Claims

[Claim 1] Process for fabricating a substrate for epitaxial growth of a layer of gallium nitride (GaN), of aluminium gallium nitride (AlGaN) or of indium gallium nitride (InGaN), comprising the following successive steps:
- providing a single-crystal semi-insulating silicon-carbide donor substrate ~~(10)~~,
- implanting ionic species into the donor substrate ~~(10)~~ so as to form a weakened region ~~(12)~~ that defines a thin layer ~~(11)~~ of single-crystal semi-insulating SiC to be transferred,
- bonding the donor substrate ~~(10)~~ to a first receiver substrate ~~(20)~~ via a bonding layer ~~(21)~~,
- detaching the donor substrate ~~(10)~~ along the weakened region ~~(12)~~ so as to transfer the thin layer ~~(11)~~ of single-crystal semi-insulating SiC to the first receiver substrate ~~(20)~~,
- forming an additional layer ~~(13)~~ of semi-insulating SiC on the transferred thin layer ~~(11)~~ of semi-insulating SiC,
- bonding the additional layer ~~(13)~~ of semi-insulating SiC to a second receiver substrate ~~(40)~~ having a high electrical resistivity,
- removing at least one portion of the bonding layer ~~(21)~~ so as to detach the first receiver substrate ~~(20)~~ and uncover the transferred layer ~~(11)~~ of single-crystal semi-insulating SiC.

[Claim 2] Process according to Claim 1, wherein the first receiver substrate ~~(20)~~ and the donor substrate ~~(10)~~ have a difference in coefficient of thermal expansion smaller than or equal to $3x10^{-6}$ K^{-1}.

[Claim 3] Process according to either of Claims 1 and 2, wherein the first receiver substrate ~~(20)~~ is an SiC substrate having a crystal quality lower than that of the donor substrate.

[Claim 4] Process according to one of Claims 1 to 3, wherein the thickness of the thin layer ~~(11)~~ of single-crystal semi-insulating SiC transferred to the first receiver substrate ~~(20)~~ has a thickness smaller than 1 µm.

[Claim 5] Process according to one of Claims 1 to 4, wherein the bonding layer ~~(21)~~ is formed from a material that remains thermally stable during the formation of the layer ~~(13)~~ of semi-insulating SiC and that is able to be removed from the interface between the transferred layer ~~(11)~~ of single-crystal semi-insulating SiC and the first receiver substrate ~~(20)~~.

[Claim 6] Process according to one of Claims 1 to 5, wherein the bonding layer ~~(21)~~ is a layer of silicon nitride or of gallium nitride.

[Claim 7] Process according to one of Claims 1 to 6, wherein removing at least one portion of the bonding layer ~~(21)~~ comprises a chemical etch, a delamination by laser and/or the application of a mechanical stress.

[Claim 8] Process according to one of Claims 1 to 7, wherein the additional layer ~~(13)~~ of semi-insulating SiC is formed by simultaneously depositing silicon, carbon and vanadium.

[Claim 9] Process according to one of Claims 1 to 8, wherein the second receiver substrate ~~(40)~~ is a silicon substrate having an electrical resistivity higher than or equal to 100 Ω.cm.

[Claim 10] Process according to Claim 9, wherein the additional layer ~~(13)~~ of semi-insulating SiC has a thickness comprised between 1 and 5 µm.

[Claim 11] Process according to one of Claims 1 to 8, wherein the second receiver substrate ~~(40)~~ is a polycrystalline SiC substrate, a diamond substrate or a polycrystalline AlN substrate.

[Claim 12] Process according to Claim 11, wherein the additional layer ~~(13)~~ of semi-insulating SiC has a thickness smaller than or equal to 80 µm.

[Claim 13] Process according to one of Claims 1 to 12, wherein:
- the ionic species are implanted through the silicon face ~~(10-Si)~~ of the donor substrate ~~(10)~~,
- the silicon face ~~(10-Si)~~ of the donor substrate ~~(10)~~ is bonded to the first receiver substrate ~~(20)~~,
so that, after the bonding layer ~~(21)~~ has been removed, the silicon face of the transferred layer ~~(11)~~ of single-crystal semi-insulating SiC is uncovered.

[Claim 14] Process according to one of Claims 1 to 13, further comprising a step of recycling the segment ~~(10')~~ of the donor substrate detached from the transferred layer ~~(11)~~, with a view to forming a new donor substrate.

[Claim 15] Process for fabricating by epitaxy a layer of gallium nitride, comprising:
- providing a substrate fabricated using the process according to one of Claims 1 to 13,
- performing epitaxial growth of the layer ~~(50)~~ of gallium nitride on the silicon face ~~(11-Si)~~ of the transferred layer ~~(11)~~ of single-crystal semi-insulating SiC of said substrate.

[Claim 16] Process according to Claim 15, wherein the layer ~~(50)~~ of gallium nitride has a thickness comprised between 1 and 2 µm.

[Claim 17] Process for fabricating a high-electron-mobility transistor (HEMT), comprising:
- fabricating by epitaxy a layer ~~(50)~~ of gallium nitride using the process according to either of Claims 15 and 16,
- forming a heterojunction by epitaxy of a layer of a III-N material different from gallium nitride on the layer ~~(50)~~ of gallium nitride,
- forming a channel of the transistor level with said heterojunction,
- forming a source, a drain and a gate of the transistor on the channel.