CLAIMS

WHAT IS CLAIMED IS:

1. A blank mask comprising a transparent substrate and a multilayer light shielding film disposed on the transparent substrate,

wherein the multilayer light shielding film comprises a transition metal and at least one between oxygen and nitrogen,

wherein the multilayer light shielding film comprises a first light shielding film and a second light shielding film disposed on the first light shielding film, wherein the second light shielding film comprises an upper light shielding layer and an adhesion enhancing layer disposed between the upper light shielding layer and the first light shielding film, wherein an absolute value of a value of subtracting an amount of a transition metal of the adhesion enhancing layer from an amount of a transition metal of the upper light shielding layer is 10 at% or less,

wherein the multilayer light shielding film comprises total nine parts of the multilayer light shielding film that are formed by trisection in a width direction and a length direction of an upper surface of the multilayer light shielding film,

each part of the multilayer light shielding film comprises a measuring range disposed in a side thereof,

wherein the measuring range is corresponded to a range between a point distant from an upper boundary of the first light shielding film to a lower boundary of the first light shielding film and a point distant from a lower boundary of the second light shielding film to an upper boundary of the second light shielding film, and

wherein the multilayer light shielding film has dR (difference value of roughness)

values of Equation 1 below respectively measured from the total nine parts of the multilayer light shielding film, and an average value of the dR values of the Equation 1 is 3 nm or less:

[Equation 1]

$dR = Rac - Rbc$

wherein the Rac is a surface roughness [unit: nm] measured from the measuring range of the part of the multilayer light shielding film, after the part of the multilayer light shielding film is soaked for 800 seconds in SC-1 (Standard Clean-1) solution and rinsed by ozone water,

the Rbc is a surface roughness [unit: nm] measured from the measuring range of the part of the multilayer light shielding film before the part of the multilayer light shielding film is soaked in SC-1 solution,

the SC-1 solution is a solution comprising NH_4OH of 14.3 wt%, H_2O_2 of 14.3 wt%, and H_2O of 71.4 wt%, and

the ozone water is a solution comprising ozone in an amount of 20 ppm (by weight) with ultrapure water as a solvent.

2. The blank mask of claim 1,

wherein a standard deviation of dR values respectively measured from the total nine parts of the multilayer light shielding film is 0.5 nm or less.

3. The blank mask of claim 1,

comprising an interface,

wherein the interface is disposed between the upper boundary of the first light shielding film and the lower boundary of the second light shielding film,

wherein the measuring range is corresponded to a range between a point distant by 5

nm from the interface to the lower boundary of the first light shielding film and a point distant by 5 nm from the interface to the upper boundary of the second light shielding film.

4. The blank mask of claim 1,

wherein the adhesion enhancing layer has a thickness of 12 Å to 30 Å.

5. The blank mask of claim 1,

wherein an absolute value of a value of subtracting an amount of a transition metal of the first light shielding film from an amount of a transition metal of the adhesion enhancing layer is 35 at% or less.

6. The blank mask of claim 1,

wherein an upper surface of the adhesion enhancing layer immediately after forming comprises total nine sectors that are formed by trisection in a width direction and a length direction of the upper surface of the adhesion enhancing layer, and

the adhesion enhancing layer has Rku (kurtosis) values respectively measured from the total nine sectors of the adhesion enhancing layer, and an average value of the Rku (kurtosis) values is 3.5 or more.

7. The blank mask of claim 6,

wherein a standard deviation of the Rku (kurtosis) values respectively measured from the total nine sectors of the adhesion enhancing layer is 2 or less,

8. A photomask comprising:

a transparent substrate and a multilayer light shielding pattern film disposed on the transparent substrate,

wherein the multilayer light shielding pattern film comprises a transition metal and at least any one between oxygen and nitrogen,

wherein the multilayer light shielding pattern film comprises a first light shielding film and a second light shielding film disposed on the first light shielding film, wherein the second light shielding film comprises an upper light shielding layer and an adhesion enhancing layer disposed between the upper light shielding layer and the first light shielding film, wherein an absolute value of a value of subtracting an amount of a transition metal of the adhesion enhancing layer from an amount of a transition metal of the upper light shielding layer is 10 at% or less,

wherein the multilayer light shielding pattern film comprises total nine parts of the multilayer light shielding pattern film that are formed by trisection in a width direction and a length direction of an upper surface of the transparent substrate, and

each part of the multilayer light shielding pattern film comprises a measuring range disposed in a side thereof,

wherein the measuring range is corresponded to a range between a point distant from an upper boundary of the first light shielding film to a lower boundary of the first light shielding film and a point distant from a lower boundary of the second light shielding film to an upper boundary of the second light shielding film, and

wherein the multilayer light shielding pattern film has pdR (difference value of roughness for a photomask) values of Equation 2 below respectively measured from the total nine parts of the multilayer light shielding pattern film, and an average value of the pdR values of the Equation 2 is 3 nm or less;

[Equation 2]

pdR = pRac – pRbc

wherein the pRac is a surface roughness [unit: nm] measured from the measuring range after the multilayer light shielding pattern film is soaked for 800 second in SC-1 (Standard Clean-1) solution and rinsed by ozone water,

the pRbc is a surface roughness [unit: nm] measured from the measuring range before the multilayer light shielding pattern film is soaked in the SC-1 solution,

the SC-1 solution is a solution comprising NH_4OH of 14.3 wt%, H_2O_2 of 14.3 wt%, and H_2O of 71.4 wt%, and

the ozone water is a solution comprising ozone in an amount of 20 ppm (by weight) with ultrapure water as a solvent.

9. A manufacturing method of a semiconductor element comprising:

a preparation of disposing a light source, a photomask, and a semiconductor wafer where a resist film have been applied; an exposure operation of selectively transmitting a light incident from the light source to the semiconductor wafer through the photomask to be transferred; and a development operation of developing a pattern on the semiconductor wafer,

wherein the photomask comprises a transparent substrate and a multilayer light shielding pattern film disposed on the transparent substrate,

wherein the multilayer light shielding pattern film comprises a transition metal, and at least any one between oxygen and nitrogen,

wherein the multilayer light shielding pattern film comprises a first light shielding film and a second light shielding film disposed on the first light shielding film, wherein the second light shielding film comprises an upper light shielding layer and an adhesion enhancing layer

disposed between the upper light shielding layer and the first light shielding film, wherein an absolute value of a value of subtracting an amount of a transition metal of the adhesion enhancing layer from an amount of a transition metal of the upper light shielding layer is 10 at% or less,

wherein the multilayer light shielding pattern film comprises total nine parts of the multilayer light shielding pattern film that are formed by trisection in a width direction and a length direction of an upper surface of the transparent substrate, and

each part of the multilayer light shielding pattern film comprises a measuring range a disposed in a side thereof,

wherein the measuring range is corresponded to a range between a point distant from an upper boundary of the first light shielding film to a lower boundary of the first light shielding film and a point distant from a lower boundary of the second light shielding film to an upper boundary of the second light shielding film, and

wherein the multilayer light shielding pattern film has pdR (difference value of roughness for a photomask) values of Equation 2 below respectively measured from the total nine parts of the multilayer light shielding pattern film, and an average value of the pdR values of the Equation 2 is 3 nm or less;

[Equation 2]

$$pdR = pRac - pRbc$$

wherein the pRac is a surface roughness [unit: nm] measured from the measuring range after the multilayer light shielding pattern film is soaked for 800 second in SC-1 (Standard Clean-1) solution and rinsed by ozone water,

the pRbc is a surface roughness [unit: nm] measured from the measuring range before the multilayer light shielding pattern film is soaked in the SC-1 solution,

wherein the SC-1 solution is a solution comprising NH_4OH of 14.3 wt%, H_2O_2 of 14.3 wt%, and H_2O of 71.4 wt%, and

the ozone water is a solution comprising ozone in an amount of 20 ppm (by weight) with ultrapure water as a solvent.