CLAIMS

1. Process for manufacturing a composite structure comprising a thin layer of monocrystalline silicon carbide arranged on a carrier substrate made of silicon carbide, the process comprising:

a) a step of providing an initial substrate made of monocrystalline silicon carbide,

b) a step of epitaxial growth of a monocrystalline silicon carbide donor layer on the initial substrate, to form a donor substrate, the donor layer having a density of crystal defects less than that of the initial substrate,

c) a step of ion implantation of light species into the donor layer, to form a buried brittle plane delimiting the thin layer between said buried brittle plane and a free surface of said donor layer,

d) a step of direct liquid injection-chemical vapour deposition, at a temperature below 1000°C, to form a carrier layer directly on the free surface of the donor layer, said carrier layer being formed by an at least partially amorphous SiC matrix,

e) a step of separating along the buried brittle plane to form, on the one hand, an intermediate composite structure comprising the thin layer on the carrier layer and, on the other hand, the rest of the donor substrate,

f) a step of heat treatment at a temperature of between 1000°C and 1800°C, applied to the intermediate composite structure, to crystallize the carrier layer and to form the polycrystalline carrier substrate,

g) a step of mechanical and/or chemical treatment(s) of the composite structure, the treatment(s) being applied to a free face of the carrier substrate, the rear face of the composite structure, and/or to a free face of the thin layer, the front face of the composite structure.

2. Manufacturing process according to the preceding claim, in which the deposition step d) is performed at a temperature of between 100°C and 700°C, or even preferentially between 200°C and 600°C.

3. Manufacturing process according to either of the preceding claims, in which the deposition step d) is performed at a pressure of between 1 Torr and 500 Torr.

4. Manufacturing process according to any one of the preceding claims, in which the precursors used during the deposition step d) are chosen from polysilylethylene and disilabutane.

5. Manufacturing process according to any one of the preceding claims, in which, on conclusion of the deposition step d), the carrier layer has a thickness of greater than or equal to 10 microns, or even a thickness of greater than or equal to 50 microns, or even a thickness of greater than or equal to 100 microns, or even a thickness of greater than or equal to 200 microns.

6. Manufacturing process according to any one of the preceding claims, in which chemical etching, mechanical grinding and/or mechanochemical polishing is (are) applied to a free face of the carrier layer, between step d) and step e).

7. Manufacturing process according to any one of the preceding claims, in which step a) comprises the formation, on the initial substrate, of a monocrystalline conversion layer, to convert basal plane dislocation defects of the initial substrate into threading edge dislocation defects.

8. Manufacturing process according to any one of the preceding claims, in which the epitaxial growth step b) is performed at a temperature above 1200°C, preferentially between 1500°C and 1650°C.

9. Manufacturing process according to any one of the preceding claims, in which the separation step e) is performed at a temperature above the deposition temperature of step d).

10. Manufacturing process according to any one of Claims 1 to 8, in which the separation step e) takes place during the deposition step d), preferentially at the end of step d).

11. Manufacturing process according to any one of Claims 1 to 9, in which the separation step e) and the crystallization step f) are performed during the same heat treatment.

12. Manufacturing process according to any one of the preceding claims, in which step g) comprises simultaneous mechanochemical polishing of a front face and of a rear face of the composite structure.

13. Manufacturing process according to any one of the preceding claims, comprising a step of reconditioning the rest of the donor substrate for the purpose of reuse as initial substrate or as donor substrate.