

CLAIMS

1. ~~A~~ Ttemporary substrate ~~(10)~~, which is detachable at a detachment temperature higher than 1000°C and comprises:
 - a semiconductor working layer ~~(1)~~ extending along a main plane ~~(x, y)~~,
 - a carrier substrate ~~(3)~~,
 - an intermediate layer ~~(2)~~ arranged between the working layer ~~(1)~~ and the carrier substrate ~~(3)~~, and having a thickness, along an axis ~~(z)~~ normal to the main plane ~~(x, y)~~, less than 20 nm,
 - a bonding interface ~~(4)~~ located in the intermediate layer ~~(2)~~ or adjacent thereto,
 - atoms ~~(2a)~~ of at least one gaseous species that are distributed according to a concentration profile ~~(2b)~~ along the axis ~~(z)~~ normal to the main plane ~~(x, y)~~, with a maximum concentration higher than $10^{21}/\text{cm}^3$, said atoms ~~(2a)~~ remaining trapped in the intermediate layer ~~(2)~~ and/or in an adjacent layer of the carrier substrate ~~(3)~~ with a thickness less than or equal to 10 nm and/or in an adjacent sublayer of the working layer ~~(1)~~ with a thickness less than or equal to 10 nm when the temporary substrate ~~(10)~~ is subjected to a temperature lower than the detachment temperature, and said atoms ~~(2a)~~ being intended to diffuse to a detachment interface when the temporary substrate ~~(10)~~ is subjected to a temperature higher than or equal to the detachment temperature.

2. ~~The~~ ttemporary substrate ~~(10)~~ according to the preceding claim, wherein the intermediate layer ~~(2)~~ is formed by at least one material chosen from among tungsten, nickel, titanium, aluminium, molybdenum, tantalum, titanium nitride, tantalum nitride, amorphous silicon.

3. ~~—The~~ temporary substrate ~~(10)~~ according to either of the preceding claims, wherein the gaseous species is nitrogen, helium, argon, xenon and/or hydrogen.
4. ~~—The~~ temporary substrate ~~(10)~~ according to one of the preceding claims, wherein the carrier substrate ~~(3)~~ comprises a material the coefficient of thermal expansion of which is equal to or close to that of the working layer ~~(1)~~.
5. ~~—PA~~ process for producing a temporary substrate ~~(10)~~ according to one of the preceding claims, comprising:
 - a) a step of providing a donor substrate ~~(11)~~,
 - b) a step of implanting light ions chosen from among hydrogen, helium, or a combination of the two into the donor substrate ~~(11)~~ in order to form a buried weakened plane ~~(5)~~ in said donor substrate ~~(11)~~, the buried weakened plane ~~(5)~~ delimiting a surface working layer ~~(1)~~ with a front face ~~(11a)~~ of the donor substrate ~~(11)~~,
 - c) a step of providing a carrier substrate ~~(3)~~ having a front face ~~(3a)~~,
 - d) a step of depositing at least one film ~~(21, 22)~~ on the front face ~~(11a)~~ of the donor substrate ~~(11)~~ and/or on the front face ~~(3a)~~ of the carrier substrate ~~(3)~~, the at least one film being intended to form the intermediate layer ~~(2)~~,
 - e) joining the donor substrate ~~(11)~~ and the carrier substrate ~~(3)~~ such that the at least one film ~~(21, 22)~~ is arranged between said substrates ~~(11, 3)~~ so as to form the intermediate layer ~~(2)~~,
 - f) separating along the buried weakened plane ~~(5)~~ in order to form, on the one hand, the temporary substrate ~~(10)~~ and, on the other hand, the rest of the donor substrate ~~(11')~~,

the production process further comprising a step of introducing atoms ~~(2a)~~ of the at least one gaseous species:

- into the donor substrate ~~(11)~~ and/or into the carrier substrate ~~(3)~~ to a depth less than or equal to 10 nm from their respective front faces ~~(11a, 3a)~~, before deposition step d), or
- into the at least one film ~~(21, 22)~~, after deposition step d), or
- into the intermediate layer ~~(2)~~, after separation step f).

6. ~~—The P~~process for producing a temporary substrate ~~(10)~~ according to ~~the preceding~~ claim 5, wherein step f) comprises a heat treatment at a temperature of between 900°C and 1200°C.

7. ~~—A P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to one of Claims 1 to 4 to a receiver substrate ~~(50)~~, the process comprising:

- g) a step of forming a detachable structure ~~(510)~~ comprising a receiver substrate ~~(50)~~ arranged on the working layer ~~(1)~~ of the temporary substrate ~~(10)~~, the formation step involving a treatment at a first temperature higher than or equal to 1000°C,
- h) a step of detaching the detachable structure ~~(510)~~ along a detachment interface in or adjacent to the intermediate layer ~~(2)~~, the detachment step comprising a heat treatment at a detachment temperature higher than the first temperature in order to form, on the one hand, a composite structure ~~(51)~~ comprising the working layer ~~(1)~~ arranged on the receiver substrate ~~(50)~~ and, on the other hand, the carrier substrate ~~(3)~~.

8. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to ~~the preceding~~ claim 7, wherein step g) comprises the deposition of the receiver substrate ~~(50)~~ on a free face of the working layer ~~(1)~~ of the temporary substrate ~~(10)~~.
9. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to ~~the preceding~~ claim 8, wherein the deposition of the receiver substrate ~~(50)~~ is performed by, thermal or enhanced, chemical vapour deposition, or by evaporation, at a temperature higher than or equal to 1000°C, preferably higher than or equal to 1200°C.
10. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to ~~either of the two preceding claims~~ claim 8 or 9, wherein the receiver substrate ~~(50)~~ formed is made of polycrystalline silicon carbide.
11. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to one of Claims 7 to 10, wherein step h) comprises a heat treatment at a temperature higher than or equal to 1400°C, or even higher than or equal to 1500°C.
12. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to one of Claims 7 to 11, comprising a step i) of finishing the composite structure ~~(51)~~, including an operation of chemical cleaning and/or chemical etching and/or chemical-mechanical polishing of the free face of the working layer ~~(1)~~, front face ~~(51a)~~ of the composite structure ~~(51)~~.

13. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to ~~the preceding~~ claim 12, wherein step i) comprises an operation of chemical cleaning and/or chemical etching and/or mechanical grinding and/or chemical-mechanical polishing of the free face of the receiver substrate ~~(50)~~, back face ~~(50b)~~ of the composite structure ~~(51)~~.
14. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to one of Claims 7 to 13, comprising a step g') of treating the detachable structure ~~(510)~~, prior to detachment step h), including an operation of chemical cleaning and/or chemical etching and/or mechanical grinding and/or chemical-mechanical polishing of the back face ~~(50b)~~ of the receiver substrate ~~(50)~~.
15. ~~—The P~~process for transferring a working layer ~~(1)~~ from a temporary substrate ~~(10)~~ according to one of Claims 7 to 14, comprising the production of electronic components in or on the working layer ~~(1)~~ of the composite structure ~~(51)~~, potentially after the epitaxial growth of an additional layer on the working layer ~~(1)~~.