Luminous efficiency for light emitting devices is measured precisely by utilizing an integrating sphere.

Light emitting materials are characterized by their fluorescence quantum yield. For light emitting devices like organic and inorganic LEDs the respective physical value is the external quantum efficiency, measured usually by electroluminescence (EL) method. For this application the External quantum efficiency measurement system C9920-12 system is designed.

The luminous efficiency of OLED devices depends on various factors such as absorption of the individual layers and of the glass substrate, reflectance of the surface, radiation angle and waveguiding capacity of the glass substrate. These effects are countered by using an integrating sphere as sample chamber.

The sample is placed inside the sphere and excited by constant current or voltage.

Employing a highly sensitive Hamamatsu CCD spectrometer as detector, the whole spectrum is measured instantaneously. The spectral data as well as the external quantum yield, I-V-L characteristics and further calculations are displayed by the dedicated software.
External quantum efficiency (EQE) measurement system utilizing an integrating sphere.

For measuring EQE of a light emitting device, it is placed inside an integrating sphere and excited by constant current. Current or voltage is changed stepwise and each time a complete emission spectrum is taken and displayed by the software.

**Features**
- Use of an integrating sphere enables to measure EQE independent of the emission angle characteristic of a sample.
- Software controls the constant current power supply.
- The spectrum for each step of the applied voltage/current is measured instantaneously (I-V-L measurement).
- Cooled BT-CCD enables high sensitive measurement.
- Easy to handle intuitive software for measuring, calculating and controlling the system.
- Display of combination of several variables (current, voltage, luminous efficiency, chromaticity, etc).
- The system can be easily extended to absolute PL quantum yield measurement system and light distribution measurement system.

**Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrating sphere</td>
<td>3.3 inch inside diameter, reflective material: Spectralon</td>
</tr>
<tr>
<td>Detector</td>
<td>BT-CCD</td>
</tr>
<tr>
<td>Cooling temperature</td>
<td>$-15 , ^\circ C$</td>
</tr>
<tr>
<td>Number of photosensitive device channels</td>
<td>1024 ch</td>
</tr>
<tr>
<td>Wavelength</td>
<td>380 nm to 780 nm (Detector: 200 nm to 950 nm)</td>
</tr>
<tr>
<td>Fiber length</td>
<td>1.5 m</td>
</tr>
<tr>
<td>Range of measurement for luminous flux</td>
<td>0.00013 lm to 0.12 lm (with an emission area 2 mm square and white light)</td>
</tr>
</tbody>
</table>

**C9920-12 configuration example**

<table>
<thead>
<tr>
<th>SIGNAL INPUT</th>
<th>PHOTONIC MULTI-CHANNEL ANALYZER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA-12</td>
<td>Photonic multichannel analyzer</td>
</tr>
<tr>
<td>C10027-01</td>
<td></td>
</tr>
<tr>
<td>C10027-01</td>
<td>Photonic multichannel analyzer</td>
</tr>
<tr>
<td>A9924-04</td>
<td>Sample holder for EL external QE</td>
</tr>
<tr>
<td>A10393</td>
<td>Sphere correction adapter</td>
</tr>
<tr>
<td>A10094</td>
<td>Integration sphere unit</td>
</tr>
<tr>
<td>A9829</td>
<td>Light yield adapter</td>
</tr>
<tr>
<td>A9829-04</td>
<td>Sample holder for EL external QE</td>
</tr>
<tr>
<td>2400 Constant current power supply C13697-01</td>
<td>Integration sphere adapter for EL self absorption correction A10393</td>
</tr>
<tr>
<td>2400 Constant current power supply C13697-01</td>
<td>Light yield adapter for external quantum efficiency A9829</td>
</tr>
<tr>
<td>2400 Constant current power supply C13697-01</td>
<td>Sample holder for EL external QE measurement (pin type) A9824-04</td>
</tr>
<tr>
<td>2400 Constant current power supply C13697-01</td>
<td>Data analyzer Light shield adapter for external quantum efficiency A9829</td>
</tr>
<tr>
<td>2400 Constant current power supply C13697-01</td>
<td>Fiber probe Standard Option</td>
</tr>
</tbody>
</table>
Simple and intuitive handling is realized through the dedicated analysis software.

Measurement data

Results
- Current density/EQE
- Current density/Luminous efficiency (cd/A)
- Current density/Power efficiency
- Current density/Voltage
- Current density/Dominant wavelength
- Current density/Chromaticity coordinates
- Current density/Excitation purity
- Current/External differential quantum efficiency
- Time/Current (voltage)
- Time/Emission spectrum
- Wavelength/Intensity

Example of measurement results

Measurement results can be displayed in various graphic representations.

- Current density/Voltage
- Current density/Chromaticity coordinates
- Current density/Dominant wavelength
- Current density/Luminous flux
- Current density/Power efficiency
- Wavelength/Intensity

* The Voltage parameter is alternatives for Current Density.
With many shared components, the C9920 series offers easy upgrades to the following products.

Related Products

Absolute PL quantum yield spectrometer C9920-02, -02G, -03, -03G

These systems measure the absolute values of luminous quantum yields of light-emitting materials using the photoluminescence method. Absolute PL quantum yield measurement systems C9920-02, -02G, -03, and -03G measure the absolute values of luminous quantum yields of light-emitting materials using the photoluminescence method. Use of a spectrometer enables excitation at a variety of wavelengths. We have various sample holders that can accommodate measurement of thin films as well as solutions and powders.

Options

Option

Sample holder for EL external QE measurement (pin type) A9924-04

A general-purpose sample holder with alligator clips. It comes with a light shielding cover.

Sample holder for EL external QE measurement (pin type) A9924-06

Sample holder for EL self absorption correction A10393

Adapter to joint an integrating sphere and a fiber of light source for absorption correction. (for L6758-21)

Integration sphere adapter for EL self absorption correction A10393

Addition of optional parts and components accommodates a wide variety of measurement objects.

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