

- a) providing a donor substrate including a buried weakened plane, the useful layer being delimited by a front face of the donor substrate and the buried weakened plane;
- b) providing a carrier substrate;
- c) joining the donor substrate, by its front face, to the carrier substrate along a bonding interface so as to form a bonded structure;
- d) annealing the bonded structure ~~in order to~~by applying a weakening thermal budget thereto and ~~to bring~~ing the buried weakened plane to a defined level of weakening, the weakening thermal budget being less than a splitting thermal budget, the splitting thermal budget leading to spontaneous initiation of a splitting wave in the buried weakened plane during the anneal; and
- e) after the annealing of the bonded structure to apply the weakening thermal budget, initiating ~~a the~~ splitting wave in the buried weakened plane by applying a stress to the bonded structure, the splitting wave propagating in a self-sustained manner along the buried weakened plane ~~in order~~ to result in the useful layer being transferred to the carrier substrate, wherein the splitting wave is initiated when the bonded structure is subjected, at least in its hottest region, to a temperature between 150°C and 250°C.

According to other advantageous and non-limiting features of the embodiments of the invention, taken alone or in any technically feasible combinations:

- the maximum temperature is between 180°C and 220°C;
- the anneal in step d) reaches a maximum hold temperature between 300°C and 600°C;
- the weakening thermal budget is between 40% and 95% of a splitting thermal budget; ~~the splitting thermal budget leading to spontaneous initiation of the~~

~~splitting wave in the buried weakened plane during the anneal;~~

- the initiation in step e) takes place directly after the anneal in step d), before the hottest region of the bonded structure reaches a temperature below 150°C;
- the anneal in step d) takes place in a horizontally or vertically configured heat treatment apparatus, suitable for batch-treating a plurality of bonded structures, and the initiation in step e) takes place when the bonded structures exit the apparatus;
- the application of a stress to the buried weakened plane corresponds to the application of a local mechanical load to the bonded structure, in particular to the periphery of said structure;
- the local mechanical load is applied by inserting a wedge at the bonding interface of the bonded structure, between chamfered edges of the donor substrate and of the carrier substrate, respectively, of said bonded structure;
- the local mechanical load is applied in a region of the bonded structure which experiences lower temperatures when there is a temperature gradient across the bonded structure in step e);
- the local mechanical load is applied to the bonded structure when the temperature gradient is about 80°C;

CLAIMS

1. ~~A~~ Process for transferring a useful layer to a carrier substrate, comprising the following steps:
 - a) providing a donor substrate including a buried weakened plane, the useful layer being delimited by a front face of the donor substrate and the buried weakened plane;
 - b) providing a carrier substrate;
 - c) joining the donor substrate, by its front face, to the carrier substrate along a bonding interface so as to form a bonded structure;
 - d) annealing the bonded structure ~~in order to apply by~~ applying a weakening thermal budget thereto and ~~to bringing~~ the buried weakened plane to a defined level of weakening,
the weakening thermal budget being less than a splitting thermal budget, the splitting thermal budget leading to spontaneous initiation of a splitting wave in the buried weakened plane during the anneal; and
 - e) after the annealing of the bonded structure to apply the weakening thermal budget, initiating ~~a the~~ a splitting wave in the buried weakened plane by applying a stress to the bonded structure, the splitting wave propagating in a self-sustained manner along the buried weakened plane ~~in order~~ to result in the useful layer being transferred to the carrier substrate;

wherein the splitting wave is initiated when the bonded structure is subjected, at least in its hottest region, to a temperature between 150°C and 250°C.
2. ~~Transfer~~ The process according to claim 1, wherein the maximum temperature in step e) is between 180°C and 220°C.

3. ~~Transfer~~ The process according to claim 1 or 2, wherein the anneal in step d) reaches a maximum hold temperature between 300°C and 600°C.
4. ~~Transfer~~ The process according to any one of claims 1 to 3, wherein the weakening thermal budget is between 40% and 95% of ~~a~~ the splitting thermal budget, ~~the splitting thermal budget leading to spontaneous initiation of the splitting wave in the buried weakened plane during the anneal.~~
5. ~~Transfer~~ The process according to any one of claims 1 to 4, wherein the initiation in step e) takes place directly after the anneal in step d), before the hottest region of the bonded structure reaches a temperature below 150°C.
6. ~~Transfer~~ The process according to any one of claims 1 to 5, wherein the anneal in step d) takes place in a horizontally or vertically configured heat treatment apparatus, ~~suitable~~ suitable for batch-treating a plurality of bonded structures, and wherein the initiation in step e) takes place when the bonded structures exit the apparatus.
7. ~~Transfer~~ The process according to any one of claims 1 to 6, wherein the application of a stress to the buried weakened plane corresponds to the application of a local mechanical load to the bonded structure, in particular to the periphery of said structure.
8. ~~Transfer~~ The process according to claim 7, wherein the local mechanical load is applied by inserting a wedge at the bonding interface of the bonded structure, between respective chamfered edges of the donor substrate and of the carrier substrate, ~~respectively,~~ of said bonded structure.

9. ~~Transfer~~The process according to claim 7 or 8, wherein the local mechanical load is applied in a region of the bonded structure which experiences lower temperatures when there is a temperature gradient across the bonded structure in step e).
10. ~~Transfer~~The process according to claim 9, wherein the local mechanical load is applied to the bonded structure when the temperature gradient is about 80°C.
11. ~~Transfer~~The process according to any one of claims 1 to 10, wherein the donor substrate and the carrier substrate ~~are made of~~comprise monocrystalline silicon, and wherein the buried weakened plane is formed by ion implantation of light species into the donor substrate, said light species being chosen from hydrogen and helium, or a combination of hydrogen and helium.