

alpha300 R Confocal Raman Microscope

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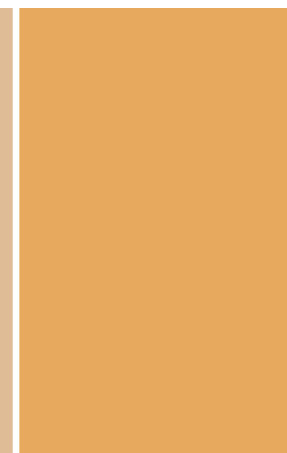
WITec
focus innovations



alpha300 R

Confocal Raman Microscope with unrivaled resolution and sensitivity

The *alpha300 R* represents a new generation of Raman imaging systems, focusing on high resolution as well as high speed spectrum and image acquisition. Its sensitive setup allows for the nondestructive imaging of chemical properties without specialized sample preparation. In typical experiments, the acquisition time for a single Raman spectrum is significantly less than 100 milliseconds. This results in complete images consisting of tens of thousands of spectra being collected within a few minutes. Differences in chemical composition, although completely invisible in the optical image, will be apparent in the Raman image and can be analyzed with a resolution down to 200 nm. The confocal setup reduces unwanted background signals, enhances contrast and provides depth information.



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Technical leadership

The *alpha300 R* combines an ultrahigh-throughput confocal microscope with an extremely sensitive spectroscopy system for unprecedented chemical sensitivity. A highly efficient combination of filters and optical components used in conjunction with the most sensitive detectors available is the key to the extremely short integration times of the various imaging modes. The most comprehensive mode of the *alpha300 R* is *Raman Spectral Imaging*. In this mode, a complete Raman spectrum is acquired at each image pixel and the images are calculated by isolating spectral characteristics (height, width, peak position, etc.) of these Raman spectra. It is also possible to perform depth scans along arbitrary lines, at selected points, or even to capture time series.

For high resolution sample survey, a video camera and white light illumination system are integrated and a variety of laser sources are available for excitation. Due to an extremely accurate, feedback-controlled, piezo-driven XYZ-scan stage, the lateral resolution is not limited by any mechanical properties of the stage itself. All spectra and image data are collected, stored and processed by the powerful *WITec Control* and *WITec Project* software package for data acquisition, data-evaluation and image processing. These high performance, easy-to-use software tools help to extract every last piece of information from your data.

Confocal Raman Imaging

A Raman spectrum shows the energy shift of the excitation light (laser) as a result of elastic or inelastic scattering by the molecules in a sample. The excitation light induces vibrations of the chemical bonds within the molecules. Different chemical species consist of different atoms and bonds, so each molecule can be easily identified by its unique Raman spectrum. As only molecular vibrations are excited (or annihilated), Raman spectroscopy is a

nondestructive technique. The Raman spectra are collected with a high-throughput spectrometer equipped with a CCD camera connected to a powerful computer and software system. The integrated software package *WITec Project* expands the imaging capabilities even further. For example, it is possible to generate images by integrating over selected spectral areas, determining the peak width, peak position or by even more sophisticated procedures such as the fitting of complete spectra.





key features

02

Operating Modes

- Single spectra at selected points
- Spectra along arbitrary lines
- Time series
- Raman Spectral Imaging (XY or XZ)
- Raman Fast Imaging (XY or XZ) (optional)
- Image stacks (optional)
- All modes available for air and liquid measurements
- 3D imaging and depth profiling due to confocal configuration
- Virtually limitless experimental setup

Resolution

- Optical resolution diffraction limited to 200 nm laterally and 500 nm vertically
- Spectral res. down to 0.02 wavenumbers

Excitation Lasers

- Multiple laser sources easily interchangeable
- Wide variety of lasers available, to best fulfill individual excitation requirements
- Flexible setup through single mode fiber connections

Spectroscopy system

- Ultra-high throughput WITec UHTS 300 spectrometer with up to 70% throughput
- Designed specifically for Raman microscopy
- Delivers excellent image quality at the highest spectral resolution
- Single or double grating options
- High sensitivity, back-illuminated spectroscopic CCD (deep depletion for NIR excitation)
- Ultrafast spectra acquisition with EMCCD (optional)
- Latest generation, vacuum sealed TE cooling technology (down to -100°C)
- Ultra high sensitivity, photon counting APD with up to 80% QE (optional)

Software

- WITec Control for measurement control and data acquisition
- Includes specialized routines and default safety features
- Control Window for immediate access to various parameters
- Number of spectra limited only by computer memory
- Full access to all acquired spectra, even during the measurement
- Real-time data evaluation
- WITec Project for data evaluation and post-processing (e.g. line-by-line averaging, background subtraction, fitting procedures, peak position/width analysis, ...)

Microscopy Stage

- Highly linear (0,02 %), piezo-driven, feed-back controlled scan stage
- Capacitive feedback-control on all axes
- 4 nm lateral positioning accuracy, 0.5 nm vertical
- Capacity for large samples

Control Unit alphaControl

- Fully digital system-on-a-chip concept for the highest speed, flexibility, accuracy, expandability and timing precision
- Complete access to internal signals

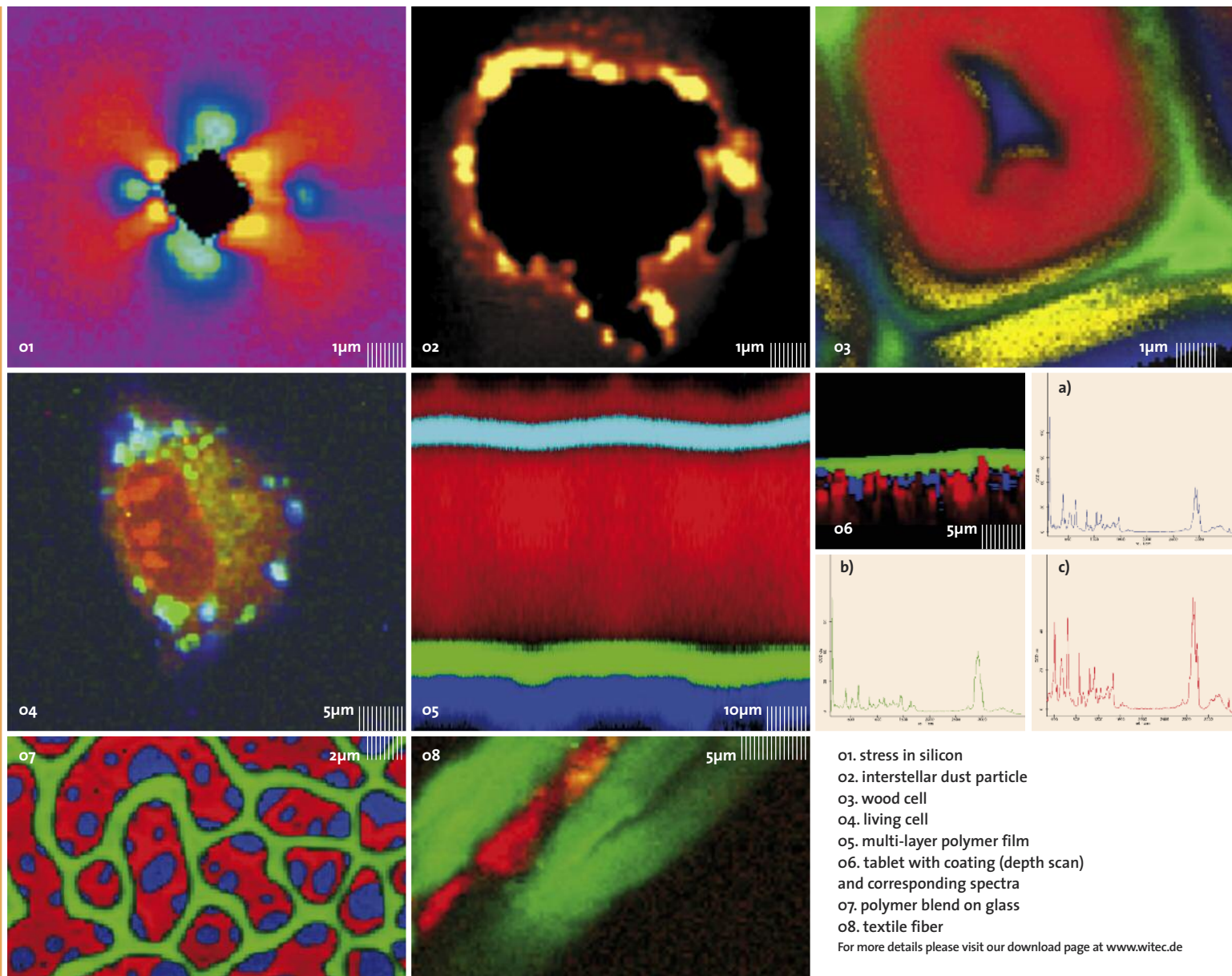
Modular Design

- Upgrade possibilities to Atomic Force Microscopy (AFM) and Scanning Near-field-Optical Microscopy (SNOM)
- Cost effective
- Flexible
- Scalable

Focusing on innovations, WITec uses only state-of-the-art, high quality, precise and optimized components. This philosophy has produced one of the best and most flexible pieces of equipment available for your experiments, enabling ground-breaking results and fundamentally new discoveries. With such a convenient and versatile instrument on hand, you can focus on your applications.

applications

Using the Confocal Raman Microscope *alpha300 R*, chemical properties of solid and liquid components can be analyzed with diffraction limited resolution (~ 200 nm). No labeling or other sample preparation techniques are necessary. The inherent depth resolution due to the confocal setup provides the ability to analyze the interior of transparent samples without microtome sectioning or freeze etching. The modular design even allows the combination of the Raman setup with an Atomic Force Microscope (AFM). Chemical information acquired by Confocal Raman Microscopy can be directly linked to the high spatial and topographical resolution of the AFM. Typical applications are found in Materials Science, Thin Film and Polymer Research, Semiconductors, Life Science, Polymorph and Crystal Analysis, Geosciences and the Pharmaceutical Industry.



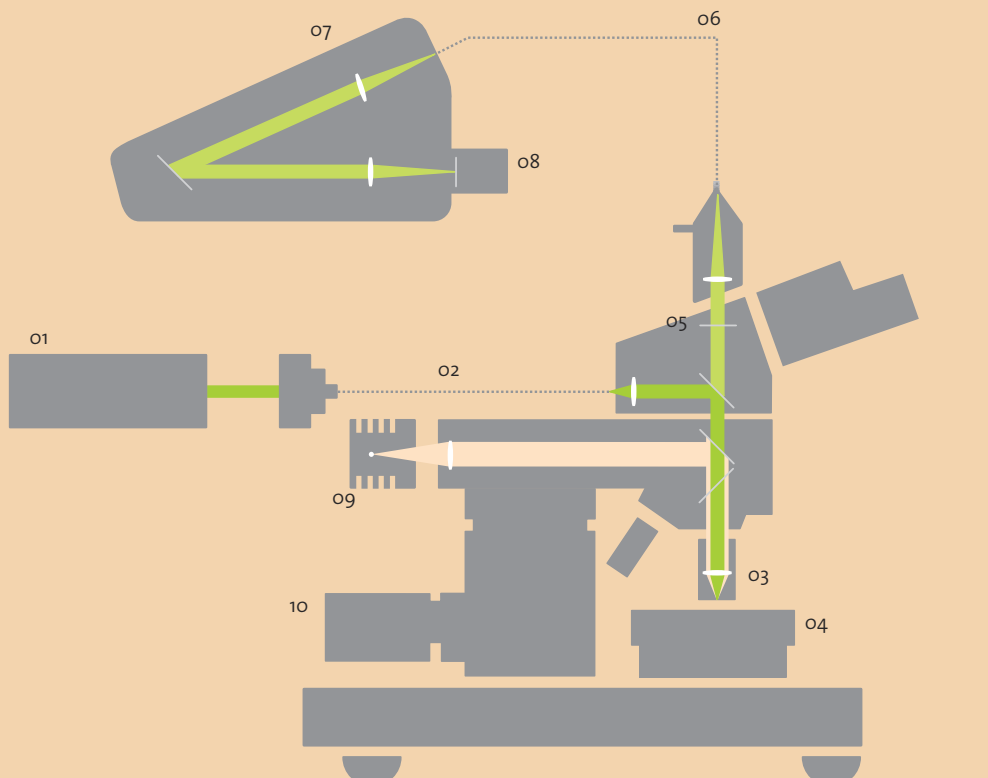
01. stress in silicon
02. interstellar dust particle
03. wood cell
04. living cell
05. multi-layer polymer film
06. tablet with coating (depth scan)
and corresponding spectra
07. polymer blend on glass
08. textile fiber

For more details please visit our download page at www.witec.de

flexible platform

The modular design of the *alpha300 R* and the WITec *alpha300* series guarantees easy and cost effective upgrade possibilities to Atomic Force Microscopy and Scanning Near-Field Optical Microscopy (SNOM).

By combining different techniques, a more comprehensive understanding of the samples can be attained. Not only chemical information, but also structural and topographic information can be acquired at the same time and on the same sample area using only one instrument.



alpha300 R Beam Path

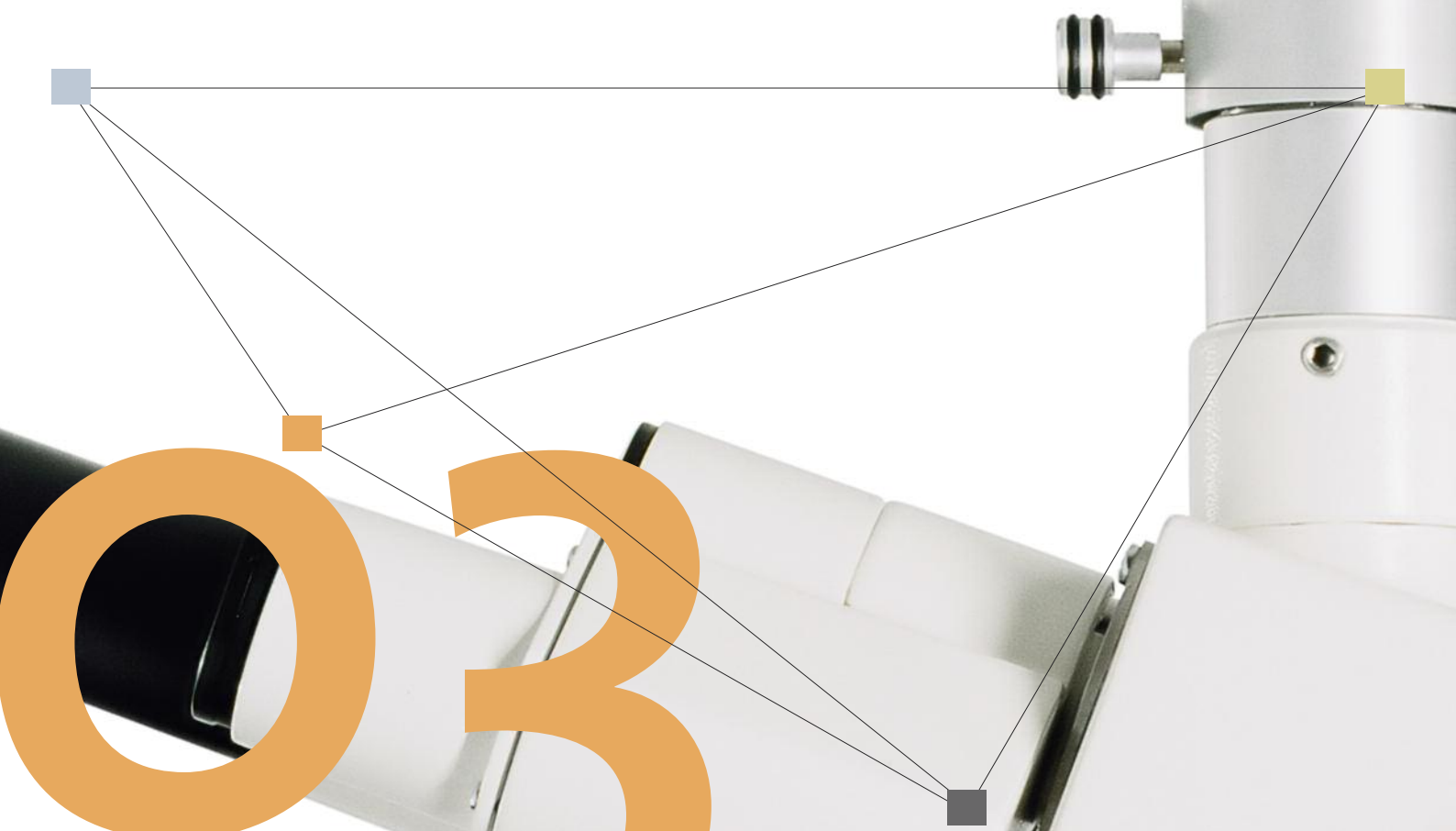
- 01. laser
- 02. single mode fiber
- 03. objective
- 04. scan table
- 05. filter
- 06. multi mode fiber
- 07. lense based spectroscopy system UHTS 300
- 08. CCD detector
- 09. white light illumination
- 10. Z-stage for focusing

Upgrades

Our modular product line incorporates essentially all scanning probe and optical microscopy techniques to meet your individual requirements.

The Atomic Force Microscope WITec *alpha 300 A* is a modular, user-friendly Atomic Force Microscope designed specifically for Materials Research, Nanotechnology and Life Science. It integrates a scientific-grade optical microscope for superior optical access, easy cantilever alignment and high resolution sample survey. All standard AFM modes are supported, ensuring high flexibility throughout the full range of AFM applications. Local surface properties can be investigated with the *Pulsed Force Mode* along with topographic structures on the nanometer scale.

All WITec microscopes are built rock-solid and modular. Upgrades are possible at any time. You can, for example, start with the *alpha300 R* and upgrade later to Atomic Force Microscopy (*alpha300 A*) or vice versa. This modularity provides a universal tool for almost all optical and scanning probe microscopy applications you may encounter.



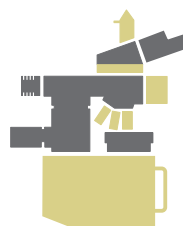
In Scanning Near-field Optical Microscopy (SNOM), represented by the WITec *alpha300 S*, optical resolution below the diffraction limit can be achieved. The *alpha300 S* employs unique micro-fabricated Cantilever SNOM Sensors with extraordinarily high transmission, user-friendliness and reliability. The near-field optical information is acquired simultaneously with topography and the instrument also integrates a confocal microscope.

alpha300 S

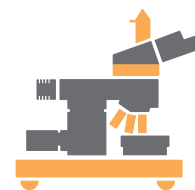
alpha300 R

alpha300 A

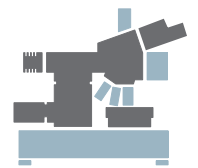
basic modules



alpha300 S
SNOM



alpha300 R
Raman



alpha300 A
AFM

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