Claims

1. Method for bonding of a first contact surface (3) of a first substrate (1) to a second contact surface (4) of a second substrate (2) with the following sequence:

- forming a reservoir (5) in a surface layer (6) on the first contact surface (3),

- at least partial filling of the reservoir (5) with a first educt or a first group of educts,

- the first contact surface (3) making contact with the second contact surface (4) for formation of a prebond connection,

- forming a permanent bond between the first and second contact surface (3, 4) by deforming at least one of the contact surfaces (3, 4) by the reaction of the first educt with a second educt contained in a reaction layer (7) of the second substrate (2), wherein the permanent bond is at least partially strengthened by the reaction of the first educt with the second educt,

wherein the reaction of the first educt is made with the first educt contained in the reservoir (5).

2. Method for bonding of a first contact surface (3) of a first substrate (1) to a second contact surface (4) of a second substrate (2) with the following sequence:

- forming a reservoir (5) in a surface layer (6) on the first contact surface (3),

- at least partial filling of the reservoir (5) with a first educt or a first group of educts,

- the first contact surface (3) making contact with the second contact surface (4) for formation of a prebond connection,

- forming a permanent bond between the first and second contact surface (3, 4) by deforming at least one of the contact surfaces (3, 4) by the reaction of the first educt with a second educt contained in a reaction layer (7) of the second substrate (2), wherein the permanent bond is at least partially strengthened by the reaction of the first

educt with the second educt wherein during the reaction a reaction product (10) with a greater molar volume than the molar volume of the second educts is formed in the reaction layer (7),

wherein the reaction of the first educt is made with the first educt contained in the reservoir (5).

3. Method as claimed in Claim 1 or 2, wherein formation and/or strengthening of the permanent bond takes place by diffusion of the first educt into the reaction layer (7).

4. Method as claimed in claim 1 or 2, wherein the formation of the permanent bond takes place at a temperature between room temperature and 200° Celsius, especially during a maximum 12 days, more preferably a maximum 1 day, even more preferably a maximum 1 hour, and most preferably a maximum 15 minutes.

5. Method as claimed in claim 1 or 2, wherein the irreversible bond has a bond strength of greater than 1.5 J/m^2, especially greater than 2 J/m^2, preferably greater than 2.5 J/m^2.

6. Method as claimed in claim 1 or 2, wherein the reservoir (5) is formed by plasma activation.

7. Method as claimed in claim 1 or 2, wherein the formation of the reservoir (5) takes place by using an especially compacted tetraethoxy silane-oxide layer as the surface layer (6).

8. Method as claimed in claim 1 or 2, wherein the surface layer (6) consists predominantly, especially essentially completely of an especially amorphous, especially silicon oxide produced by thermal oxidation, and the reaction layer (7) consists of an oxidizable material, especially predominantly, preferably essentially completely, of Si, Ge, InP, GaP or GaN.

9. Method as claimed in claim 1 or 2, wherein between the second contact surface (4) and the reaction layer (7) there is a growth layer (8), especially predominantly of native silicon dioxide.

10. Method as claimed in Claim 9, wherein before formation of a permanent bond the growth layer (8) has an average thickness A between 1 angstrom and 10 nm.

11. Method as claimed in claim 1 or 2, wherein a reservoir is formed in a vacuum.

12. Method as claimed in claim 1 or 2, wherein the reservoir is filled by one or more of the steps cited below:

- exposing the first contact surface (3) to the atmosphere, especially with a high oxygen and/or water content,
- exposing the first contact surface (3) to a fluid consisting especially predominantly, preferably almost completely, of especially deionized H_2O and/or H_2O_2,
- exposing the first contact surface (3) to N_2 gas and/or O_2 gas and/or Ar gas and/or forming gas, especially consisting of 95% Ar and 5% H_2, especially with an ion energy in the range from 0 to 2000 eV.

13. Method as claimed in claim 1 or 2, wherein the reservoir (5) is formed in an average thickness (R) between 0.1 nm and 25 nm, especially between 0.1 nm and 20 nm.

14. Method as claimed in claim 1 or 2, wherein the average distance (B) between the reservoir (5) and the reaction layer (7) immediately before formation of the permanent bond is between 0.1 nm and 15 nm, especially between 0.5 nm and 5 nm, preferably between 0.5 nm and 3 nm.

15. Method as claimed in claim 1 or 2, wherein the irreversible bond has a bond strength which comprises 2 times, preferably 4 times, more preferably 10 times, most preferably 25 times the prebond strength.