About the MIRell Photonics GmbH
MIRell Photonics is a start-up from Würzburg and was founded in 2017. The three founders have worked in research and want to push on the transfer from pure research to useful applications. During their research, they recognized the lack of analysers for applications in the mid-infrared region, which was the starting signal to develop their own solution.

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MIRell
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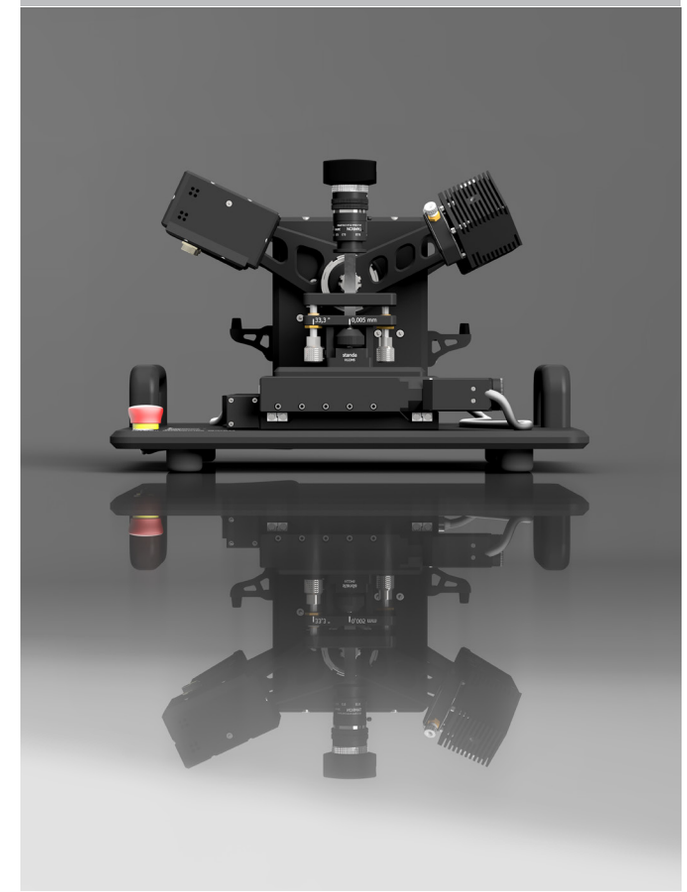
A NEW BOOST FOR MATERIAL SCIENCE



MIRELL PHOTONICS GMBH

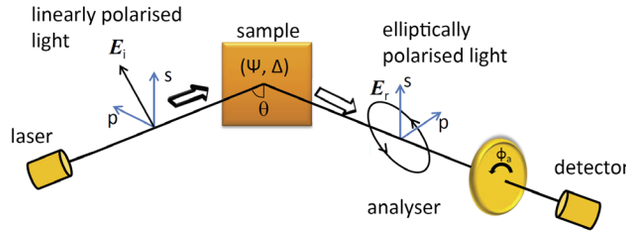
FIRST VENDOR FOR LASER BASED ELLIPSOMETRY IN MID-INFRARED RED

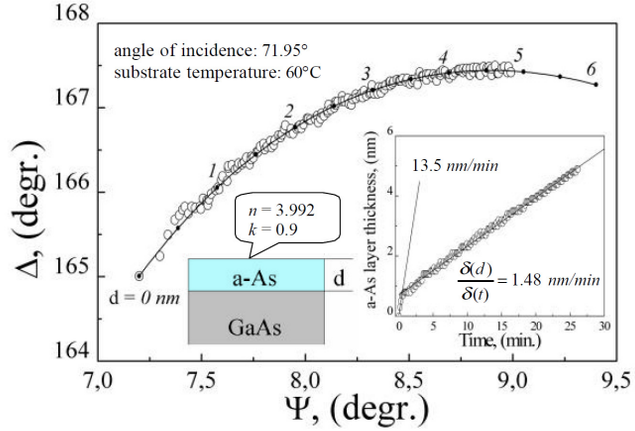
Non-destructive thin film analysis

In the extremely dynamic field of semiconductor technology, research and development is one of the key features for long lasting success, as well as an effective quality management. For both tasks, innovative measuring systems give your company a head start in this highly competitive market. In thin-film analysis, an elegant and non-destructive method is ellipsometry.

Ellipsometry

This is a well-established measurement technique to determine the refractive index and the thickness of thin films. This technique is non-invasive, as the change in polarisation of incident and reflected light at the boundaries of thin films is analysed. One of the most important characteristics in crystalline film systems is the material composition, which can be deduced from the refractive index and the thickness. In the rising market of mid-infrared applications, MIRell Photonics GmbH is the world's first vendor for Ellipsometer with a laser light source.





Top: Diagram of the measuring process with rotating analyser. From Neshat *et al.*: „Developments in THz range ellipsometry". https://arxiv.org/pdf/1305.3127.pdf (Mai 2013).
Bottom: Exemplary measurement result for the evolution of thickness during the growth process. From Vasev *et al.*: „Condensation and sublimation of thin amorphous arsenic films studied by ellipsometry". https://arxiv.org/ftp/cond-mat/papers/0402/0402592.pdf.

What do we offer:

Our MIR-ellipsometer with rotating analyser **Elli-3u** solves all problems which prohibit a wide-spread use of ellipsometry in the mid-infrared: high costs, long measuring times, huge and heavy hardware, complex handling and unintuitive software.

Due to modern construction methods, we achieve a **maximum size of 40 cm * 40 cm * 30 cm** with a weight of 14 kg with high rigidity and stability.

The outstanding precision of our laser light source (**wavelength up to 6µm**) enables a measurement **within parts of a second** with a s**patial resolution of <100µm**. Combined with the accuracy of the **automatic angle placement of <0.5°** covering the **full range from 0° to 90°**, **automated X-Y-mapping** is possible.

An integrated d**igital microscope with 2.1MP** resolution and an auxiliary laser (visible) simplify the correct positioning of the sample (**maximum size 70mm*70mm*5mm**). The manually driven sample stage can be **tilted in x- and y-direction up to +/- 1.8°**.

The Ellipsometer will be connected with a **standardized GigE-port** and can be operated from any computer, regardless of its architecture or operating system. The **intuitive user software** enables the creation of **individual measurement processes**, as well as the manual controlling of all components of the ellipsometer.

Launch is in **Q3/2018**.

How does ellipsometry work?

Light with well-defined polarisation is incidents at a specified angle upon the sample surface. At the interfaces of layer boundaries, light will be partially reflected and the polarisation will change depending on the material. This change in polarisation will be detected and analysed by software to make a physically correct model of the measured film system.

What is the meaning of the measured data?

The direct results of the calculated model are the film thickness and the refractive index for every film in the system. The refractive index characterises the behaviour of light in matter. It is based on material parameters like the concentration of donors or the material composition in semiconductor devices. The knowledge of these parameters is crucial for all photonic applications.