

Lumenera and Titan Electro Optics Provide Solar Cell Inspection Solutions

Lumenera Offers Scientific Grade CCD Cameras for Solar Panel Inspection

A highly sensitive camera capable of taking images in very low light conditions is needed to identify possible defects in the solar cells found in solar panels.

Solar technology is starting to be seen in everyday devices and is gaining traction from green initiatives. It will continue to be more readily used to power everyday products.

Background

A solar cell is a device that converts energy from the sun into electricity. This is commonly seen in solar panels or small solar powered devices such as flash lights, phone chargers and camping lanterns. Solar panels are tested in order to ensure there are no defects in the silicon solar cells contained within the panel. Any defects present would affect the efficiency and lifetime of the cell.

Silicon solar cells will emit photons (light) when stimulated with a voltage, or current. This light is emitted from 950 – 1250 nm with the peak occurring at approximately 1150 nm. Silicon cells with a long diffusion length have brighter luminescence and higher conversion efficiency. By imaging this process, the efficiency of the solar cells can be determined by the diffusion lengths and light emitted, clearly identifying those cells with defects.

How to Inspect

Electroluminescence tests for uniformity by passing electric currents through the solar cell causing the cell to emit photons. Defects, or holes in the cell will influence the emission of light and become detectable.

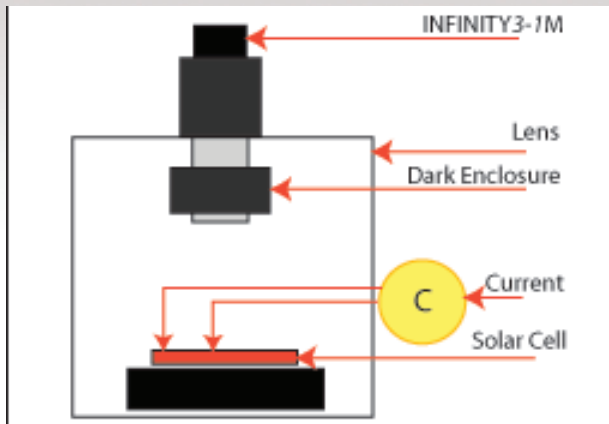


INFINITY3-1M for Electroluminescence

Highlights

- Electroluminescence tests for uniformity by passing electric currents through the solar cell causing the cell to emit photons. Defects, or holes in the cell will influence the emission of light and become detectable.
- Any defects present would affect the efficiency and lifetime of the cell and return the solar panel.
- Lumenera along with Titan Electro Optics provide a imaging solution for the solar cell inspection market with the INFINITY3-1M.
- The INFINITY3-1M USB 2.0 camera features a 1.4 megapixel CCD image sensor capable of detecting the short wavelength tail of the band-to-band luminescence from silicon solar cells at room temperature.





An electroluminescence system requires a camera, lens, and an enclosure free from ambient light. The solar cell is placed inside this enclosure and connected to a constant current source. The camera will snap an image while the current is streaming into the cell. This image will then be analyzed for

overall efficiency, uniformity, and dark defects of the cell. The cell will either be accepted or rejected based on the severity of the defects.

Inspecting the solar cells is a challenging process which requires a camera capable of capturing clear images at specific wavelengths, 950 to 1250 nm. The camera must be able to accurately render the entire panel in one capture and the resolution must be sufficient enough to allow the operator to easily identify micro cracks, different light intensities, uniformities of the emitted photons to electrons, and broken contacts that would otherwise go unnoticed by a visual inspection.

Solution

Lumenera and Titan Electro Optics are seeing considerable success in the solar cell inspection market with the INFINITY3-1M. When used in electroluminescence solar cell inspection this scientific grade camera is capable of inspecting the entire cell in one image.

The INFINITY3-1M is a high speed USB 2.0 scientific camera with a 1.4 megapixel CCD image sensor. The camera offers a cooling feature that reduces thermal noise and dark current (.015 e-/s) during electroluminescence. The CCD sensor has a cut-off wavelength at 1100 nm which will detect the short wavelength tail of the band-to-band luminescence from silicon solar cells at room temperature.

The INFINITY3-1M offers a fully customizable SDK. The feature rich API library eliminates design risk, allows full access to camera controls and provides easy integration and camera exchange.

Ensuring the solar cells that make up solar panels are defect free allows manufacturers to reduce rework and improve module efficiency.

About Lumenera

Lumenera Corporation, a division of Roper Technologies, headquartered in Ottawa, Canada, is a leading developer and manufacturer of high performance digital cameras and custom imaging solutions. Lumenera cameras are used worldwide in a diverse range of industrial, scientific and security applications.

Lumenera solutions provide unique combinations of speed, resolution and sensitivity in order to satisfy the most demanding digital imaging requirements. Lumenera customers achieve the benefit of superior price to performance ratios and faster time to market with the company's commitment to high quality, cost effective product solutions.

For further information about Lumenera, please visit www.lumenera.com or call 613-736-4077.

