1) for transferring a transfer layer (6) from the carrier substrate (1) onto a product substrate (2, 2', 2'', 2e) according to at least one of the preceding claims with the following steps:

i) provision of a carrier base substrate (3),
ii) application of a protective layer (5) on the carrier base substrate (3),
iii) growing of a transfer layer (6), in particular a graphene layer, on the protective layer (5).

11. The method according to claim 10, wherein the protective layer (5) is recrystallised before the growing of the transfer layer (6) in step iii).

12. The method according to claim 10 or 11, wherein the carrier base substrate (3) is coated with a release layer (4) before the application of the protective layer (5) in step ii), so that the protective layer (5) is applied on the release layer (4).

13. The method according to claim 10, 11 or 12, wherein a contact layer (8, 8’) is deposited on the transfer layer (6) on the side facing away from the protective layer (5).

14. A method for transferring a transfer layer (6) from a carrier substrate (1) according to at least one of the preceding claims and/or produced according to a process according to at least one of the preceding claims onto a product substrate (2, 2’, 2’’, 2e), wherein

- the carrier substrate (1) is contacted by the product substrate (2, 2’, 2’’, 2e), so that the transfer layer (6) is facing the product substrate (2, 2’, 2’’, 2e), and

- wherein at least one debonding means (11) acts on the carrier substrate (1), so that the transfer layer (6) together with the protective layer (5) is detached from a carrier base substrate (3).

15. The method for transferring a transfer layer (6) according to claim 14, wherein the carrier substrate (1) is contacted by the product substrate (2, 2’, 2’’, 2e) via a contact layer (8, 8’) applied on the transfer layer (6) or the carrier substrate (1) is contacted by a further contact layer (8, 8’) of the product substrate (2, 2’, 2’’, 2e) applied on the product base substrate (7, 7’) via a contact layer (8, 8’) applied on the transfer layer (6).