CLAIMS

1. A seed substrate for epitaxial growth comprising:

a support substrate;

a planarizing layer provided on an upper surface of the support substrate, the planarizing layer having a thickness of 0.5 to 3.0 μm;

a seed crystal layer provided on an upper surface planarizing layer; and

a stress-adjusting layer provided on a bottom surface of the support substrate, the stress-adjusting layer has a thermal expansion coefficient that enables further correction of the warpage after the planarizing layer is provided and consists of polycrystalline Si prepared by a method selected from at least the sputtering, plasma CVD, and LPCVD,

wherein the support substrate comprises:

a core formed by group III nitride polycrystalline ceramics; and

an encapsulating layer that directly encapsulates the core, the encapsulating layer having a thickness of 0.05 to 1.5 μm, and

the seed crystal layer is provided by thin-film transfer of 0.1 to 1.5 μm of a surface layer of Si <111> single crystal with oxidation-induced stacking faults of 10 defects/cm^2 or less.

2. A seed substrate for epitaxial growth comprising:

a support substrate;

a planarizing layer provided on an upper surface of the support substrate, the planarizing layer having a thickness of 0.5 to 3.0 μm;

a Si<111> single-crystal seed crystal layer provided on an upper surface planarizing layer; and

a stress-adjusting layer provided on a bottom surface of

the support substrate, the stress-adjusting layer has a thermal expansion coefficient that enables further correction of the warpage after the planarizing layer is provided and consists of polycrystalline Si prepared by a method selected from at least the sputtering, plasma CVD, and LPCVD,

wherein the support substrate comprises:

a core formed by group III nitride polycrystalline ceramics; and

an encapsulating layer that directly encapsulates the core, the encapsulating layer having a thickness of 0.05 to 1.5 μm, and

the seed crystal layer has oxidation-induced stacking faults of 10 defects/cm^2 or less, and the thickness of the seed crystal layer is 0.1 to 1.5 μm.

3. The seed substrate for epitaxial growth as claimed in claim 1 or 2, wherein the group III nitride polycrystalline ceramics forming the core are AlN ceramics.

4. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 3, wherein the encapsulating layer includes at least a layer of Si_3N_4.

5. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 4, wherein the planarizing layer comprises SiO_2 and/or silicon oxynitride ($Si_xO_yN_z$) or AlAs.

6. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 5, wherein the electrical resistivity (at room temperature) of Si <111> forming the seed crystal layer is 1 kΩ-cm or higher.

7. The seed substrate for epitaxial growth as claimed in claim 1 or 2, wherein the stress-adjusting layer is provided as

polycrystalline Si with SiO_2 and/or silicon oxynitride ($Si_xO_yN_z$) interposing just below the bottom surface of the support substrate.

8. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 7, wherein the encapsulation layer is deposited by LPCVD.

9. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 8, wherein the planarizing layer is formed by depositing SiO_2 and/or silicon oxynitride ($Si_xO_yN_z$) or AlAs on one or all sides of the top surface of the support substrate by one of plasma CVD, LPCVD, and low-pressure MOCVD.

10. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 9, wherein the seed crystal layer is provided by ion implanting hydrogen and/or He into Si <111> single crystal with oxidation-induced stacking faults of 10 defects/cm^2 or less and electrical resistivity (at room temperature) of 1 kΩ-cm or higher, followed by transferring a thin film of the Si <111> single crystal of 0.1 to 1.5 μm by physical means at 450°C or lower.

11. A semiconductor substrate on which a III-V semiconductor thin film is deposited on the top surface of a seed substrate for epitaxial growth according to any one of claims 1 to 10.

12. The semiconductor substrate as claimed in claim 11, wherein the III-V semiconductor thin film is a nitride semiconductor thin film containing Ga and/or Al.

13. A manufacturing method of seed substrate for epitaxial growth comprising:

preparing a core consisting of group III nitride

polycrystalline ceramics;

obtaining a support substrate by depositing an encapsulating layer so as to directly wrap the core, the encapsulating layer having a thickness of 0.05 to 1.5 μm;

depositing a planarizing layer on an upper surface of the support substrate, the planarizing layer having a thickness of 0.5 to 3.0 μm;

providing a stress-adjusting layer on a bottom surface of the support substrate, wherein the stress-adjusting layer has a thermal expansion coefficient that enables further correction of the warpage after the planarizing layer is deposited and consists of polycrystalline Si prepared by a method selected from at least the sputtering, plasma CVD, and LPCVD; and

providing a seed crystal layer by thin-film transfer of 0.1 to 1.5 μm of the surface layer of Si <111> single crystal with oxidation-induced stacking faults of 10 defects/cm^2 or less on the top surface of the planarizing layer.

14. The manufacturing method of seed substrate for epitaxial growth as claimed in claim 13, wherein the encapsulation layer is deposited by the LPCVD.

15. The manufacturing method of seed substrate for epitaxial growth as claimed in claim 13 or 14, wherein the planarizing layer is formed by depositing SiO_2 and/or silicon oxynitride ($Si_xO_yN_z$) or AlAs on one or all sides of the top surface of the support substrate by one of plasma CVD, LPCVD, and low-pressure MOCVD.

16. The manufacturing method of seed substrate for epitaxial growth as claimed in any one of claims 13 to 15, wherein in the step of providing the seed crystal layer, the seed crystal layer is provided by ion implanting hydrogen and/or He into Si <111> single crystal with oxidation-induced stacking faults of 10

defects/cm^2 or less and electrical resistivity (at room temperature) of 1 kΩ-cm or more, followed by transferring a thin film of the Si <111> single crystal of 0.1 to 1.5 μm by physical means at 450°C or less.

17. A manufacturing method of semiconductor substrate comprising:

manufacturing a seed substrate for epitaxial growth by the manufacturing method of seed substrate for epitaxial growth as claimed in any one of claims 13 to 16; and

depositing a III-V semiconductor thin film on the top surface of the seed substrate for epitaxial growth.