CLAIMS

[Claim 1]

A semiconductor failure analysis device that analyzes for a failure portion included in a semiconductor device using a response to a stimulation signal, the semiconductor failure analysis device comprising:

a signal generation unit configured to apply a stimulation signal to the semiconductor device;

a light source configured to generate irradiation light with which the semiconductor device is irradiated;

a solid immersion lens disposed on an optical path of the irradiation light;

a light detection unit configured to receive reflected light generated by the irradiation light being reflected by the semiconductor device and to output a detection signal according to the reflected light;

an optical system disposed between the light source and the solid immersion lens to emit the irradiation light to the semiconductor device via the solid immersion lens and disposed between the solid immersion lens and the light detection unit to emit the reflected light received via the solid immersion lens to the light detection unit; and

an analysis unit configured to obtain information on a failure portion of the semiconductor device from the detection signal based on a change in transmittance of the solid immersion lens according to a temperature change of the solid immersion lens and a change in a refractive index of the semiconductor device caused by heat generation ,

wherein the light source emits the irradiation light having a center wavelength of 900 nm or more and 960 nm or less, and

wherein the solid immersion lens is formed of gallium arsenide (GaAs).

[Claim 2]

The semiconductor failure analysis device according to claim 1,

wherein the analysis unit has a heat source position identification unit, and

wherein the heat source position identification unit is configured to identify a position of a heat source generated in the semiconductor device as a response to the stimulation signal on the basis of the detection signal and the stimulation signal.

[Claim 3]

The semiconductor failure analysis device according to claim 1 or 2,

wherein the analysis unit has an operating frequency identification unit, and

wherein the operating frequency identification unit is configured to identify a position on the semiconductor device operating at a predetermined frequency generated in the semiconductor device as a response to the stimulation signal on the basis of the detection signal and the stimulation signal.

[Claim 4]

The semiconductor failure analysis device according to any of claims 1 to 3,

wherein a center wavelength of the reflected light is 900 nm or more and 960 nm or less, belonging to the same range as the center wavelength of the irradiation light, and

wherein the analysis unit is further configured to obtain the information on the failure portion of the semiconductor device from the detection signal based on an intensity of the reflected light in accordance with transmittance of the solid immersion lens, the transmittance of the solid immersion lens increasing as the temperature of the solid immersion lens decreases.

[Claim 5]

The semiconductor failure analysis device according to any of claims 1 to 4,

wherein the light source generates the Continuous Wave (CW) light.

[Claim 6]

The semiconductor failure analysis device according to claim 5,

wherein the light source is configured to generate the CW light having a band of 20 nm.

[Claim 7]

The semiconductor failure analysis device according to claim2,

wherein the heat source position identification unit is further configured to identify the position of the heat source generated in the semiconductor device by applying a modulated current having a frequency lower than a default frequency as the stimulation signal.

[Claim 8]

The semiconductor failure analysis device according to claim 3,

wherein the operating frequency identification unit is further configured to identify the position on the semiconductor device operating at the predetermined frequency by applying a drive current having a

frequency equivalent to the predetermined frequency as the simulation signal.