Claims

1. A method for producing a semiconductor structure comprising the following steps:

a) providing a working layer made of a semiconductor material having a free face to be joined,

b) providing a carrier substrate made of a semiconductor material having a free face to be joined,

c) depositing a film composed of a semiconductor material different from that or those of the working layer and of the carrier substrate, having a thickness of less than 50 nm, on the free face to be joined of the working layer and/or on the free face to be joined of the carrier substrate,

d) forming an intermediate structure, comprising directly joining, along a bonding interface extending along a main plane, the free faces to be joined of the working layer and of the carrier substrate, respectively, the intermediate structure comprising an encapsulated film originating from the one or more film(s) deposited during step c),

e) annealing the intermediate structure at a temperature higher than or equal to a critical temperature, so as to bring about segmentation of the encapsulated film and form the semiconductor structure comprising an interface region between the working layer and the carrier substrate, said interface region comprising:

- regions of direct contact between the working layer and the carrier substrate, and

- agglomerates comprising the semiconductor material of the film, and having a thickness, along an axis normal to the main plane, of less than or equal to 250 nm; the regions of direct contact and the agglomerates being adjacent in the main plane.

2. The production method according to the preceding claim, wherein:

• in step a), the free face to be joined of the working layer comprises a native oxide and/or, in step b), the free face to be joined of the carrier substrate comprises a native oxide;

• in step e), the agglomerates of the interface region trap the oxygen originating from the native oxide(s).

3. The production method according to one of the preceding claims, wherein step a) comprises an implantation of light species in a donor substrate, to form a buried fragile plane which delimits, with a front face of the donor substrate, the working layer.

4. The production method according to claim 3, wherein step a) comprises the formation of the donor substrate by epitaxy of a donor layer on an initial substrate, the implantation being carried out subsequently, in the donor layer.

5. The production method according to claim 3 or 4, wherein step d) comprises, after the direct assembly giving rise to a bonded assembly comprising the donor substrate and the carrier substrate, a separation at the buried fragile plane, in order to form, on the one hand, the intermediate structure comprising the working layer, the encapsulated film and the carrier substrate, and on the other hand, the remainder of the donor substrate.

6. The production method according to one of the preceding claims, wherein the thickness of the deposited film in step c) is less than or equal to 10 nm, or less than or equal to 5 nm, or less than or equal to 3 nm, or even less than or equal to 2 nm.

7. The production method according to claim 6, wherein the thickness of the deposited film in step c) is less than 10 nm, and the agglomerates have a thickness, along an axis normal to the main plane, of less than or equal to 50 nm.

8. The production method according to one of the preceding claims, wherein the critical temperature is between 500°C and 1,800°C, depending on the nature of the semiconductor material of the film and of the semiconductor material(s) of the working layer and of the carrier substrate.

9. The production method according to one of the preceding claims, wherein the semiconductor material of the working layer is silicon carbide and has a monocrystalline, polycrystalline or amorphous structure.

10. The production method according to one of the preceding claims, wherein the semiconductor material of the carrier substrate is silicon carbide and has a monocrystalline, polycrystalline or amorphous structure.

11. The production method according to one of the preceding claims, wherein the semiconductor material of the film is chosen from silicon or germanium.

12. The production method according to one of the preceding claims, wherein the agglomerates have a thickness of less than or equal to 40 nm, or less than or equal to 30 nm.

13. The production method according to one of the preceding claims, wherein the agglomerates are in the form of:

- first precipitates comprising the semiconductor material of the film,
- second precipitates comprising the semiconductor material of the film and oxygen, and/or
- cavities lined with a compound comprising the semiconductor material of the film and oxygen.

14. The production method according to claim 13, wherein the second precipitates have a substantially triangular shape in a transverse plane normal to the main plane.

15. An electronic component produced on and/or in a working layer of a semiconductor structure resulting from the production method according to one of the preceding claims, the semiconductor structure comprising:

- the working layer made of a semi-conductor material, extending in a main plane,

- a carrier substrate made of a semiconductor material,

- and an interface region between the working layer and the carrier substrate, extending parallel to the main plane, the interface region comprising regions of direct contact between the working layer and the carrier substrate, and agglomerates, comprising a semiconductor material different from that or those of the working layer and of the carrier substrate, and having a thickness, along an axis normal to the main plane, of less than or equal to 250 nm; the regions of direct contact and the agglomerates being adjacent in the main plane.

16. The electronic component according to claim 15, comprising at least one electrical contact on and/or in the carrier substrate, at a rear face of the semiconductor structure for a power application.