

IMPROVEMENT DESIGN OF UV IRRADIANCE MONITOR SYSTEM

BACKGROUND OF THE INVENTION

a) Field of the Invention

The present invention is in relation to an improvement design of UV irradiance monitor system. It especially indicates a technique to install the detecting components of UV irradiance monitor system on rotational device synchronously, instead of installing on external fix housing, to provide real-time & full-time monitor to UV irradiance signal & real-time response during system running production.

b) Description of the Prior Art

The NanoCure UV twin chamber on Producer SE or GT mainframe which produced by Applied Materials is used to cure the low k films and to enhance film stress in the Silicon Nitride films. The UV chamber features a high intensity ultraviolet (UV) source with reflectors to provide uniform irradiance cross the wafer. The UV cure treatment occurs when the UV light is applied to a thin film that already be deposited on wafer. The UV energy is absorbed by the pre-deposited film and modifies the film properties to achieve the desired dielectric and mechanical properties.

The desired film properties will not be achieved if the UV intensity decays, so the UV intensity must be monitored seriously to ensure the film properties. The UV irradiance monitoring system is used to UV NanoCure twin chamber.

FIG. 1 is the top view of a typical Producer CVD system. Up to three Twin chambers (1) can be installed on the producer SE or GT mainframe. Each chamber has two process positions.

FIG. 2 is the side view of one UV NanoCure twin chamber (1). The major structure of each chamber includes chamber body (10)、housing (20)、lampheads (30) and driving motors (40).

FIG. 3 is the detail drawing of chamber assembly. The lower window clamp (12), quartz window (13), upper window clamp(14) are installed to the groove (11) of chamber body (10) step by step. The housing (20) is mounted on chamber body (10). The rotation structure including UV lamphead assembly (30), lamphead enclosure seal (31), lamphead tray (32), lamphead tray mounting seal (33), pulley (34), upper bearing clamp (35), bearing (36), lower dynamic seal (37), lower clamp ring (38) and secondary reflector assembly (39) are mounted upon chamber body. The UV bulbs (not shown in the drawings) are included inside UV lamphead assembly (30). There are several light pipes (391) around secondary reflector assembly (39).

FIG. 4 shows the structure inside UV lamphead assembly (30). Two UV bulbs (2) are installed in one chamber with a primary reflector (3) around each one. The secondary reflector (39) provides the reflection support of UV irradiance.

FIG. 5 shows the UV irradiance emitted by UV bulbs (2) pass through the quartz window (13) which under secondary reflector (39) to cure the film on wafer (5) which is located on pedestal (4).

The UV intensity emitted by UV bulks (2) maybe decay after using a long time, it must be monitored to prevent from impacting film properties caused by UV intensity decays.

FIG. 6 shows the original design of UV monitoring system. The UV sensors (50) are installed on the housing (20).

FIG. 7 shows the overall components of original UV monitoring system. An UV irradiance monitor sensor box (60) connects two UV sensors (50) by optic fiber (61). The UV sensors (50) installed on housing (21) detect UV irradiance through light pipes (391) on secondary reflector (39) when lamphead assembly (30) rotates.

Two major defects in the original UV monitoring system design. First of all, the UV

irradiance cannot be full-time monitored continuously in most of time during UV sensor monitoring because the UV irradiance is usually sheltered from the secondary reflector (39) when the secondary reflector rotates with lamphead assembly. Secondly, the real-time monitoring during production is inhibited because the system production must be paused and a special monitoring sequence must be executed offline for data collection & processing during the monitoring process is running. This design of offline monitoring sequence cannot provide real-time response to any abnormal generated during production.

In order to improve this concern in original UV monitoring system, this new type of UV monitoring technique is invented to get better performance than original one.

SUMMARY OF THE INVENTION

The purpose of the present invention is to provide an improvement design to UV irradiance monitor system.

In this invention, the detecting components of UV irradiance monitor system are directly installed on rotational device, instead of installing on external fix housing. The UV sensors can directly monitor UV irradiance full-time during process running without any shelter. In addition, the monitoring system can operate & real-time monitor UV irradiance during system running without terminating production. The in-situ monitoring function can reduce the wafer defect caused by UV irradiance decay by connecting to system interlock to stop production right after any abnormal detected any time.

To enable a further understanding of the said objectives and the technological methods of the invention herein, the brief description of the drawings below is followed by the detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a top view of typical Producer CVD system of a prior art.

FIG. 2 shows a side view of one UV NanoCure twin chamber of a prior art.

FIG. 3 shows an exploded schematic view of chamber assembly of a prior art.

FIG. 4 shows a schematic view of the structure inside UV lamphead assembly of a prior art.

FIG. 5 shows a schematic view of the sketch of UV irradiance on wafer of a prior art.

FIG. 6 shows a schematic view of the original design of UV monitoring system with UV sensors installed on the housing of a prior art.

FIG. 7 shows a schematic view of the overall components of original UV monitoring system of a prior art.

FIG. 8 shows a schematic view of the sketch of installation position of UV sensor of the present invention.

FIG. 9 shows a schematic view of UV NanoCure twin chamber assembly of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides an improvement to UV monitor system in NanoCure UV twin chamber (1). As shown in FIG. 2, the chamber includes chamber body (10), housing (20), lampheads (30) and driving motors (40). The major characteristics are :

As shown in FIG. 8, two optic fibers (392) are installed through the light pipes (391) on secondary reflector (39). As shown in FIG. 9, the optic fibers (392) go through the lower clamp ring (38), lower dynamic seal (37), bearing (36), upper bearing clamp (35), hole (341) on pulley (34), hole (331) on lamphead tray mounting seal (33), lamphead tray (32), lamphead enclosure seal (31) from bottom up & connect to UV irradiance monitor sensor box (60). The UV irradiance monitor sensor box (60) is installed outside the UV lamphead assembly (30), thus the whole assembly of UV irradiance monitor sensor box (60) and UV sensors (50) are installed on rotational structure, not on external fix housing, and can rotate with rotational structure synchronously to prevent from being sheltered by

any frame.

With this design of the present invention, the following advantaged can be achieved:

1. Continuously full-time monitors UV irradiance without any shelter.
2. Real-time in-line monitors UV irradiance during system running without stopping production.
3. Real-time upload the monitoring data to fabrication data collection center by system I/O.
4. Available to connect to system interlock to terminate production immediately to protect wafer when any abnormal of UV irradiance detected. Reduce the product scrap rate caused by UV decay issue.
5. Improve the system available time & productivity because it's unnecessary to stop production for running monitor procedure off-line.
6. Provide un-interrupt monitor and real-time response to any defect about UV irradiance. Improve the line yield of production wafer.

CLAIMS

What is claim is:

1. An improvement design of UV irradiance monitor system, by directly installing the UV irradiance detecting components on rotational device and connecting to UV sensor box mounted directly on rotational device, the UV sensors can rotate synchronously with UV lamphead assembly, Thus the UV irradiance can be full-time monitored without any shelter.