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 between 0.5 μm and 3.0 μm, inclusive; and

a seed crystal layer provided on an upper surface planarizing layer,

wherein the support substrate comprises:

a core of polycrystalline ceramics with surface voids filled and flattened by Al or Si oxide, nitride, oxynitride, or a mixture of these; and

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

the seed crystal layer is provided by thin-film transfer of 0.1 to 1.5 μm of surface layer of Si <111> single crystal, and

the seed crystal layer is Si<111> with oxidation-induced stacking faults of 10 defects/cm^2 or less.

2. The seed substrate for epitaxial growth as claimed in claim 1, wherein the surface voids of the polycrystalline ceramics are filled and flattened by applying a silicone compound and/or a silicone compound with at least SiO_2, Si_3N_4, or AlN powder to the surface of the polycrystalline ceramics, followed by treatment in an N_2 atmosphere.

3. The seed substrate for epitaxial growth as claimed in claim

1 or 2, wherein the silicone compound is alkoxysilane and/or condensate thereof.

4. The seed substrate for epitaxial growth as claimed in any one of claims 1 to 3, wherein the group III nitride polycrystalline ceramics forming the core are AlN ceramics.

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

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

7. The seed substrate for epitaxial growth, as claimed in any one of claims 1 to 6, further comprises a stress-adjusting layer made of a semiconducting compound such as polycrystalline Si on a bottom surface of the support substrate.

8. The seed substrate for epitaxial growth as claimed claim 7, wherein the stress-adjusting layer is polycrystalline Si with SiO_2 and/or silicon oxynitride ($Si_xO_yN_z$) interposing just below the bottom surface of the support substrate.

9. A semiconductor substrate on which a III-V semiconductor thin film is deposited on a top surface of the seed substrate for epitaxial growth according to any one of claims 1 to 8.

10. The semiconductor substrate, as claimed in claim 9, wherein

the III-V semiconductor thin film is a nitride semiconductor thin film containing Ga and/or Al.

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

preparing a core consisting of group III nitride polycrystalline ceramics with surface voids filled by Al or Si oxide, nitride, oxynitride, or a mixture of these materials and flattened;

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

depositing a planarizing layer on an upper surface of the support substrate, the planarizing layer having a thickness of between 0.5 μm and 3.0 μm, inclusive; 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 on an upper surface of the planarizing layer, 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/cm2 or less, 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.

12. The manufacturing method of seed substrate for epitaxial growth as claimed in claim 11, wherein the encapsulating layer is deposited by the LPCVD.

13. The manufacturing method of seed substrate for epitaxial

growth as claimed in claim 11 or 12, wherein the planarizing layer is formed by depositing SiO2 and/or silicon oxynitride (SixOyNz) or AlAs on one or all sides of the support substrate by one of plasma CVD, LPCVD, and low-pressure MOCVD.

14. The manufacturing method of seed substrate for epitaxial growth as claimed in any one of claims 11 to 13, further provides a stress-adjusting layer on a bottom surface of the support substrate.

15. The manufacturing method of seed substrate for epitaxial growth as claimed in claim 14, wherein the stress-adjusting layer consists of polycrystalline Si made by a method selected from at least sputtering, plasma CVD, and LPCVD that can further correct the warpage after the planarizing layer is provided.

16. A manufacturing method of semiconductor substrate comprising steps of:

manufacturing a seed substrate for epitaxial growth by the manufacturing method of seed substrate for epitaxial growth as claimed in any one of claims 11 to 15; and

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