The inventors have been found that when a multilayer reflection film consisting of at least two first layers and at least two second layers that are laminated alternatively and have different optical properties from each other is formed, a multilayer reflection film having a high reflectance with respect to extreme ultraviolet (EUV) light having a wavelength of 13 to 14 nm can be obtained by a sputtering method to form the first and second layers alternatively. In the sputtering method, each layer is formed by two stages consisting of a first stage applied from when the forming of said each layer is started and until a prescribed thickness is formed, and a second stage applied from when the prescribed thickness is formed and until the forming of said each layer is completed. Further, in forming the layer subsequent to forming the last layer, a sputtering pressure of the first stage is set to higher than both a sputtering pressure at which the forming of the layer formed just before is completed, and a sputtering pressure of the second stage.

In one aspect, the invention provides a method of manufacturing a reflective mask blank including a substrate, a multilayer reflection film formed on one main surface of the substrate, and an absorber film formed on the multilayer reflection film, the multilayer reflection film consisting of at least two first layers and at least two second layers that are laminated alternatively, the first and second layers having different optical properties from each other,

the method including the step of forming the first and second layers constituting the multilayer reflection film alternatively by a sputtering method, wherein

in the forming step of the first and second layers constituting the multilayer reflection film, each layer is formed by two stages consisting of a first stage applied from when the forming of said each layer is started and until a prescribed thickness is formed, and a second stage applied from when the prescribed thickness is formed and until the forming of said each layer is completed, and

in forming the second layer subsequent to forming the first layer, or in forming the first layer subsequent to forming second layer, a sputtering pressure of the first stage is set to higher than both a sputtering pressure at which the forming of the layer formed just before is completed, and a sputtering pressure of the second stage.

CLAIMS:

1. A method of manufacturing a reflective mask blank comprising a substrate, a multilayer reflection film formed on one main surface of the substrate, and an absorber film formed on the multilayer reflection film, the multilayer reflection film consisting of at least two first layers and at least two second layers that are laminated alternatively, the first and second layers having different optical properties from each other,

the method comprising the step of forming the first and second layers constituting the multilayer reflection film alternatively by a sputtering method, wherein

in the forming step of the first and second layers constituting the multilayer reflection film, each layer is formed by two stages consisting of a first stage applied from when the forming of said each layer is started and until a prescribed thickness is formed, and a second stage applied from when the prescribed thickness is formed and until the forming of said each layer is completed, and

in forming the second layer subsequent to forming the first layer, or in forming the first layer subsequent to forming second layer, a sputtering pressure of the first stage is set to higher than both a sputtering pressure at which the forming of the layer formed just before is completed, and a sputtering pressure of the second stage.

2. The method of claim 1 wherein the prescribed thickness formed in the first stage is at least 1/20 and less than 1/2 of the total thickness formed in the whole of the first and second stages.

3. The method of claim 1 or 2 wherein the sputtering pressure of the first stage is at least 0.08 Pa, and a sputtering pressure of the second stage is less than 0.08 Pa.

4. The method of any one of claims 1 to 3 wherein the sputtering method is a magnetron sputtering method.

5. The method of any one of claims 1 to 4 wherein the sputtering pressures of the first and second stages are adjusted by argon gas.

6. The method of any one of claims 1 to 5 wherein the first and second layers are a Si layer and a Mo layer, respectively, and the first and second layers are laminated alternatively at least 40 layers, respectively.