

CLAIMS

1. Process for joining two semiconductor substrates by molecular adhesion comprising:

- a step a) of bringing a first ~~(1)~~ and a second ~~(2)~~ substrate into intimate contact in order to form an assembly ~~(3)~~ exhibiting a bonding interface ~~(4)~~;
- a step b) of reaction-annealing the bonding interface at a first temperature, higher than a predetermined first temperature, this step b) generating bubbles at the bonding interface;

the process being characterized in that it comprises:

- a step c) of at least partially debonding the two substrates ~~(1, 2)~~ at the bonding interface ~~(4)~~ in order to eliminate the bubbles;
- a step d) of bringing the first ~~(1)~~ and the second ~~(2)~~ substrate back into intimate contact at the bonding interface ~~(4)~~ in order to reform the assembly ~~(3)~~.

2. Joining process according to the preceding claim, in which the debonding step c) is performed under a controlled atmosphere.

3. Joining process according to the preceding claim, in which the controlled atmosphere of the debonding step c) is an anhydrous atmosphere or vacuum.

4. Joining process according to one of the preceding claims, in which the debonding step c) is carried out entirely or partly at a second temperature higher than or equal to ambient temperature.

5. Joining process according to the preceding claim, in which the second temperature is lower than 700°C, preferably lower than 200°C and even more preferably lower than 100°C.

6. Joining process according to one of the preceding claims, in which the debonding step c) comprises mechanically

separating the two substrates ~~(1, 2)~~ by inserting a blade between the two substrates ~~(1, 2)~~ at the bonding interface ~~(4)~~.

- 5 7. Joining process according to one of the preceding claims comprising, after step d), a step e) of thinning the first substrate ~~(1)~~ in order to form a thin layer ~~(1')~~.

- 10 8. Joining process according to the preceding claim, in which the first substrate ~~(1)~~ comprises a main face ~~(1a)~~ and a buried weakened plane ~~(1b)~~, the thin layer ~~(1')~~ being defined between the main face ~~(1a)~~ and the buried weakened plane ~~(1b)~~.

- 15 9. Joining process according to the preceding claim, in which step e) comprises splitting along the buried weakened plane ~~(1b)~~ in order to transfer the thin layer ~~(1')~~ onto the second substrate ~~(2)~~.

- 20 10. Joining process according to the preceding claim, in which:
 - step e) comprises a heat treatment at a temperature higher than or equal to a predetermined second temperature allowing spontaneous splitting along the buried weakened
 - 25 plane ~~(1b)~~;
 - the first temperature of step b) and the second temperature of step c) are lower than the predetermined second temperature.