on which the supporting member is formed on the SiC film.

[0015]

Preferably, according to an example, the pellicle film further includes a radiation film formed on one principal surface of the second SiC film, and the radiation film has a higher radiation factor than radiation factors of the first and second SiC film.

[0016]

Preferably, according to an example, the radiation film contains Ru.

[0017]

Preferably, according to an example, a thickness of the first SiC film is greater than 0 and less than or equal to 10 nanometers and the first average carbon concentration is lower than the second average carbon concentration.

[0018]

Preferably, according to an example, a transmittance rate of the pellicle film for light having wavelength of 13.5 nanometers is 70% or more.

[0019]

Preferably, according to an example, the supporting member is composed of a Si substrate.

[0020]

Preferably, according to an example, the supporting member includes a Si substrate and a Si oxide film formed on one principal surface of the Si substrate.

[0021]

According to another aspect of the present disclosure, a method for manufacturing a pellicle comprises: a step to prepare a supporting member containing Si, and a step to form a pellicle film including a SiC film having a thickness of 10 nanometers or more and 100 nanometers or less on one principal surface of the supporting member, wherein the step to form the pellicle film includes a step to form a first SiC film having a first average carbon concentration on one principal surface of the supporting member, by carbonizing Si of the one principal surface of the supporting member, and a step to form a second SiC film having a second average carbon concentration different from the first average carbon concentration on one principal surface of the first SiC film, wherein the method further comprises a step to exposes at least a part of another principal surface of the first SiC film by wet etching the supporting member so that the supporting member has a ring-like and planar shape.

[0022]

Preferably, according to an example, the step to form the pellicle film includes a step to form a radiation film having a radiation factor higher than radiation factors of the first and second SiC films on one principal surface of the second SiC film.

[0023]

Preferably, according to an example, the step to expose at least a part of another principal surface of the first SiC film is performed after the step to form the radiation film.

[0024]

Preferably, according to an example, at least the supporting member and the first SiC film are moved relative to liquid chemical used for the wet etching, in the step to expose at least a part

WHAT IS CLAIMED IS:

1. A pellicle comprising:

a supporting member with a ring-like and planar shape and containing Si, and

a pellicle film formed on one principal surface of the supporting member, wherein

the pellicle film includes a SiC film having a thickness of 10 nanometers or more and 100 nanometers or less, and

the SiC film includes

a first SiC film formed on the one principal surface of the supporting member and having a first average carbon concentration, and

a second SiC film formed on one principal surface of the first SiC film and having a second average carbon concentration different from the first average carbon concentration.

2. The pellicle according to claim 1, wherein

a SiC film is not formed on another principal surface of the supporting member.

3. The pellicle according to claim 1, wherein

a Si oxide film is not formed on a principal surface opposite to a side on which the supporting member is formed on the SiC film.

4. The pellicle according to claim 1, wherein

the pellicle film further includes a radiation film formed on one principal surface of the second SiC film, and the radiation film has a higher radiation factor than radiation factors of the first and second SiC film.

5. The pellicle according to claim 4, wherein

the radiation film contains Ru.

6. The pellicle according to claim 1, wherein

a thickness of the first SiC film is greater than 0 and less than or equal to 10 nanometers and

the first average carbon concentration is lower than the second average carbon concentration.

7. The pellicle according to claim 1, wherein

a transmittance rate of the pellicle film for light having wavelength of 13.5 nanometers is 70% or more.

8. The pellicle according to claim 1, wherein

the supporting member is composed of a Si substrate.

9. The pellicle according to claim 1, wherein

the supporting member includes a Si substrate and a Si oxide film formed on one principal surface of the Si substrate.

10. A method for manufacturing a pellicle comprising:

a step to prepare a supporting member containing Si, and

a step to form a pellicle film including a SiC film having a thickness of 10 nanometers or more and 100 nanometers or less on one principal surface of the supporting member, wherein

the step to form the pellicle film includes

a step to form a first SiC film having a first average carbon concentration on one principal surface of the supporting member, by carbonizing Si of the one principal surface of the supporting member, and

a step to form a second SiC film having a second average carbon concentration different from the first average carbon concentration on one principal surface of the first SiC film, wherein the method further comprises

a step to expose at least a part of another principal surface of the first SiC film by wet etching the supporting member so that the supporting member has a ring-like and planar shape.

11. The method for manufacturing a pellicle according to claim 10, wherein

the step to form the pellicle film includes a step to form a radiation film having a radiation factor higher than radiation factors of the first and second SiC films on one principal surface of the second SiC film.

12. The method for manufacturing a pellicle according to claim 11, wherein

the step to expose at least a part of another principal surface of the first SiC film is performed after the step to form the radiation film.

13. The method for manufacturing a pellicle according to claim 10, wherein

at least the supporting member and the first SiC film are moved relative to liquid chemical used for the wet etching, in the step to expose at least a part of another principal surface of the first SiC film.

14. The method for manufacturing a pellicle according to claim 13, wherein

at least the supporting member and the first SiC film are moved in a direction in a plane parallel to the another principal surface of the first SiC film, in the step to expose at least a part of another principal surface of the first SiC film.

15. The method for manufacturing a pellicle according to claim 14, wherein

at least with the supporting member and the first SiC film rotated, liquid chemical used for the wet etching is injected onto another principal surface of the supporting member, in the step to expose at least a part of another principal surface of the first SiC film.

16. The method for manufacturing a pellicle according to claim 10, further comprising

a step to form a recessed part having Si as a bottom surface on a central part of another principal surface of the supporting member, wherein

the first SiC film is exposed on the bottom surface of the recessed part, in the step to expose at least a part of another principal surface of the first SiC film.

17. The method for manufacturing a pellicle according to claim 16, wherein

the central part of the another principal surface of the supporting member is removed by wet etching, with a mask layer consisting of an oxide film or a nitride film formed on the another principal surface of the supporting member as a mask, in the step to form a recessed part on the central part of the another principal surface of the supporting member.

18. The method for manufacturing a pellicle according to claim 10, wherein

mixed acid including hydrofluoric acid and nitric acid is used as liquid chemical used for the wet etching, in the step to expose at least a part of another principal surface of the first SiC film.

19. The method for manufacturing a pellicle according to claim 10, wherein

a Si substrate is prepared as the supporting member, in the step to prepare a supporting member.

20. The method for manufacturing a pellicle according to claim 10, wherein

a Si substrate, a Si oxide film formed on one principal surface of the Si substrate, and a Si film formed on one principal surface of the Si oxide film are prepared in the step to prepare the supporting member, and

at least a part of the Si film is carbonized, in the step to form the first SiC film.