What is claimed is:

[Claim 1]

A reaction furnace for producing a polycrystalline silicon rod, comprising;

a bell jar and a base plate which seal inside of the reaction furnace, wherein

the base plate comprises a plurality of electrode pairs holding a silicon core wire and supplying electric power to the silicon core wire, and

the base plate comprises a plurality of gas supply nozzles, each having an injection tip opening facing upwards, for supplying a silicon deposition raw material gas to an internal space of the bell jar, wherein

at least part of a contacting surface of the gas supply nozzles contacting the internal space of the bell jar is configured of quartz including a rough surface part having a ten-point average roughness Rz of 1.0 to 5.0 μm and an arithmetic average surface roughness Ra of 0.3 to 3.0 μm.

[Claim 2]

The reaction furnace for producing the polycrystalline silicon rod according to claim 1, wherein 50% or more of a surface area of the contacting surface of the gas supply nozzles is configured of quartz including the rough surface part.

[Claim 3]

The reaction furnace for producing the polycrystalline silicon rod according to claim 1, comprising;

a supplying pipe for supplying the silicon deposition raw material gas

to the gas supply nozzles, and

at least one of the gas supply nozzles and the supplying pipe comprise a removing means for removing impurities mixed in the silicon deposition raw material gas.

[Claim 4]

A gas supply nozzle used for a reaction furnace for producing a polycrystalline silicon rod, comprising; a bell jar and a base plate which seal inside of the reaction furnace, wherein the base plate comprises a plurality of electrode pairs holding a silicon core wire and supplying electric power to the silicon core wire, and the base plate comprises a plurality of gas supply nozzles, each having an injection tip opening facing upwards, for supplying a silicon deposition raw material gas to an internal space of the bell jar,

wherein at least part of a contacting surface of the gas supply nozzle contacting the internal space of the bell jar is configured of quartz including a rough surface part having a ten-point average roughness Rz of 1.0 to 5.0 μm and an arithmetic average surface roughness Ra of 0.3 to 3.0 μm.

[claim 5]

The gas supply nozzle according to claim 4, wherein 50% or more of a surface area of the contacting surface of the gas supply nozzles is configured of quartz including the rough surface part.

[Claim 6]

A method for producing a polycrystalline silicon rod, comprising steps of;

placing a silicon core wire inside a bell jar, and

injecting a silicon deposition raw material gas onto the silicon core wire while supplying electric power to the silicon core wire to deposit polycrystalline silicon on the silicon core wire, wherein

the method for producing the polycrystalline rod uses the reaction furnace for producing the polycrystalline silicon rod according to any one of claims 1 to 3.

[Claim 7]

The method for producing the polycrystalline silicon rod according to claim 6, comprising steps of;

removing a gas supply nozzle in the reaction furnace for producing the polycrystalline silicon rod after the polycrystalline silicon is deposited, and

washing a surface of the removed gas supply nozzle contacting an internal space of the bell jar.

[Claim 8]

The method for producing the polycrystalline silicon rod according to claim 6, wherein impurities mixed in a silicon deposition raw material gas are removed using a removing means, and the silicon deposition raw material gas from which the impurities are removed is injected onto the silicon core wire.

[Claim 9]

The method for producing the polycrystalline silicon rod according to claim 6, wherein the polycrystalline silicon rod is produced under an atmosphere satisfying a cleanliness of Class 1 to 3 defined by ISO 14644-1.

[Claim 10]

A polycrystalline silicon rod, wherein an outer layer part which is 4 mm deep from a surface has a Fe concentration of 10.0 pptw or less, or a Ni concentration of 2.0 pptw or less and a foreign object having a size of 0.5 to 10 cm and a height of 0.5 to 5.0 cm is two or less per 100000 cm^2 surface area of the polycrystalline silicon rod.

[Claim 11]

The polycrystalline silicon rod according to claim 10, wherein a volume average of a Fe concentration is 20 pptw or less, or a Ni concentration is 2.0 pptw or less which are calculated from actual measured values in a core wire part, a middle part, and the outer layer part.