

CLAIMS

1. A substrate processing system comprising:
a gas source to supply a first gas to a process module of the substrate processing
5 system;
an RF source to supply RF power to the process module to generate plasma when
the first gas is supplied to the process module of the substrate processing system; and
a light source coupled to the process module to introduce light into the process
module to irradiate an internal component of the process module during the plasma
10 generation.
2. The substrate processing system of claim 1 wherein the light source is coupled to
the process module to introduce light into the process module synchronously with the
supply of the RF power to the process module during the plasma generation.
3. The substrate processing system of claim 1 further comprising a controller to
15 control the RF source and the light source and to synchronize the introduction of the light
from the light source into the process module with the supply of the RF power from the
RF source to the process module during the plasma generation.
4. The substrate processing system of claim 1 wherein:
the light includes only ultraviolet light or only visible light; and
20 the process module is configured to generate inductively coupled plasma or a
capacitively coupled plasma.
5. The substrate processing system of claim 1 wherein the light has a first
wavelength, the substrate processing system further comprising a second light source to
introduce light having a second wavelength into the process module synchronously with
25 the supply of the RF power during the plasma generation.

6. The substrate processing system of claim 5 further comprising a controller to select the second light source in response to the gas source supplying a second gas to the process module instead of the first gas.
7. The substrate processing system of claim 1 wherein the light source is configured to output light having different wavelengths, the substrate processing system further comprising a controller to select a wavelength of the light output by the light source based on the first gas.
8. The substrate processing system of claim 1 wherein the light source is external to the process module and is arranged proximate to a viewing port of the process module.
9. The substrate processing system of claim 1 wherein the light source is arranged inside the process module and wherein the light source is encapsulated with a material other than glass.
10. The substrate processing system of claim 1 wherein the process module includes a dielectric window and the light source includes light emitting diodes disposed in the dielectric window.
11. The substrate processing system of claim 10 wherein the light emitting diodes output ultraviolet light, visible light, or light having different wavelengths.
12. The substrate processing system of claim 10 further comprising a controller to turn the light emitting diodes on and off individually.
13. The substrate processing system of claim 10 further comprising a controller to turn the light emitting diodes on and off in a pattern.
14. The substrate processing system of claim 10 further comprising a controller to control wavelengths of light output by the light emitting diodes individually.

15. The substrate processing system of claim 1 wherein the light source is external to the process module and the light from the light source is introduced into the process module using optical fibers.
- 5 16. The substrate processing system of claim 15 wherein the process module includes a showerhead and the optical fibers are routed through the showerhead.
17. The substrate processing system of claim 15 wherein the process module includes a dielectric window and a gas injector arranged therein and wherein the optical fibers are routed through the gas injector.
- 10 18. The substrate processing system of claim 15 wherein the process module includes a pedestal and the optical fibers are routed from under the process module at a location outside the perimeter of the pedestal.
19. The substrate processing system of claim 1 further comprising a controller to control the light source to introduce the light in the form of light pulses into the process module during the plasma generation.
- 15 20. The substrate processing system of claim 19 wherein the controller selects at least one of a pulse width and a pulse repetition rate based on the first gas.
- 20 21. The substrate processing system of claim 1, wherein during the plasma generation, the light source is configured to irradiate the internal component of the process module to cause photoionization of metal molecules in surfaces of the internal component of the process module, wherein photoelectrons are ejected from the surfaces of the internal component of the process module to assist in the plasma generation.