Claims

1. An apparatus for inspection of light emitting semiconductor devices on a substrate, comprising:

a broadband light source configured to simultaneously illuminate two or more light emitting semiconductor devices of the substrate at one or more points in a semiconductor production process, wherein at least some of the light emitting semiconductor devices, in response to the illumination from the broadband source, emit at least some light caused by a recombination process of electron-hole pairs in an active layer of the light emitting semiconductor devices;

an objective lens defining a detection beam path;

a camera with a sensor positioned in the detection beam path for receiving light from the light emitting semiconductor devices via the objective lens, wherein the sensor registers gray scale values for the two more light emitting semiconductor devices;

a first filter disposed within in an illumination beam path of the broadband light source, wherein the first filter is configured to pass a waveband $\lambda_A+\lambda_B$;

a second filter disposed within the detection path, wherein the second filter is configured to block reflected incident light from reaching the sensor, wherein the second filter is further configured to pass light emitted by one or more of the light emitting semiconductor devices of at least a wavelength of λ_C; and

a computer system communicatively coupled to the sensor, wherein the computer system is configured to determine one or more characteristics of the semiconductor production process based on the light of wavelength λ_C.

2. The apparatus of claim **1**, wherein the light source is a ring light source.

3. The apparatus of claim **2**, wherein the ring light source has a plurality of LEDs.

4. The apparatus of claim **1**, wherein the light source is a coaxial light source.

5. The apparatus of claim **1**, wherein the light source is at least one of a pulsed light source or a continuous light source.

6. The apparatus of claim **1**, wherein a waveband constraint $(\lambda_A+\lambda_B)<\lambda_C$ is implemented with the first filter and the second filter.

7. The apparatus of claim **1**, further comprising:

a stage movable in the X/Y-directions, wherein the computer system controls movement of the stage so an entire surface of the light emitting semiconductor devices on the substrate is imaged via the objective lens in the sensor of the camera.

8. The apparatus of claim **1**, wherein the two or more light emitting semiconductor devices comprise:

two or more LED die, wherein light emitted from the two or more LED is caused by a recombination process of electron hole pairs that are generated by the illumination in an active layer of the LED die.

9. An apparatus for inspection of light emitting semiconductor devices on a substrate comprises:

a ring light source configured to simultaneously illuminate two or more LED die of the substrate at one or more points in a semiconductor production process, wherein at least some of the light emitting semiconductor devices, in response to the illumination from the ring light source, emit at least some light caused by a recombination process of electron-hole pairs in an active layer of the LED devices;

an objective lens defining a detection beam path;

a camera with a sensor positioned in the detection beam path for receiving light from the LEDs via the objective lens;

a first filter disposed within in an illumination beam path of the broadband light source wherein the first filter is configured to pass a waveband $\lambda_A+\lambda_B$;

a second filter disposed within the detection path, wherein the second filter is configured to block reflected incident light from reaching the sensor, wherein the second filter is further configured to pass light emitted by one or more of the LEDs of at least a wavelength of λ_C; and

a computer system communicatively coupled to the sensor, wherein the computer system is configured to determine one or more characteristics of the semiconductor production process based on the light of wavelength λ_C.

10. An apparatus for inspection of light emitting semiconductor devices on a substrate, comprising:

a coaxial light source configured to simultaneously illuminate two or more LED die of the substrate at one or more points in a semiconductor production process, wherein at least some of the light emitting semiconductor devices, in response to the illumination from the coaxial light source, emit at least some light caused by a recombination process of electron-hole pairs in an active layer of the LED devices;

an objective lens defining an illumination beam path

a first filter disposed within in the illumination beam path of the broadband light source wherein the first filter is configured to pass a waveband $\lambda_A+\lambda_B$;

a camera with a sensor positioned in a detection beam path for receiving light from the LEDs via the objective lens and a second filter, wherein the sensor registers gray scale values of the two more LED die, wherein the second filter is configured to block reflected incident light from reaching the sensor, wherein the second filter is further configured to pass light emitted by one or more of the LEDs of at least a wavelength of λ_C; and

a computer communicatively coupled to the sensor, wherein the computer system is configured to determine one or more characteristics of the semiconductor production process based on the light of wavelength λ_C.

11. The apparatus of claim **1**, wherein the computer system is further configured to determine one or more characteristics of the semiconductor production process by comparing the intensity of light of wavelength λ_C at a first point in the semiconductor production process to the intensity of light of wavelength λ_C at an additional point in the semiconductor production process.

12. The apparatus of claim **1**, wherein the computer system is further configured to determine an efficiency of at least some of the two or more light emitting semiconductor devices based on the intensity of light of wavelength λ_C.

13. The apparatus of claim **1**, wherein the computer system is further configured to identify a defective light emitting semiconductor device based on the identification of one or more black regions on the light emitting semiconductor device.