

Solar



Controlling production processes, increasing efficiency and assuring quality – ranging from mono- and polycrystalline thick-film applications to thin-film applications.

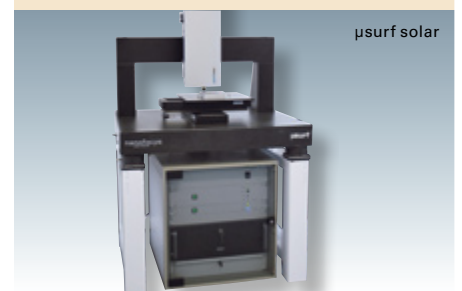
Due to the constant demand for ever more efficient and better quality solar cells, continuous process control is becoming increasingly important in the fields of research and development, the supply industry and production itself.

NanoFocus offers high precision optical measurement solutions for the broad spectrum of laboratory and production applications in the photovoltaics industry. The optimum flexibility of the systems allows all measurement tasks to be performed using the same technology. In addition to standard solutions, NanoFocus also develops individual customer and industry solutions – tailored to individual applications, from hardware to software. Table sizes, for example, can be extended to the metre range.

µsurf and µscan technology facilitates the non-destructive analysis of all types of solar cell and all materials used ranging from metal and silicon to glass, without the need for sample preparation. Furthermore, it makes no difference whether the surfaces are alkaline textured or coated with an anti-reflective coating.

The NanoFocus systems deliver precise 3-D measurements with repeatable accuracy in seconds, even with awkward sample characteristics such as steep sides, complex geometries and structures in the nanometre range. To increase efficiency of the measurement process, all measuring instruments can be fitted with a simple automation function. The systems additionally offer optimum data stability through extensive evaluation – with optimum dynamics and intuitive handling.

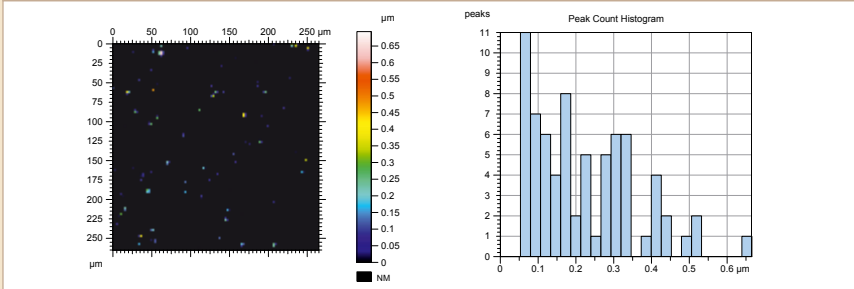
- ▶ Crystalline and thin-film applications
- ▶ Exact measurement of isolation channels
- ▶ Defect detection
- ▶ Roughness measurement compliant with current standard
- ▶ Alkaline textured surfaces
- ▶ Finger measurement with and without light traps
- ▶ Nanometre precision
- ▶ Simple and intuitive automation



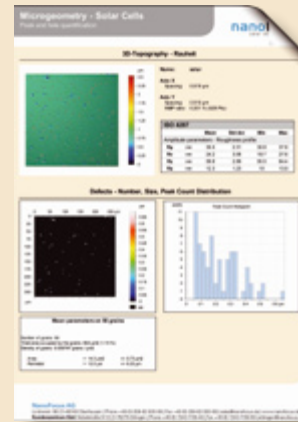
NanoFocus AG

µsoft automation solar

Defect detection of a thin-film solar cell



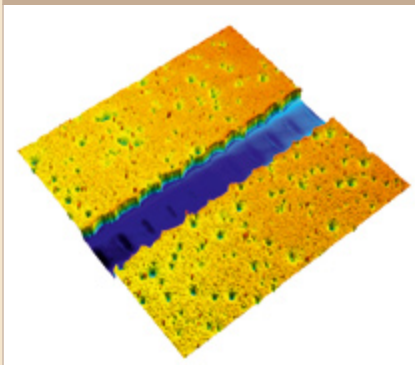
The µsoft automation solar software works with special algorithms which enhance surface evaluation, particularly with alkaline texturisation, and also allow for variable exposure times. The extensive evaluation delivers more stable data and a combination of height and reflection data enables precise edge determination. As a result, fingers can be measured with nanometre precision in terms of height, width and standard deviation. Thanks to the automatic surface search function, the measuring head can trace the structure of the sample, enabling even wavy surfaces such as EFG cells to be analysed effortlessly and without user input.



Measurement report of a defect detection on a thin-film solar cell.

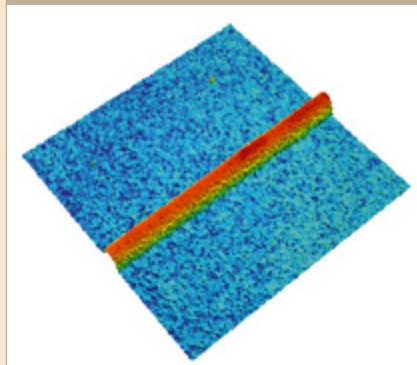
Applications

Laser scribes



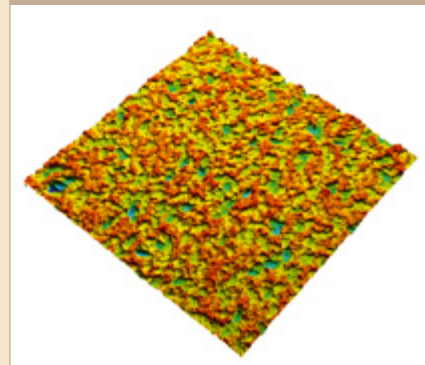
The entire thin-film module can be subdivided using laser-structured isolation channels, known as laser scribes. The individual segments are monolithically integrated with corresponding overlapping regions. The high precision 3-D measuring instruments record both the geometric data of the laser scribes and information to optimise material removal. Warming the material can result in undesirable edge fusions, which can be removed, quantified and corrected using the 3-D data.

Fingers



Thin strips of paste which conduct electricity are imprinted on to the front of the solar cell. These so-called fingers must be as narrow and deep as possible. Homogenous pressure is required to prevent shading of the solar cell whilst at the same time ensuring that the cross-sectional area is sufficient to allow current transmission. To ensure the quality of solar cells it is therefore essential to measure the height, width and standard deviation of the fingers to optimise and control the pressure process.

Structured surfaces



Light traps are applied to the surface of solar cells to increase their efficiency. These fine structures in the micrometre range are created by etching. Randomly distributed pyramids form on monocrystalline wafers. Random structures occur on polycrystalline wafers with surface areas that are orientated in different directions, regardless of the crystal orientation. Examining the micro-geometric structure of the surfaces, such as the size and angle of the pyramids, is an important aspect of process control.

Are you interested in other NanoFocus-Technologies?
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