an increased etching rate which contributes to ease of working.

In one aspect, there is provided abinary photomask blank comprising a transparent substrate and a light-shielding film disposed thereon, containing silicon and nitrogen, but being free of a transition metal, wherein said light-shielding film has an optical density (OD) of at least 2.5 with respect to ArF excimer laser, said light-shielding film is constructed of a light-shielding layer containing silicon and nitrogen, free of a transition metal, and having a nitrogen content of 3 to 50 at % based on the sum of silicon and nitrogen, and one or more of a reflectance-reducing layer containing silicon and nitrogen, free of a transition metal.

In another aspect, there is provided a method for preparing a photomask comprising the step of patterning the light shielding film of the binary photomask blank as described herein.

In yet another aspect, there is provided a binary photomask blank comprising a transparent substrate and a light-shielding film disposed thereon, containing silicon and nitrogen, but being free of a transition metal, wherein said light-shielding film has an optical density (OD) of at least 2.5 with respect to ArF excimer laser, said light-shielding film is constructed of a light-shielding layer containing silicon and nitrogen, free of a transition metal, and having a nitrogen content of 3 to 50 at % based on the sum of silicon and nitrogen, and a compositionally graded layer containing silicon and nitrogen, free of a transition metal, having a composition continuously graded in thickness direction.

In another aspect, there is provided a method for preparing a photomask comprising the step of patterning the light shielding film of the binary photomask blank as described herein.

In one embodiment, the invention provides a photomask blank comprising a transparent substrate and a light-

shielding film disposed thereon, containing silicon and nitrogen, but being free of a transition metal. The light-shielding film is constructed by a single layer or multiple layers, and the single layer or one of the multiple layers is a light-shielding layer containing silicon and nitrogen, free of a transition metal, and having a nitrogen content of 3 to 50 at% based on the sum of silicon and nitrogen.

Preferably the light-shielding layer consists of silicon and nitrogen.

In one preferred embodiment, the light-shielding film is constructed by a single layer which is the light-shielding layer.

In another preferred embodiment, the light-shielding film is constructed by multiple layers which are the light-shielding layer and a reflectance-reducing layer containing silicon and nitrogen, free of a transition metal. Preferably the silicon content of the reflectance-reducing layer is lower than the silicon content of the light-shielding layer, and the reflectance-reducing layer has a silicon content of 43 to 60 at% and a nitrogen content of

CLAIMS:

1. A binary photomask blank comprising a transparent substrate and a light-shielding film disposed thereon, containing silicon and nitrogen, but being free of a transition metal, wherein
said light-shielding film has an optical density (OD) of at least 2.5 with respect to ArF excimer laser,
said light-shielding film is constructed of a light-shielding layer containing silicon and nitrogen, free of a transition metal, and having a nitrogen content of 3 to 50 at % based on the sum of silicon and nitrogen, and
one or more of a reflectance-reducing layer containing silicon and nitrogen, free of a transition metal.

2. The binary photomask blank of claim 1 wherein the light-shielding layer consists of silicon and nitrogen.

3. The binary photomask blank of claim 1 wherein the silicon content of the reflectance-reducing layer is lower than the silicon content of the light-shielding layer, and the reflectance-reducing layer has a silicon content of 43 to 60 at % and a nitrogen content of 40 to 57 at %.

4. The binary photomask blank of claim 1 wherein said one or more layers of reflectance-reducing layer have a thickness of up to 10 nm.

5. The binary photomask blank of claim 1 wherein said light-shielding film has a thickness of up to 70 nm.

6. The binary photomask blank of claim 1, further comprising a hard mask film which is disposed contiguous to the surface of said light-shielding film remote from the substrate, and has different etching properties from said light-shielding film.

7. The binary photomask blank of claim 1, further comprising an etching stop film which is disposed contiguous to the surface of said light-shielding film close to the substrate, and has different etching properties from said light-shielding film.

8. A method for preparing a photomask comprising the step of patterning the light shielding film of the binary photomask blank of claim 1.

9. The binary photomask blank of claim 1 wherein the light-shielding layer has a total content of silicon and nitrogen of at least 70 at % based on the layer and a nitrogen content of 3 to 40 at % based on the sum of silicon and nitrogen.

10. The binary photomask blank of claim 1 wherein said light-shielding film is constructed by two layers consisting of the light-shielding layer and the reflectance-reducing layer.

11. A binary photomask blank comprising a transparent substrate and a light-shielding film disposed thereon, containing silicon and nitrogen, but being free of a transition metal, wherein
said light-shielding film has an optical density (OD) of at least 2.5 with respect to ArF excimer laser,
said light-shielding film is constructed of a light-shielding layer containing silicon and nitrogen, free of a transition metal, and having a nitrogen content of 3 to 50 at % based on the sum of silicon and nitrogen, and
a compositionally graded layer containing silicon and nitrogen, free of a transition metal, having a composition continuously graded in thickness direction.

12. The binary photomask blank of claim 11 wherein the compositionally graded layer has a thickness of up to 30 nm.

13. The binary photomask blank of claim 11 wherein the compositionally graded layer is a reflectance-reducing layer which is disposed on the side of the light-shielding layer remote from the substrate and compositionally graded such that the silicon content continuously decreases in a direction remote from the substrate.

14. The binary photomask blank of claim 13 wherein the reflectance-reducing layer has a silicon content of 43 to 60 at % and a nitrogen content of 40 to 57 at % at the surface thereof which is remote from the substrate.

15. The binary photomask blank of claim 11 wherein the light-shielding layer consists of silicon and nitrogen.

16. The binary photomask blank of claim 11 wherein said light-shielding film has a thickness of up to 70 nm.

17. The binary photomask blank of claim 11, further comprising a hard mask film which is disposed contiguous to the surface of said light-shielding film remote from the substrate, and has different etching properties from said light-shielding film.

18. The binary photomask blank of claim 11, further comprising an etching stop film which is disposed contiguous to the surface of said light-shielding film close to the substrate, and has different etching properties from said light-shielding film.

19. The binary photomask blank of claim 11 wherein the light-shielding layer has a total content of silicon and nitrogen of at least 70 at % based on the layer and a nitrogen content of 3 to 40 at % based on the sum of silicon and nitrogen.

20. A method for preparing a photomask comprising the step of patterning the light shielding film of the binary photomask blank of claim 11.