CLAIMS

WHAT IS CLAIMED IS:

1. 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.

2. The manufacturing method of claim 1,

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.

3. The manufacturing method of claim 1,

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.

4. The manufacturing method of claim 1,

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.