SCOPE OF THE CLAIMS:

[Claim 1]

A quartz glass crucible for pulling a silicon single crystal, the quartz glass crucible comprising:

a crucible main body having a cylindrical sidewall, a bottom, and a corner provided between the sidewall and the bottom and consisting of silica glass; and

a crystallization accelerator-containing layer applied to an outer surface of the crucible main body,

wherein the crucible main body includes, from an inner surface side toward an outer surface side of the crucible, an inner transparent layer containing no bubbles, a bubble layer containing a large number of bubbles and provided outside of the inner transparent layer, and an outer transparent layer containing no bubbles and provided outside of the bubble layer,

an outer transition layer where a bubble content decreases from the bubble layer toward the outer transparent layer is provided at a boundary between the outer transparent layer and the bubble layer,

a thickness of the outer transition layer is 0.1 mm or more and 8 mm or less,

the crystallization accelerator containing layer is provided on at least one of the sidewall and the corner.

the outer transition layer is provided on the sidewall and the corner, and

a maximum thickness of the outer transition layer at the corner is greater than a maximum thickness of the outer transition layer at the sidewall.

[Claim 2]

The quartz glass crucible according to claim 1,

wherein the thickness of the outer transition layer is 0.67% or more and 33% or less of a wall thickness of the crucible.

[Claim 3]

The quartz glass crucible according to claim 1 or 2,

wherein in a case where an average bubble content of the outer transparent layer is 0 and an average bubble content of the bubble layer is 1, an average bubble content of the outer transition layer is from 0.1 to 0.7.

[Claim 4]

The quartz glass crucible according to claim 3,

wherein a bubble content of the bubble layer is 1 to 4 vol%, and

a bubble content of the outer transparent layer is 0.1 vol% or less.

[Claim 5]

The quartz glass crucible according to claim 3 or 4,

wherein an inner transition layer where a bubble content increases from the inner transparent layer toward the bubble layer is provided at a boundary between the inner transparent layer and the bubble layer, and

a maximum thickness of the inner transition layer at any portion of the sidewall, the corner, and the bottom is greater than a maximum thickness of the outer transition layer at the same portion.

[Claim 6]

The quartz glass crucible according to any one of claims 1 to 5,

wherein a crystallization accelerator contained in the crystallization accelerator-containing layer is an element in the group 2.

[Claim 7]

A manufacturing method of a quartz glass crucible, comprising:

a raw material filling step of forming a deposited layer of raw material silica particles along an inner surface of a rotating mold;

an arc melting step of arc melting the raw material silica particles to form a crucible main body consisting of silica glass; and

a crystallization accelerator-containing layer forming step of forming a crystallization accelerator-containing layer on an outer surface or an outer surface layer portion of the crucible main body,

wherein the arc melting step includes

an inner transparent layer forming step of forming an inner transparent layer containing no bubbles by arc melting the deposited layer while evacuating from a side of the inner surface of the mold,

a bubble layer forming step of forming a bubble layer containing a large number of bubbles outside of the inner transparent layer by continuing the arc melting while suspending or weakening the evacuation, and

an outer transparent layer forming step of forming an outer transparent layer containing no bubbles outside of the bubble layer by restarting the evacuation and continuing the arc melting, and

the outer transparent layer forming step includes an outer transition layer

forming step of forming an outer transition layer where a bubble content decreases from the bubble layer toward the outer transparent layer at a boundary between the bubble layer and the outer transparent layer by changing stepwise a decompression level when the evacuation is restarted,

the quartz glass crucible has a cylindrical sidewall, a bottom, and a corner provided between the sidewall and the bottom,

a thickness of the outer transition layer is 0.1 mm or more and 8 mm or less,

the crystallization accelerator containing layer is provided on at least one of the sidewall and the corner,

the outer transition layer is provided on the sidewall and the corner, and

a maximum thickness of the outer transition layer at the corner is greater than a maximum thickness of the outer transition layer at the sidewall.

[Claim 8]

A manufacturing method of a silicon single crystal, comprising pulling up a silicon single crystal by the Czochralski method using the quartz glass crucible according to any one of claims 1 to 6.