[CLAIMS]

[Claim 1]

A quartz glass crucible comprising:

a cylindrical side wall portion;

a bottom portion;

a corner portion connecting the side wall portion and the bottom portion to each other;

a transparent layer made of quartz glass that does not contain bubbles;

a bubble layer formed outside the transparent layer and made of quartz glass containing a large number of bubbles; and

a semi-molten layer formed outside the bubble layer and made of raw material silica powder solidified in a semi-molten state,

wherein a thickness of the bubble layer in the cylindrical side wall portion is la rger than that of the transparent layer in the cylindrical side wall portion,

a thickness of the bubble layer in the corner portion is larger than that of the t ransparent layer in the cylindrical side wall portion,

an infrared transmissivity of the corner portion in a state where the semi-molten layer is removed is 25 to 51%,

the infrared transmissivity of the corner portion in the state where the semi-molten layer is removed is lower than an infrared transmissivity of the side wall portion in a state where the semi-molten layer is removed, and

the infrared transmissivity of the corner portion in the state where the semi-molten layer is removed is lower than an infrared transmissivity of the bottom portion in a state where the semi-molten layer is removed.

[Claim 2]

The quartz glass crucible according to claim 1,

wherein the infrared transmissivity of the side wall portion in the state where the semi-molten layer is removed is higher than the infrared transmissivity of the bottom portion in the state where the semi-molten layer is removed.

[Claim 3]

The quartz glass crucible according to claim 1 or 2,

wherein the infrared transmissivity of the side wall portion in the state where the semi-molten layer is removed is 46 to 84%, and

the infrared transmissivity of the bottom portion in the state where the semi-molten layer is removed is 36 to 70%.

[Claim 4]

The quartz glass crucible according to any one of claims 1 to 3,

wherein a thermal conductivity of the corner portion in the state where the semi-molten layer is removed is 1.5×10^{-3} to 5.8×10^{-3} cal/cm·s·°C,

the thermal conductivity of the corner portion in the state where the semi-molten layer is removed is lower than a thermal conductivity of the side wall portion in the state where the semi-molten layer is removed, and

the thermal conductivity of the corner portion in the state where the semi-molten layer is removed is lower than a thermal conductivity of the bottom portion in the state where the semi-molten layer is removed.

[Claim 5]

The quartz glass crucible according to claim 4,

wherein the thermal conductivity of the side wall portion in the state where the semi-molten layer is removed is 3.5×10^{-3} to 15.0×10^{-3} cal/cm·s·°C, and
the thermal conductivity of the bottom portion in the state where the semi-molten layer is removed is 2.7×10^{-3} to 13.2×10^{-3} cal/cm·s·°C.

[Claim 6]
The quartz glass crucible according to any one of claims 1 to 5,
wherein a thickness of the bubble layer of the corner portion is 10 to 35 mm,
a thickness of the bubble layer of the side wall portion is 1 to 21 mm, and
a thickness of the bubble layer of the bottom portion is 4 to 21 mm.

[Claim 7]
A manufacturing method of a silicon single crystal by a Czochralski method, comprising:
pulling up a silicon single crystal having an oxygen concentration of 12×10^{17} atoms/cm^3 or less using the quartz glass crucible according to any one of claims 1 to 6.

[Claim 8]
A quartz glass crucible comprising:
a cylindrical side wall portion;
a bottom portion;
a corner portion connecting the side wall portion and the bottom portion to each other;
a transparent layer made of quartz glass that does not contain bubbles;
a bubble layer formed outside the transparent layer and made of quartz glass containing a large number of bubbles;

a semi-molten layer formed outside the bubble layer and made of raw material silica powder solidified in a semi-molten state; and

at least one semi-molten layer-removed portion formed of a region from which a portio n of the semi-molten layer has been removed,

wherein semi-molten layer-removed portion is a region from which the semi-molt en layer is locally removed, and the semi molten layer removed portion is surr ounded by the semi-molten layer.

[Claim 9]

The quartz glass crucible according to claim 8,

wherein the semi-molten layer-removed portion includes a first semi-molten layer-removed portion provided in the side wall portion, a second semi-molten layer-removed portion provided in the corner portion, and a third semi-molten layer-removed portion provided in the bottom portion.