SUMMARY OF INVENTION

Technical Problem

[0008]

Embodiments of the invention, which has been made under the above-mentioned circumstances, seek to provide a composite substrate comprising an inorganic insulating sintered body substrate which is opaque to visible light, has high heat conductivity and a low loss in the high-frequency region, and is cheap, and a single crystal semiconductor thin film deposited thereon, the composite substrate being suppressed in contamination with metal impurities from the sintered body.

Solution to Problem

[0009]

The inventors have found that the above object is effectively attained by providing a composite substrate comprising an inorganic insulating sintered body substrate having a heat conductivity of at least 5 W/m·K and a volume resistivity of at least 1×10^{8} Ω·cm, a single crystal semiconductor film, and optionally, a thin layer of oxide, nitride or oxynitride disposed between the inorganic insulating sintered body substrate and the single crystal semiconductor film.

[0010]

According to an aspect of the present invention, there is provided

a composite substrate comprising an inorganic insulating sintered body substrate having a heat conductivity of at least 5 W/m·K and a volume resistivity of at least 1×10^{8} Ω·cm, a single crystal semiconductor film, and ~~optionally,~~ a thin layer disposed between the inorganic insulating sintered body substrate and the single crystal semiconductor film, said thin layer being composed of ~~at least one component selected from among an oxide, nitride, and oxynitride~~ silicon nitride

deposited by a chemical vapor deposition method, and being formed to cover the inorganic insulating sintered body substrate in entirety, the single crystal semiconductor film being bonded to only one surface of the inorganic insulating sintered body substrate via the thin layer.

CLAIMS:

1. A composite substrate comprising an inorganic insulating sintered body substrate having a heat conductivity of at least 5 W/m·K and a volume resistivity of at least 1×10^{8} Ω·cm, a single crystal semiconductor film, and ~~optionally,~~ a thin layer disposed between the inorganic insulating sintered body substrate and the single crystal semiconductor film, said thin layer being composed of ~~at least one component selected from among an oxide, nitride, and oxynitride~~ silicon nitride deposited by a chemical vapor deposition method, and being formed to cover the inorganic insulating sintered body substrate in entirety, the single crystal semiconductor film being bonded to only one surface of the inorganic insulating sintered body substrate via the thin layer.

2. The composite substrate of claim 1 wherein ~~said~~ the thin layer of silicon nitride is disposed solely between the inorganic insulating sintered body substrate and the single crystal semiconductor film~~is formed to cover the inorganic insulating sintered body substrate in entirety~~.

3. The composite substrate of claim 1 or 2 wherein the inorganic insulating sintered body is silicon nitride, aluminum nitride or SiAlON.

4. The composite substrate of any one of claims 1 to 3 wherein the single crystal semiconductor is single crystal silicon.

5. The composite substrate of any one of claims 1 to 4 wherein the inorganic insulating sintered body substrate has a thickness of 100 to 2,000μm~~said thin layer is a film of high purity SiO_2, Si_3N_4, or SiO_xN_y wherein $0 < x < 2$ and $0 < y < 1.3$, deposited by an electron beam evaporation or chemical vapor deposition method~~.

6. The composite substrate of any one of claims 1 to ~~4~~ 5, wherein ~~said~~ the thin layer has a thickness of 0.01 to 50μm ~~is of silicon nitride deposited by a chemical vapor deposition method~~.

7. The composite substrate of any one of claims 1 to 6, wherein the single crystal semiconductor film has a thickness of 0.01 to 100μm.

8. The composite substrate of any one of claims 1 to 7, wherein the single crystal semiconductor film is a flaking film from a single crystal semiconductor substrate.

9. The composite substrate of any one of claims 1 to 8, wherein the single crystal semiconductor film is a film formed by bonding a semiconductor layer of Si or SOI and thinning by mechanical and/or chemical means.

10. The composite substrate of any one of claims 1 to 9, wherein the single crystal semiconductor film is a film where a semiconductor device is to be formed.

11. The composition substrate of any one of claims 1 to 10, wherein the thin layer is a film to prevent metal impurities in the inorganic insulating sintered body substrate from leaching out or diffusing during the semiconductor device fabrication process using the composition substrate.

12. The composite substrate of any one of claims 1 to 11, wherein the concentration of Al in the thin layer is up to $1x10^{17}$ atoms/cm^3 and the concentration of Fe in the thin layer is up to $1x10^{17}$ atoms/cm^3.

~~7~~13. The composite substrate of any one of claims 1 to ~~6~~12, further comprising a layer of polycrystalline or amorphous silicon on at least the back surface of the composite substrate.