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,
- implanting ionic species into the donor substrate so as to form a weakened region that defines a thin layer of single-crystal semi-insulating SiC to be transferred,
- bonding the donor substrate to a first receiver substrate via a bonding layer,
- detaching the donor substrate along the weakened region so as to transfer the thin layer of single-crystal semi-insulating SiC to the first receiver substrate,
- forming an additional layer of semi-insulating SiC on the transferred thin layer of semi-insulating SiC,
- bonding the additional layer of semi-insulating SiC to a second receiver substrate having a high electrical resistivity,
- removing at least one portion of the bonding layer so as to detach the first receiver substrate and uncover the transferred layer of single-crystal semi-insulating SiC.

[Claim 2] Process according to Claim 1, wherein the first receiver substrate and the donor substrate 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 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 of single-crystal semi-insulating SiC transferred to the first receiver substrate has a thickness smaller than 1 μm.

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

[Claim 6] Process according to one of Claims 1 to 5, wherein the bonding layer 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 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 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 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 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 is a polycrystalline SiC substrate, a diamond substrate or a polycrystalline AlN substrate.

[Claim 12] Process according to Claim 11, wherein the additional layer 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 of the donor substrate,
- the silicon face of the donor substrate is bonded to the first receiver substrate, so that, after the bonding layer has been removed, the silicon face of the transferred layer 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 of the donor substrate detached from the transferred layer, 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 of gallium nitride on the silicon face of the transferred layer of single-crystal semi-insulating SiC of said substrate.

[Claim 16] Process according to Claim 15, wherein the layer 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 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 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.