[Claims]

[Claim 1]

A mask blank comprising a light shielding film on a transparent substrate,

wherein the light shielding film has a structure where a lower layer and an upper layer are stacked from a side of the transparent substrate,

wherein the lower layer contains silicon and nitrogen,

wherein the upper layer contains silicon and oxygen,

wherein an optical density to an ArF excimer laser exposure light of the light shielding film is 2.5 or more,

wherein a surface reflectance to the exposure light of the light shielding film is 30% or less,

wherein a back-surface reflectance to the exposure light of the light shielding film is 40% or less,

wherein a transmittance to a light having a wavelength of 900 nm of the light shielding film is 50% or less,

wherein an extinction coefficient k to a light having a wavelength of 900 nm of the light shielding film is 0.04 or more, and

wherein a thickness of the light shielding film is 60 nm or less.

[Claim 2]

The mask blank according to claim 1, wherein the lower layer is made of a material consisting of silicon and nitrogen, or a material consisting of silicon, nitrogen, and one or more elements selected from a metalloid element and a non-metallic element.

[Claim 3]

The mask blank according to claim 1 or 2, wherein the upper layer is made of a material consisting of silicon and oxygen, or a material consisting of silicon, oxygen, and one or more elements selected from a metalloid element and a non-metallic element.

[Claim 4]

The mask blank according to any one of claims 1 to 3, wherein an extinction coefficient k to a light having a wavelength of 700 nm of the light shielding film is 0.10 or more.

[Claim 5]

The mask blank according to any one of claims 1 to 4, wherein a refractive index n to a light having a wavelength of 900 nm of the light shielding film is 3.5 or less.

[Claim 6]

The mask blank according to any one of claims 1 to 5, wherein a refractive index n to a light having a wavelength of 700 nm of the light shielding film is 3.8 or less.

[Claim 7]

The mask blank according to any one of claims 1 to 6, a refractive index n to the exposure light of the lower layer is 1.6 or more and 2.1 or less.

[Claim 8]

The mask blank according to any one of claims 1 to 7, an extinction coefficient k to the exposure light of the lower layer is 1.6 or more and 2.1 or less.

[Claim 9]

The mask blank according to any one of claims 1 to 8, wherein a hard mask film made of a material containing chromium is formed on the light shielding film.

[Claim 10]

A transfer blank comprising a light shielding film including a transfer pattern on a transparent substrate,

wherein the light shielding film has a structure where a lower layer and an upper layer are stacked from a side of the transparent substrate,

wherein the lower layer contains silicon and nitrogen,

wherein the upper layer contains silicon and oxygen,

wherein an optical density to an ArF excimer laser exposure light of the light shielding film is 2.5 or more,

wherein a surface reflectance to the exposure light of the light shielding film is 30% or less,

wherein a back-surface reflectance to the exposure light

of the light shielding film is 40% or less,

wherein a transmittance to a light having a wavelength of 900 nm of the light shielding film is 50% or less,

wherein an extinction coefficient k to a light having a wavelength of 900 nm of the light shielding film is 0.04 or more, and

wherein a thickness of the light shielding film is 60 nm or less.

[Claim 11]

The transfer mask according to claim 10, wherein the lower layer is made of a material consisting of silicon and nitrogen, or a material consisting of silicon, nitrogen, and one or more elements selected from a metalloid element and a non-metallic element.

[Claim 12]

The transfer mask according to claim 10 or 11, wherein the upper layer is made of a material consisting of silicon and oxygen, or a material consisting of silicon, oxygen, and one or more elements selected from a metalloid element and a non-metallic element.

[Claim 13]

The transfer mask according to any one of claims 10 to 12, wherein an extinction coefficient k to a light having a wavelength of 700 nm of the light shielding film is 0.10 or more.

[Claim 14]

The transfer mask according to any one of claims 10 to 13, wherein a refractive index n to a light having a wavelength of 900 nm of the light shielding film is 3.5 or less.

[Claim 15]

The transfer mask according to any one of claims 10 to 14, wherein a refractive index n to a light having a wavelength of 700 nm of the light shielding film is 3.8 or less.

[Claim 16]

The transfer mask according to any one of claims 10 to 15, a refractive index n to the exposure light of the lower layer is 1.6 or more and 2.1 or less.

[Claim 17]

The mask blank according to any one of claims 10 to 16, an extinction coefficient k to the exposure light of the lower layer is 1.6 or more and 2.1 or less.

[Claim 18]

A method of manufacturing a semiconductor device, the method comprising the step of exposure-transferring a transfer pattern on a resist film on a semiconductor substrate using the transfer mask according to any one of claims 10 to 17.