CLAIMS

1. A reflective mask blank comprising:

a substrate;

a reflective film having a multi-layer film structure formed on the substrate and configured to reflect an EUV light;

a protective film formed on the reflective film and configured to protect the reflective film; and

an absorption film containing a multi-layer film containing two or more layers formed on the protective film and configured to absorb the EUV light, wherein

the absorption film is obtained by alternately depositing a first absorption film and a second absorption film,

the first absorption film is in contact with the protective film,

a correction etching rate in electron beam correction of the first absorption film is larger than a correction etching rate in electron beam correction of the second absorption film, and

the second absorption film contains indium.

2. The reflective mask blank according to claim 1, wherein the first absorption film contains one or more elements selected from tantalum, silicon, molybdenum, titanium, vanadium, cobalt, zirconium, niobium, and hafnium.

3. The reflective mask blank according to claim 1 or 2, wherein at least one of the first absorption film and the second absorption film contains one or more types selected from nitrogen, oxygen, and carbon.

4. The reflective mask blank according to any one of claims 1 to 3, wherein a total film thickness of the absorption film is 60 nm or less.

5. The reflective mask blank according to claim 4, wherein a film thickness of the first absorption film is within a range of 0.5 nm or more and 6 nm or less.

6. The reflective mask blank according to any one of claims 1 to 5, wherein a film thickness of the second absorption film is 35 nm or less.

7. The reflective mask blank according to any one of claims 1 to 6, wherein an outermost surface layer of the absorption film is the first absorption film.

8. A reflective mask comprising:

a substrate;

a reflective film having a multi-layer film structure formed on the substrate and configured to reflect an EUV light;

a protective film formed on the reflective film and

configured to protect the reflective film; and

an absorption film containing a multi-layer film containing two or more layers formed on the protective film and configured to absorb the EUV light, wherein

a transfer pattern is formed on the absorption film,

the absorption film is formed by alternately depositing a first absorption film and a second absorption film,

the first absorption film is in contact with the protective film,

a correction etching rate in electron beam correction of the first absorption film is larger than a correction etching rate in electron beam correction of the second absorption film, and

the second absorption film contains indium.

9. The reflective mask according to claim 8, wherein the first absorption film contains one or more elements selected from tantalum, silicon, molybdenum, titanium, vanadium, cobalt, zirconium, niobium, and hafnium.

10. The reflective mask according to claim 8 or 9, wherein at least one of the first absorption film and the second absorption film contains one or more types selected from nitrogen, oxygen, and carbon.

11. The reflective mask according to any one of

claims 8 to 10, wherein a total film thickness of the absorption film is 60 nm or less.

12. The reflective mask according to claim 11, wherein a film thickness of the first absorption film is within a range of 0.5 nm or more and 6 nm or less.

13. The reflective mask according to any one of claims 8 to 12, wherein a film thickness of the second absorption film is 35 nm or less.

14. The reflective mask according to any one of claims 8 to 13, wherein an outermost surface layer of the absorption film is the first absorption film.

15. The reflective mask according to any one of claims 8 to 14, comprising:

a projection portion and a depressed portion on a side surface on which the transfer pattern is formed of the second absorption film,

the projection portion being a most projecting portion in an in-plane direction of the second absorption film and the depressed portion being a most depressed portion in the in-plane direction of the second absorption film, wherein

when a distance from the projection portion to the depressed portion in the in-plane direction of the second absorption film is defined as a side etching amount, the

side etching amount is 5 nm or less.

16. The reflective mask according to any one of claims 8 to 15, further comprising:

an etching resistant film having a composition different from a composition of the second absorption film and configured to cover at least a part of the side surface on which the transfer pattern is formed of the second absorption film to protect the side surface of the second absorption film.

17. A method for manufacturing the reflective mask according to any one of claims 8 to 16, the method comprising:

performing electron beam correction etching of the first absorption film; and

performing electron beam correction etching of the second absorption film, wherein

in the performing of the electron beam correction etching of the first absorption film, an etching resistant film is formed on the side surface of the second absorption film when the first absorption film is subjected to the electron beam correction etching, and

in the performing of the electron beam correction etching of the second absorption film, the second absorption film is subjected to the electron beam correction etching such that a side etching amount is 5 nm or less.

18. A correction method by electron beam correction etching of the reflective mask according to any one of claims 8 to 16 comprising:

performing electron beam correction of the first absorption film with an oxygen-containing etching gas; and

performing electron beam correction of the second absorption film with an oxygen-free etching gas.