

intended for accommodating power devices. High deposition temperatures are also advantageous in that they allow high growth speeds.

SUBJECT MATTER OF THE INVENTION

Embodiments of the present invention relate to a solution as an alternative to those of the prior art, and aims to completely or partly overcome the aforementioned drawbacks. Embodiments of the invention relate in particular to a process for producing a composite structure comprising a thin layer of c-SiC arranged on a carrier substrate made of p-SiC resulting from high-temperature deposition.

BRIEF DESCRIPTION OF THE INVENTION

According to an aspect of the invention, there is provided a process for producing a composite structure including a thin layer of monocrystalline silicon carbide arranged on a carrier substrate made of polycrystalline silicon carbide. The process includes:

- a step of providing an initial substrate made of monocrystalline silicon carbide,
- a first deposition step at a temperature higher than 1000°C to form an intermediate layer of polycrystalline silicon carbide on the initial substrate, the thickness of the intermediate layer being greater than or equal to 1.5 microns,
- a step of implanting ~~light~~ hydrogen and/or helium ionic species through the intermediate layer to form a buried brittle plane in the initial substrate, delimiting the thin layer between said buried brittle plane and the intermediate layer,

- a second deposition step at a temperature higher than 1000°C to form an additional layer of polycrystalline silicon carbide on the intermediate layer, said intermediate layer and the additional layer forming the carrier substrate, a separation along the buried brittle plane taking place during the second deposition step.

According to other advantageous and non-limiting embodiments of the invention, considered alone or according to any technically feasible combination:

- the first deposition step and the second deposition step are carried out by chemical vapour deposition at a temperature between 1000°C and 1600°C, preferably between 1200°C and 1600°C;
- the first deposition step and the second deposition step are carried out at the same temperature;
- the first deposition step and/or the second deposition step are carried out starting from chlorinated precursors;
- upon completion of the first deposition step, the thickness of the intermediate layer is greater than or equal to 3 microns, or even greater than or equal to 5 microns;
- ~~• the implanted light species are chosen from hydrogen and/or helium;~~
- the hydrogen ions are implanted at an energy between 260 keV and 2000 keV, and at a dose between 5E16/cm² and 1E17/cm²;
- the process includes, before the first deposition step, a step of preparing the initial substrate including at least one operation of deoxidizing a front surface of said initial substrate;
- the process includes, after the second deposition step, finishing steps applied to the composite structure, said steps including chemical-mechanical polishing of a free

CLAIMS

1. A ~~Process~~ for producing a composite structure ~~(1)~~ comprising a thin layer ~~(10)~~ of monocrystalline silicon carbide arranged on a carrier substrate ~~(20)~~ made of polycrystalline silicon carbide, the process comprising:
 - a step of providing an initial substrate ~~(11)~~ made of monocrystalline silicon carbide,
 - a first deposition step at a temperature higher than 1000°C to form an intermediate layer ~~(21)~~ of polycrystalline silicon carbide on the initial substrate ~~(11)~~, the thickness of the intermediate layer ~~(21)~~ being greater than or equal to 1.5 microns,
 - a step of implanting ~~light~~ hydrogen and/or helium ionic species through the intermediate layer ~~(21)~~ to form a buried brittle plane ~~(12)~~ in the initial substrate ~~(11)~~, delimiting the thin layer ~~(10)~~ between said buried brittle plane ~~(12)~~ and the intermediate layer ~~(21)~~,
 - a second deposition step at a temperature higher than 1000°C to form an additional layer ~~(22)~~ of polycrystalline silicon carbide on the intermediate layer ~~(21)~~, said intermediate layer ~~(21)~~ and the additional layer ~~(22)~~ forming the carrier substrate ~~(20)~~,
 a separation along the buried brittle plane ~~(12)~~ taking place during the second deposition step.

2. The Production ~~process~~ according to ~~the preceding~~ claim 1, wherein the first deposition step and the second deposition step are carried out by chemical vapour deposition at a temperature between 1000°C and 1600°C, preferably between 1200°C and 1600°C.

3. The Production ~~process~~ according to ~~the preceding~~ claim 2, wherein the first deposition step and/or the second

deposition step are carried out starting from chlorinated precursors.

4. ~~The Production~~ process according to one of the preceding claims, wherein, upon completion of the first deposition step, the thickness of the intermediate layer ~~(21)~~ is greater than or equal to 3 microns, or even greater than or equal to 5 microns.

~~5. Production process according to one of the preceding claims, wherein the implanted light species are chosen from hydrogen and/or helium.~~

~~65.~~ The Production process according to one of the preceding claims, wherein the hydrogen ions are implanted at an energy between 260 keV and 2000 keV, and at a dose between $5 \times 10^{16}/\text{cm}^2$ and $1 \times 10^{17}/\text{cm}^2$.

~~76.~~ The Production process according to one of the preceding claims, comprising, before the first deposition step, a step of preparing the initial substrate ~~(11)~~ including at least one operation of deoxidizing a front surface of said initial substrate ~~(11)~~.