What is claimed is:

1. A substrate with a multilayer reflective film, comprising:

a substrate; and

a multilayer reflective film configured to reflect exposure light, the multilayer reflective film comprising a stack of alternating layers on the substrate, the alternating layers including a low refractive index layer and a high refractive index layer,

wherein the multilayer reflective film contains molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), hydrogen (H) and deuterium (D),

wherein a crystallite size of the multilayer reflective film calculated from an X-ray diffraction peak of Mo (110) is 2.5 nm or less, and

wherein the crystallite size is greater than 1.1 nm.

2. The substrate with the multilayer reflective film according to claim 1,

wherein the multilayer reflective film contains molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), and hydrogen (H).

3. The substrate with the multilayer reflective film according to claim 1,

wherein the high refractive index layer contains silicon (Si).

4. The substrate with the multilayer reflective film according to claim 1,

wherein a thickness of a diffusion layer formed between the low refractive index layer and the high refractive index layer is 1.7 nm or less.

5. The substrate with the multilayer reflective film according to claim 1, further comprising a protective film on the multilayer reflective film.

6. A reflective mask blank comprising:

a substrate;

a multilayer reflective film configured to reflect exposure light, the multilayer reflective film comprising a stack of alternating layers on the substrate, the alternating layers including a low refractive index layer and a high refractive index layer; and

an absorber film formed on the multilayer reflective film,

wherein the multilayer reflective film contains molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), hydrogen (H) and deuterium (D),

wherein a crystallite size of the multilayer reflective film calculated from an X-ray diffraction peak of Mo (110) is 2.5 nm or less, and

wherein the crystallite size is greater than 1.1 nm.

7. The reflective mask blank according to claim 6,

wherein the multilayer reflective film contains

molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), and hydrogen (H).

8. The reflective mask blank according to claim 6,

wherein the high refractive index layer contains silicon (Si).

9. The reflective mask blank according to claim 6,

wherein a thickness of a diffusion layer formed between the low refractive index layer and the high refractive index layer is 1.7 nm or less.

10. The reflective mask blank according to claim 6, wherein the reflective mask blank includes a protective film between the absorber film and the multilayer reflective film.

11. A reflective mask comprising:

a substrate;

a multilayer reflective film configured to reflect exposure light, the multilayer reflective film comprising a stack of alternating layers on the substrate, the alternating layers including a low refractive index layer and a high refractive index layer; and

an absorber pattern formed on the multilayer reflective film,

wherein the multilayer reflective film contains molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), hydrogen (H) and deuterium (D),

wherein a crystallite size of the multilayer reflective film calculated from an X-ray diffraction peak of Mo (110) is 2.5 nm or less, and

wherein the crystallite size is greater than 1.1 nm.

12. The reflective mask according to claim 11,

wherein the multilayer reflective film contains molybdenum (Mo) and at least one additive element selected from nitrogen (N), boron (B), carbon (C), zirconium (Zr), oxygen (O), and hydrogen (H).

13. The reflective mask according to claim 11,

wherein the high refractive index layer contains silicon (Si).

14. The reflective mask according to claim 11,

wherein a thickness of a diffusion layer formed between the low refractive index layer and the high refractive index layer is 1.7 nm or less.

15. The reflective mask according to claim 11, wherein the reflective mask includes a protective film between the absorber pattern and the multilayer reflective film.

16. The reflective mask blank according to claim 6, wherein the multilayer reflective film is at a first side of the substrate, and

wherein the reflective mask blank comprises a conductive back film on the substrate at a second side opposite to the first side.

17. A method of manufacturing a semiconductor device, the method comprising a process of performing a lithography

process on an exposure apparatus using the reflective mask according to claim 11 to form a transfer pattern on a transfer object.