CLAIMS

WHAT IS CLAIMED IS:

1. A laminate for a blank mask comprising:

a light-transmitting layer;

a phase shift film disposed on the light-transmitting layer; and

residual ions measured from a surface of the phase shift film through ion chromatography comprises at least one of sulfate ions in a concentration of 0 ng/cm^2 to 0.05 ng/cm^2, nitric oxide ions in a concentration of 0 ng/cm^2 to 0.5 ng/cm^2, or ammonium ions in a concentration of 0 ng/cm^2 to 5 ng/cm^2, or any combination thereof,

wherein a sum of concentrations of the residual ions is more than 0,

wherein the phase shift film comprises molybdenum,

wherein within the concentration of the nitric oxide ions, nitric acid ions (NO_3^-) have a concentration of 0 ng/cm^2 to 0.04 ng/cm^2.

2. The laminate of claim 1,

wherein the residual ions further comprise chlorine ions (Cl^-), and

wherein the chlorine ions have a concentration of 0.05 ng/cm^2 or less.

3. The laminate of claim 1,

wherein the phase shift film further comprises any one or more elements selected from the group consisting of silicon, nitrogen, oxygen, and carbon.

4. The laminate of claim 1,

wherein the residual ions comprise the sulfate ions and the nitric oxide ions,

the sulfate ions have a concentration of 0 ng/cm^2 to 0.05 ng/cm^2, and

the nitric oxide ions in a concentration of 0 ng/cm^2 to 0.5 ng/cm^2.

5. The laminate of claim 4,

wherein within the concentration of the nitric oxide ions,

nitrous acid ions (NO_2^-) have a concentration of 0 ng/cm^2 to 0.01 ng/cm^2.

6. A manufacturing method of a laminate for a blank mask comprising:

forming a phase shift film on a light-transmitting layer;

thermally treating the phase shift film; and

cleaning the thermally treated phase shift film,

wherein the forming of the phase shift film comprises a nitrogen treatment operation of putting a gas having a nitrogen atmosphere of 30 volume% to 70 volume% and maintaining a concentration of ammonium ions of a surface of the phase shift film at 50 ng/cm^2 to 110 ng/cm^2,

wherein the cleaning of the thermally treated phase shift film comprises a first cleaning process of adding UV rays and ozone water to the thermally treated phase shift film, and a second cleaning process of adding carbonated water and hydrogen water to the phase shift film of the first cleaning process,

wherein residual ions measured from the surface of the phase shift film after the cleaning of the thermally treated phase shift film comprise

at least any one of sulfate ions in a concentration of 0 ng/cm^2 to 0.05 ng/cm^2,

nitric oxide ions in a concentration of 0 ng/cm^2 to 0.5 ng/cm^2, or

ammonium ions in a concentration of 0 ng/cm^2 to 5 ng/cm^2, or any combination thereof,

wherein a sum of concentrations of the residual ions is more than 0.

7. The manufacturing method of claim 6,

wherein the forming of the phase shift film comprises disposing a target comprising molybdenum and silicon and operating sputtering under the atmosphere of a reactive gas,

wherein the reactive gas comprises one or more selected from the group consisting of oxygen, nitrogen, and carbon.

8. The manufacturing method of claim 6,

wherein the UV rays of the first cleaning process is irradiated with any one wavelength of 100 nm to 250 nm in a strength of 10 mW/cm^2 to 100 mW/cm^2.

9. The manufacturing method of claim 6,

wherein the cleaning of the thermally treated phase shift film further comprises

a third cleaning process of adding hydrogen water to the phase shift film after the second cleaning process, and

a fourth cleaning process of adding carbonated water to the phase shift film after the third cleaning process and drying the phase shift film.

10. A laminate for manufacturing a blank mask comprising,

a light-transmitting layer; and

a phase shift film disposed on the light-transmitting layer,

wherein residual ions measured from a surface of the phase shift film through ion chromatography comprise

either one or both of sulfate ions in a concentration of 0 ng/cm^2 to 0.05 ng/cm^2 and

nitric oxide ions in a concentration of 0 ng/cm^2 to 2 ng/cm^2, and

comprise ammonium ions in a concentration of 50 ng/cm^2 to 110 ng/cm^2,

wherein a sum of concentrations of the sulfate ions and the nitric oxide ions is more than 0,

wherein the phase shift film comprises molybdenum,

wherein the nitric oxide ions comprise nitric acid ions (NO_3^-), and

wherein the nitric acid ions (NO_3^-) have a concentration of 0 ng/cm^2 to 0.04 ng/cm^2.