Claims

1. A method for transferring a thin film (10) onto a support substrate (2), comprising the following steps:

- supplying a bonded structure (100) comprising a donor substrate (1) and the support substrate (2), assembled by direct bonding at the respective front faces (1a, 2a) thereof along a bonding interface (3), the donor substrate (1) comprising a buried brittle plane (11),

- applying a fracture heat treatment to the bonded structure (100) to induce spontaneous separation along the buried brittle plane (11), associated with the growth of microcracks in said plane (11) through thermal activation, the separation leading to the transfer of a thin film (10) from the donor substrate (1) onto the support substrate (2), wherein the fracture heat treatment comprises:

- a temperature rise-rate of in excess of 1°C/s, at least between an initial temperature lower than 250°C and a plateau temperature greater than or equal to 500°C, and

- a temperature profile such that the bonded structure (100) is subjected to a temperature gradient varying between 40°C and 120°C between a central region and a peripheral region.

2. The method according to the preceding claim, comprising, prior to the fracture heat treatment, a pre-annealing applied to the bonded structure (100), so as to achieve a pre-ripening of the microcracks in the buried brittle plane (11), the thermal budget provided by the pre-annealing being insufficient to cause spontaneous separation.

3. The method according to one of the preceding claims, wherein the temperature gradient is between 40°C and 80°C.

4. The method according to one of the preceding claims, comprising a step of smoothing a front face (10a) of the thin film (10), following separation, by

annealing at a temperature in excess of 1000°C, in a neutral or reducing atmosphere, the fracture heat treatment and the smoothing step taking place in the same enclosure and equipment.

5. The method according to one of the preceding claims, wherein the buried brittle plane (11) is formed in the donor substrate (1) by implanting a light species such as hydrogen, helium or a combination of these two species.

6. The method according to one of the preceding claims, wherein the donor substrate (1) and/or the support substrate (2) have an insulating layer, at least on the side of their respective front face (1a, 2a), which forms a buried insulating layer, adjacent to the bonding interface (3), in the bonded structure (100).

7. The method according to one of the preceding claims, wherein the thin film (10) from the donor substrate (1) is made of monocrystalline silicon, and the support substrate (2) comprises monocrystalline silicon, to form a stacked SOI structure (110).