extremely thin film, has a thickness of a nanometer order and thus is very easy to be broken. Another conceivable method for preventing the contamination is to perform the trimming by stealth dicing. However, even with trimming by stealth dicing, there occurs a phenomenon that particles are generated during expansion and are attached to the pellicle film. This does not fundamentally solve the problem.

[0008]

Embodiments of the present invention provide a pellicle film for EUV, a pellicle frame, a pellicle and a method for producing the same that decrease the attachment of dust or the like.

SOLUTION TO PROBLEM

[0009]

Disclosed herein is a method for producing a pellicle, including forming a pellicle film on a substrate; trimming the pellicle film; and removing at least a part of the substrate from the pellicle film after trimming the pellicle film.

[0010]

According to an aspect, there is provided a method for producing a pellicle, including forming a pellicle film on a substrate; trimming the substrate; removing at least particles attached to a surface of the pellicle film before removing the part of the substrate; and removing at least a part of the substrate after trimming the substrate.

[0011]

In an embodiment, the method for producing a pellicle may include removing at least particles attached to a surface of the pellicle film before removing the part of the substrate.

[0012]

In an embodiment, the method for producing a pellicle may include chamfering an end portion of the substrate before removing the particles.

[0013]

In an embodiment, the method for producing a pellicle may include forming a hole in at least the substrate before removing the particles.

[0014]

In an embodiment, the method for producing a pellicle may include forming a hole in at least the pellicle film and the substrate before removing the particles.

[0015]

In an embodiment, the method for producing a pellicle may include forming a hole in at least the pellicle film before removing the particles.

[0016]

In an embodiment, the hole may be formed by use of an ultra-short pulse laser.

[0017]

In an embodiment, the step of removing the part of the substrate is a wet etching step, and the hole may be formed by the wet etching step.

[0018]

In an embodiment, the substrate may be trimmed by use of an ultra-short pulse laser.

[0019]

Disclosed herein is a pellicle frame, including a pellicle film; and a first frame. The pellicle film is extended over the first frame; and the first frame includes at least one curved portion at an end portion thereof.

[0020]

Disclosed herein is a pellicle frame, including a pellicle film; and a

first frame. The pellicle film is extended over the first frame; the first frame includes inclining surface at an end portion thereof; and a top surface and the inclining surface of the first frame make an angle of 100 degrees to 170 degrees.

[0021]

Disclosed herein is a pellicle, including the above pellicle frame; and a second frame; wherein: the pellicle frame is connected with the second frame; and the second frame includes a curved portion at an end portion thereof.

[0022]

According to embodiments of the present invention, an "end portion" of the first frame refers to a side surface, an edge or a corner edge. Specifically, the "end portion" encompasses an edge made by two adjacent side surfaces of a substrate (in the case where the substrate is used as the first frame, the first frame), an edge made by a top surface (surface in contact with the pellicle film) and a side surface of the substrate, and a corner edge including a point at which the top surface and two adjacent side surfaces of the substrate cross each other.

ADVANTAGEOUS EFFECTS OF INVENTION

[0023]

With a pellicle frame, a pellicle, and a method for producing the same according to embodiments of the present invention, the step of hole formation, trimming or the like that accompanies generation of dust is performed before a substrate below the pellicle film is removed. With such an arrangement, even if dust or the like is attached to the pellicle film by such a step that accompanies the generation of dust, the pellicle film may

CLAIMS

1. A method for producing a pellicle, comprising:

forming a pellicle film on a substrate;

trimming the substrate;

removing at least particles attached to a surface of the pellicle film before removing the part of the substrate; and

removing at least a part of the substrate after trimming the substrate.

2. The method for producing a pellicle according to claim 1, further comprising:

chamfering an end portion of the substrate before removing the particles.

3. The method for producing a pellicle according to claim 1, wherein the step of removing at least the part of the substrate is a wet etching step.

4. The method for producing a pellicle according to claim 2, further comprising forming a hole in at least the substrate before removing the particles.

5. The method for producing a pellicle according to claim 2, further comprising forming a hole in at least the pellicle film and the substrate before removing the particles.

6. The method for producing a pellicle according to claim 4, wherein the hole is formed by use of an ultra-short pulse laser.

7. The method for producing a pellicle according to claim 5, wherein the hole is formed by use of an ultra-short pulse laser.

8. The method for producing a pellicle according to claim 3, wherein a hole is formed by the wet etching step.

9. The method for producing a pellicle according to claim 1, wherein the substrate is trimmed by use of an ultra-short pulse laser.