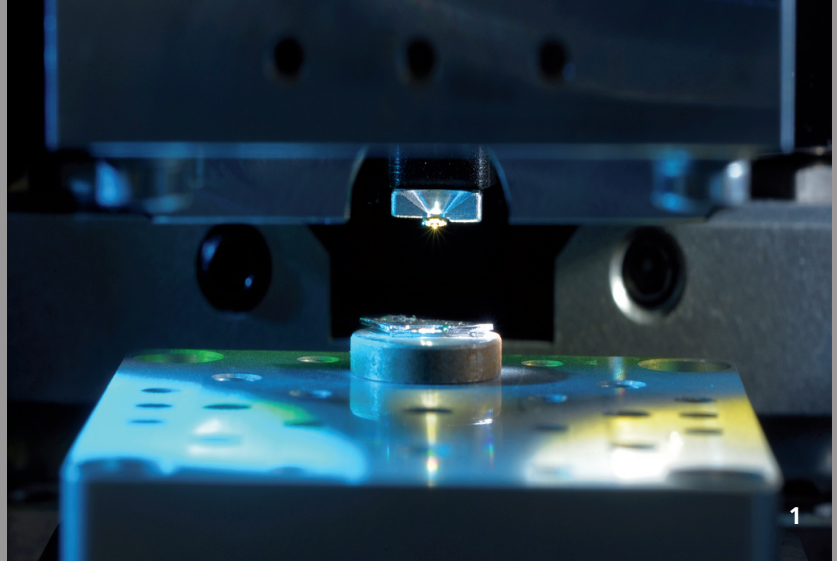



# BROADBAND NEAR-FIELD MICROSCOPY FOR MATERIAL CHARACTERIZATION

## Task

The semiconductor material gallium nitride is used in the field of high-power and high-frequency electronics. The properties of the components depend on the strain induced in the crystal structure. The ability to characterize this strain with a spatial resolution below the optical diffraction limit would be useful.

## Method

A scanning near-field optical microscope (SNOM) can be used to record infrared spectra with a spatial resolution of a few 10 nm. In addition to distinguishing individual materials, crystal properties such as polytypes and strain can also be investigated using nondestructive techniques. A broadband tunable laser system developed at Fraunhofer ILT is used for the scattered light near-field microscope. Overview images at a fixed center wavelength as well as spectra at individual measurement points can be recorded from a test sample. The tuning range of the broadband laser was extended to around 8.9 µm to 14.5 µm. This large spectral range enables various materials to be characterized, such as silicon carbide and gallium nitride.

## Result

Initial measurements on gallium nitride were made using the broadband near-field microscope. The aim is to investigate strained gallium nitride test samples.

## Applications

Near-field microscopy has numerous applications in the field of characterizing optoelectronic components, e.g. LEDs, transistors made out of gallium nitride and silicon carbide as well as nanocomposite materials, such as textile fibers, and nanoscopic inclusions. A SNOM application laboratory is being set up at Fraunhofer ILT where these issues will be investigated.

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*1 View of near-field microscope showing the holder of the illuminated tip and the underlying test sample.*



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