CLAIMS

1. A reflective mask blank for EUV lithography, comprising, in the following order, a substrate, a multilayer reflective film reflecting EUV light, a protective film for the multilayer reflective film, and an absorption layer absorbing EUV light,

wherein the protective film comprises rhodium (Rh) or a rhodium material comprising Rh and at least one element selected from the group consisting of nitrogen (N), oxygen (O), carbon (C), boron (B), ruthenium (Ru), niobium (Nb), molybdenum (Mo), tantalum (Ta), iridium (Ir), palladium (Pd), zirconium (Zr), and titanium (Ti),

wherein the protective film comprises Rh of 90 at% or more and has a film density of 10.0 $g \cdot cm^{-3}$ to 14.0 $g \cdot cm^{-3}$.

2. The reflective mask blank for EUV lithography according to claim 1, wherein the protective film comprises Rh and at least one element selected from the group consisting of N, O, C, and B.

3. The reflective mask blank for EUV lithography according to claim 2, wherein the protective film comprises Rh of 90 at% or more and 99 at% or less and the at least one element selected from the group consisting of N, O, C, and B of 1 at% or more and 10 at% or less.

4. The reflective mask blank for EUV lithography according to any one of claims 1 to 3, wherein the protective film comprises at least one element (X) selected from the group consisting of Ru, Nb, Mo, Ta, Ir, Pd, Zr, and Ti in a composition ratio (at%) (Rh:X) of Rh and X of 99:1 to 9:1.

5. The reflective mask blank for EUV lithography according to any one of claims 1 to 4, wherein the protective film has a film thickness of 1.0 nm or more and 10.0 nm or less.

6. The reflective mask blank for EUV lithography according to any one of claims 1 to 5, wherein the protective film has a surface roughness (RMS) of 0.3 nm or

less.

7. The reflective mask blank for EUV lithography according to any one of claims 1 to 6, further comprising a diffusion barrier layer between the multilayer reflective film and the protective film,

wherein the diffusion barrier layer comprises at least one element selected from Nb, Ru, Ta, silicon (Si), Zr, Ti, and Mo.

8. The reflective mask blank for EUV lithography according to claim 7, wherein the diffusion barrier layer further comprises at least one element selected from the group consisting of O, N, C, and B.

9. The reflective mask blank for EUV lithography according to any one of claims 1 to 8, wherein the absorption layer comprises at least one element selected from Ru, Ta, chromium (Cr), Nb, platinum (Pt), Ir, rhenium (Re), tungsten (W), manganese (Mn), gold (Au), Si, aluminum (Al), and hafnium (Hf).

10. The reflective mask blank for EUV lithography according to claim 9, wherein the absorption layer further comprises at least one element selected from the group consisting of O, N, C, and B.

11. The reflective mask blank for EUV lithography according to any one of claims 1 to 10, further comprising an etching mask film on the absorption layer,

wherein the etching mask film comprises at least one element selected from the group consisting of Cr, Nb, Ti, Mo, Ta, and Si.

12. The reflective mask blank for EUV lithography according to claim 11, wherein the etching mask film further comprises at least one element selected from the group consisting of O, N, C, and B.

13. The reflective mask blank for EUV lithography according to any one of claims 1 to 12, wherein the protective film has an amorphous or microcrystalline

structure.

14. A reflective mask for EUV lithography, comprising the reflective mask blank for EUV lithography according to any one of claims 1 to 13 and a pattern formed on the absorption layer.15. A method for manufacturing a reflective mask blank for EUV lithography, the method comprising:

forming a multilayer reflective film reflecting EUV light on or above a substrate;

forming a protective film on or above the multilayer reflective film; and

forming an absorption layer absorbing EUV light on or above the protective film,

wherein the protective film comprises Rh or a rhodium material comprising Rh and at least one element selected from the group consisting of N, O, C, B, Ru, Nb, Mo, Ta, Ir, Pd, Zr, and Ti; and

wherein the protective film comprises Rh of 90 at% or more and has a film density of 10.0 $g \cdot cm^{-3}$ to 14.0 $g \cdot cm^{-3}$.

16. A method for manufacturing a reflective mask for EUV lithography, the method comprising patterning an absorption layer of a reflective mask blank for EUV lithography manufactured by the method for manufacturing a reflective mask blank for EUV lithography according to claim 15 to form a pattern.

17. The method for manufacturing a reflective mask for EUV lithography according to any one of claims 15 to 16, wherein the protective film has an amorphous or microcrystalline structure.