Claims

1. A method for bonding of a first contact area (3) of a first substrate (1) to a second contact area (4) of a second substrate (2), the second substrate (2) or each of the substrates (1, 2) having at least one reaction layer (7), ~~with the following steps, especially the following sequence~~ said method comprising the steps of:

- receiving the first and second substrates (1, 2) into a plasma chamber (20, 20') or ~~into~~ a substrate chamber (27) which is connected to a plasma chamber (20"), the plasma chamber (20, 20', 20") having at least ~~two~~ first and second generators (23, 24) ~~which can be operated with different frequencies (f_{21}, f_{22}), especially are operated with different frequencies (f_{21}, f_{22}) for producing the plasma,~~

~~formation of a reservoir (5) in a reservoir formation layer (6) on the first contact area (3) by applying a plasma which has been produced in the plasma chamber (20, 20', 20") to the first contact area (3),~~

- generating alternating current at a first electrode with a first frequency (f_{21}) with the first generator to produce plasma for forming a first reservoir (5) in a first reservoir formation layer on the first contact area (3) of the first substrate (1),
- generating alternating current at a second electrode with a second frequency (f_{22}) with the second generator, the second frequency (f_{22}) being different from the first frequency (f_{21}),
- at least partially filling ~~of~~ the first reservoir (5) with a first educt or a first group of educts,
- ~~making contact of~~ contacting the first contact area (3) with the second contact area (4) for formation of a pre-bond interconnection, and
- ~~formation of~~ forming a permanent bond between the first and second contact areas (3, 4), the permanent bond being at least partially strengthened by ~~the~~ a reaction of the first educt with a second educt which is contained in the reaction layer (7) of the second substrate (2).

2. The method as claimed in Claim 1, wherein the first frequency (f_{21}) is between 1 Hz and 20 MHz, especially between 1 kHz and 1 MHz, preferably between 10 kHz and 800 kHz, even more preferably between 300 kHz and 500 kHz, and/or the first electrode (21) can be set in a first frequency range 1 Hz and 20 MHz, especially between 1 kHz and 1 MHz, preferably between 10 kHz and 800 kHz, even more preferably between 300 kHz and 500 kHz.

3. The method as claimed in Claim 1 or 2, wherein the second frequency (f_{22}) is between 1 Hz and 20 MHz, especially between 1 kHz and 1 MHz, preferably between 10 kHz and 800 kHz, even more preferably between 30 kHz and 50 kHz, and/or the second electrode (21) can be set in a second frequency range 1 Hz and 20 MHz, especially between 1 kHz and 1 MHz, preferably between 10 kHz and 800 kHz, even more preferably between 30 kHz and 50 kHz.

4. The method as claimed in one of the preceding claims, wherein a voltage amplitude of the first and/or second electrode (21, 22) is between 1 V and 1000 V, especially between 100 V and 800 V, preferably between 200 V and 600 V, even more preferably between 300 V and 500 V.

5. A method for bonding of a first contact area (3) of a first substrate (1) to a second contact area (4) of a second substrate (2), the second substrate (2) or each of the substrates (1,2) having a least one reaction layer (7), ~~with the following steps, especially the following sequence~~ said method comprising the steps of:

- receiving the first and second substrates into an inductively coupled plasma chamber,
- ~~formation of~~ forming a reservoir (5) in a reservoir formation layer (6) on the first contact area (3) by exposing the first contact area (3) to a plasma which has been produced by means of inductive coupling of the coil (26), a first frequency (f_{21}) different from a second frequency (f_{22}) of a second generator (24) being applied on a first generator (23) during plasma production,
- at least partially filling ~~of~~ the first reservoir (5) with a first educt or a first group of educts,
- ~~making contact of~~ contacting the first contact area (3) with the second contact area (4) for forming a pre-bond interconnection, and
- ~~formation of~~ forming a permanent bond between the first and second contact area (3, 4), the permanent bond being at least partially strengthened by ~~the~~ a reaction of the first educt with a second educt which is contained in the reaction layer (7) of the second substrate (2).

6. The method as claimed in Claim 1 or 5, wherein the frequency (f_{21}) of the first generator (23) is between 0.001 kHz and 100000 kHz, preferably between 0.01 kHz and 10000 kHz, more preferably between 0.1 kHz and 1000 kHz, most preferably exactly 400 kHz and/or the second

generator (24) can be set in a frequency range between 0.001 kHz and 100000 kHz, preferably between 0.01 kHz and 10000 kHz, more preferably between 0.1 kHz and 1000 kHz.

7. A device for bonding of a first contact area (3) of a first substrate (1) to a second contact area (4) of a second substrate (2), the second substrate (2) or each of the substrates (1, 2) having a least one reaction layer (7), ~~with the following features~~ said device comprising:

- a bonding chamber (20, 20', 27),
- a first electrode (21) and a second electrode (22) which ~~is~~ are located opposite,
- receiving means for receiving the first and second substrates (2, 3) between the first electrode (21) and the second electrode (22),

~~reservoir formation means for forming a reservoir (5) in a reservoir formation layer (6) on the first contact area (3) by exposing the first contact area (3) to a plasma which has been produced by means of capacitive coupling of the electrodes (21, 22), and a first frequency (f_{21}) which is different from a second frequency (f_{22}) of the second electrode (22) can be applied on the first electrode (21) during the plasma production,~~

- means for generating alternating current at a first electrode with a first frequency (f_{21}) with a first generator to produce plasma for forming a first reservoir (5) in a first reservoir formation layer on the first contact area (3) of the first substrate (1),
- means for generating alternating current at a second electrode with a second frequency (f_{22}) with a second generator, the second frequency (f_{22}) being different from the first frequency (f_{21}), and
- means for making contact of the first contact area (3) with the second contact area (4) for forming a pre-bond interconnection.

8. The device as claimed in Claim 7, wherein the first and/or the second frequency (f_{21}, f_{22}) are adjustable.

9. A device for bonding of a first contact area (3) of a first substrate (1) to a second contact area (4) of a second substrate (2), the second substrate (2) or each of the substrates (1, 2) having a least one reaction layer (7), ~~with the following features~~ said device comprising:

- a bonding chamber (20, 20', 27),
- a coil (26),
- receiving means for accommodating the first and second substrates (2, 3) within the coil (26),
- reservoir formation means for forming a first reservoir (5) in a reservoir formation layer (6) on the first contact area (3) by exposing the first contact area (3) to a plasma which has been produced by means of inductive coupling of the coil (26), a first frequency (f_{21}) which is different from a second frequency (f_{22}) of a second generator (24) being applied on a first generator (23) during the plasma production,
- means for making contact of the first contact area (3) with the second contact area (4) for forming a pre-bond interconnection.

10. The device as claimed in Claim 9, wherein the first and/or the second frequency (f_{21}, f_{22}) are adjustable.

11. The method as claimed in at least one of Claims 1 to 6, wherein the method is carried out in a bonding chamber and the bonding chamber at least in the formation of the reservoir (5) is exposed to a chamber pressure between 0.1 and 0.9 mbar, especially less than 0.7 mbar, preferably less than 0.5 mbar, even more preferably less than 0.3 mbar.

12. The method as claimed in at least one of Claims 1 to 6 or 11, wherein O_2 gas and/or N_2 gas and/or Ar gas predominates in the bonding chamber at least when the reservoir (5) is being formed.

13. A device for bonding of a first contact area (3) of a first substrate (1) to a second contact area (4) of a second substrate (2), the second substrate (2) having a least one reaction layer (7) with the following features:
- a plasma chamber (20") for producing a plasma, the plasma chamber (20") having at least two generators (23, 24) ~~which can be operated with different frequency (f_{21}, f_{22}), especially are operated with different frequencies (f_{21}, f_{22}) for producing the plasma,~~

- a bonding chamber (27) which is connected to the plasma chamber,
- ~~reservoir formation means for forming a reservoir (5) in a reservoir formation layer (6) on the first contact area (3) by exposing the first contact area (3) to a plasma which has been produced in the plasma chamber (20"),~~
- means for generating alternating current at a first electrode with a first frequency (f_{21}) with a first generator to produce plasma for forming a first reservoir (5) in a first reservoir formation layer on the first contact area (3) of the first substrate (1),
- means for generating alternating current at a second electrode with a second frequency (f_{22}) with a second generator, the second frequency (f_{22}) being different from the first frequency (f_{21}), and
- means for making contact of the first contact area (3) with the second contact area (4) for forming a pre-bond interconnection.

14. The device as claimed in Claim 13, wherein a closable opening is located between the plasma chamber (20") and the bonding chamber (27).