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WHAT IS CLAIMED IS:

- ✓ (1) A cleaning method of an optical element housed in a housing filled with a first gas containing oxygen, wherein
5 said housing is irradiated with ultraviolet light for a predetermined period of time, said ultraviolet light having a wavelength which is absorbed by oxygen.
- ✓ 2. The cleaning method of an optical element according
10 to Claim 1, wherein said first gas within said housing is replaced with a second gas which has a higher concentration of oxygen compared to said first gas, upon irradiating said ultraviolet light.
- 15 ✓ 3. The cleaning method of an optical element according to Claim 1, wherein said first gas within said housing is replaced with a third gas which contains oxygen and ozone, upon irradiating said ultraviolet light.
- 20 *noted.*
EP < 200
185 4. The cleaning method of an optical element according to any one of Claims 1 to 3, wherein said ultraviolet light has a wavelength of approximately 193.23nm.
- ✓ (5) An exposure apparatus which transfers a mask pattern
25 onto a substrate through an optical system, said exposure apparatus comprising:
a light source unit capable of emitting first light and second light, said first light having an exposure wavelength

and said second light having a wavelength which absorption by oxygen is greater than that of said first light;

an optical system for illumination for which irradiates light emitted from said light source unit onto said mask;

5 a projection optical system which projects light exiting from said mask onto said substrate;

a controller which sets said first light from said light source unit to be irradiated onto said mask via said optical system for illumination upon exposure of transferring said mask pattern onto said substrate, and upon cleaning at least a part of said optical system for illumination and said projection optical system sets said second light from said light source unit to be incident on said optical system for illumination.

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✓ 6. The exposure apparatus according to Claim 5, wherein upon said cleaning when said second light is emitted, said controller purges a cleaning gas which contains at least one of oxygen and ozone along an optical path where an element
20 subject to cleaning is arranged.

✓ 7. The exposure apparatus according to Claim 6, wherein said cleaning gas is a gas which sufficiently contains oxygen.

25 ✓ 8. The exposure apparatus according to Claim 6, wherein said cleaning gas is a gas which contains oxygen and ozone.

✓ 9. The exposure apparatus according to Claim 6, wherein

upon said exposure, prior to emitting said first light, said controller purges a gas which index of refraction is close to 1 into said optical system.

5 10.) The exposure apparatus according to Claim 5, wherein

 said light source unit has a first light source which emits said first light and a second light source which emits said second light; and

10 said controller selectively chooses one of said first light from said first light source and said second light from said second light source to guide to said optical system for illumination.

15 11.) The exposure apparatus according to Claim 5, wherein

 said light source unit has a single light source and a switching mechanism which changes a wavelength of light emitted from said light source; and

20 said controller switches said wavelength of light emitted from said light source via said switching mechanism on said exposure and on said cleaning.

 12. The exposure apparatus according to Claim 11, wherein said switching mechanism is a driving mechanism which drives a portion of a narrow-banding module, said narrow-banding module narrowing a width of said wavelength of light emitted from said light source.

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13. The exposure apparatus according to Claim 12,
wherein

said narrow-banding module can change said width of said
5 wavelength of light emitted from said light source; and

said controller changes said width of said wavelength
of light which is narrowed by said narrow-banding module to
a width which include an absorption range by oxygen via said
driving mechanism on said cleaning.

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14. The exposure apparatus according to Claim 5,
wherein said second light is an ArF excimer laser beam which
has a wavelength of approximately 193.23nm.

15 15. The exposure apparatus according to Claim 5,
wherein said exposure apparatus further comprises an
adjustment unit which can adjust an intensity of light emitted
from said light source unit and is arranged along a part of
an optical path, said optical path from said light source unit
20 to said mask; and

said controller controls said adjustment unit so as to
make an intensity of said second light stronger compared to
an intensity of said first light.

25 (16. An exposure apparatus which transfers a mask
pattern onto a substrate through an optical system, said
exposure apparatus comprising:

a light source unit which can emit at least light of

a predetermined wavelength width, including an exposure wavelength;

an optical system for illumination which irradiates said light from said light source unit onto said mask;

5 a projection optical system which projects light exiting from said mask onto said substrate;

an adjustment unit which can adjust an intensity of light emitted from said light source unit, and is arranged along a part of an optical path, said optical path from said light
10 source unit to said mask; and

a controller which controls said adjustment unit so as to make said intensity of said light emitted from said light source unit stronger upon cleaning at least a part of said optical system for illumination and said projection optical
15 system, compared with when said mask pattern is transferred onto said substrate by exposure.

17. The exposure apparatus according to Claim 16, wherein

20 said adjustment unit is arranged so it can be inserted and withdrawn from said part of said optical path, said adjustment unit includes a beam splitter which splits a light beam passing through said optical path and has at least one optical delay element to guide one of a split beam through
25 a delay optical path and back to said optical path; and

said controller inserts said beam splitter into said optical path upon said exposure and withdraws said beam splitter from said optical path upon said cleaning.

18. An exposure method which transfers a mask pattern onto a substrate through an optical system, said exposure method comprising the steps of:

5 a first step of irradiating an ultraviolet light that has a wavelength which absorption by oxygen is greater than that of an exposure wavelength on said optical system, said optical system having a sufficient amount of oxygen in at least a part of its interior;

10 a second step of replacing a gas of said optical system in at least a part of its interior which contains oxygen to a gas which has an index of refraction close to 1; and

a third step of transferring said mask pattern onto said substrate through said optical system by irradiating an ultraviolet light which has said exposure wavelength.

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19. The exposure method according to Claim 18, wherein intensity of said ultraviolet light irradiated in said first step is stronger than that of said ultraviolet light in said third step.

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20. An exposure method which transfers a mask pattern onto a substrate through an optical system, said exposure method comprising the steps of:

25 a first step of irradiating second light for a predetermined period of time, said second light having stronger intensity compared to that of first light emitted on exposure;

a second step of replacing a gas of said optical system in at least a part of its interior which contains oxygen to a gas which has an index of refraction close to 1; and

a third step of transferring said mask pattern onto said
5 substrate through said optical system by irradiating said first light which has an exposure wavelength.

21. A device manufacturing method including a lithographic process, wherein said lithographic process uses
10 said exposure apparatus in any one of Claims 5 to 17 to perform exposure.

22. A device manufacturing method including a lithographic process, wherein said lithographic process uses
15 said exposure method in any one of Claims 18 to 20.

23. A device manufactured by employing said device manufacturing method in one of Claims 21 and 22.