CLAIMS

1. A reflective photomask blank for producing a reflective photomask for pattern transfer using an extreme ultraviolet light as a light source, the reflective photomask blank comprising:

a substrate;

a reflective part formed on the substrate and configured to reflect an incident light; and

a low reflective part formed on the reflective part and configured to absorb an incident light, wherein

the reflective part includes a multi-layer reflective film and a capping layer,

the low reflective part contains a high extinction coefficient material which is a material having an extinction coefficient to an EUV light larger than 0.041, and contains the high extinction coefficient material in a proportion larger than 50 at%, and

an OD (Optical Density) value of the low reflective part is 1.0 or more.

2. The reflective photomask blank according to claim 1, wherein the low reflective part contains tantalum (Ta), and at least one of a material group consisting of titanium (Ti), niobium (Nb), tungsten (W), and molybdenum (Mo).

3. The reflective photomask blank according to claim 2, wherein a content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is equal to or less than a content ratio of the tantalum (Ta).

4. The reflective photomask blank according to claim 2, wherein the content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 2.5 at% or more based on a total number of atoms of the tantalum (Ta).

5. The reflective photomask blank according to claim 2, wherein the content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 5 at% or more based on a total number of atoms of the tantalum (Ta).

6. The reflective photomask blank according to claim 2, wherein a content ratio of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 2.5 at% or more based on a total number of atoms of the tantalum (Ta) and equal to or less than the content ratio of the tantalum (Ta).

7. The reflective photomask blank according to any one of claims 1 to 6, wherein the low reflective part contains at least one of a material containing tin (Sn) and oxygen (O) and a material containing indium (In) and oxygen (O) as the high extinction coefficient material.

8. A reflective photomask for pattern transfer using an extreme ultraviolet light as a light source, the reflective photomask comprising:

a substrate;

a reflective part formed on the substrate and configured to reflect an incident light; and

a low reflective part formed on the reflective part and configured to absorb an incident light, wherein

the reflective part includes a multi-layer reflective film and a capping layer,

the low reflective part contains a high extinction coefficient material which is a material having an extinction coefficient to an EUV light larger than 0.041, and contains the high extinction coefficient material in a proportion larger than 50 at%, and

an OD (Optical Density) value of the low reflective part is 1.0 or more.

9. The reflective photomask according to claim 8, wherein the low reflective part contains tantalum (Ta), and at least one of a material group consisting of

titanium (Ti), niobium (Nb), tungsten (W), and molybdenum (Mo).

10. The reflective photomask blank according to claim 9, wherein a content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is equal to or less than a content ratio of the tantalum (Ta).

11. The reflective photomask according to claim 9, wherein the content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 2.5 at% or more based on a total number of atoms of the tantalum (Ta).

12. The reflective photomask according to claim 9, wherein the content ratio of the at least one of the material group consisting of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 5 at% or more based on a total number of atoms of the tantalum (Ta).

13. The reflective photomask according to claim 9, wherein a content ratio of the titanium (Ti), the niobium (Nb), the tungsten (W), and the molybdenum (Mo) in the low reflective part is 2.5 at% or more based on a

total number of atoms of the tantalum (Ta) and equal to or less than the content ratio of the tantalum (Ta).

14. The reflective photomask according to any one of claims 8 to 13, wherein the low reflective part contains at least one of a material containing tin (Sn) and oxygen (O) and a material containing indium (In) and oxygen (O) as the high extinction coefficient material.