NT-MDT

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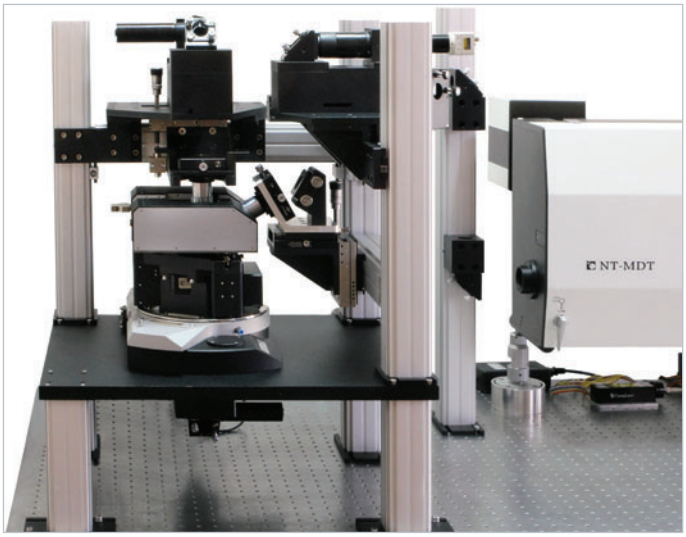
NEW

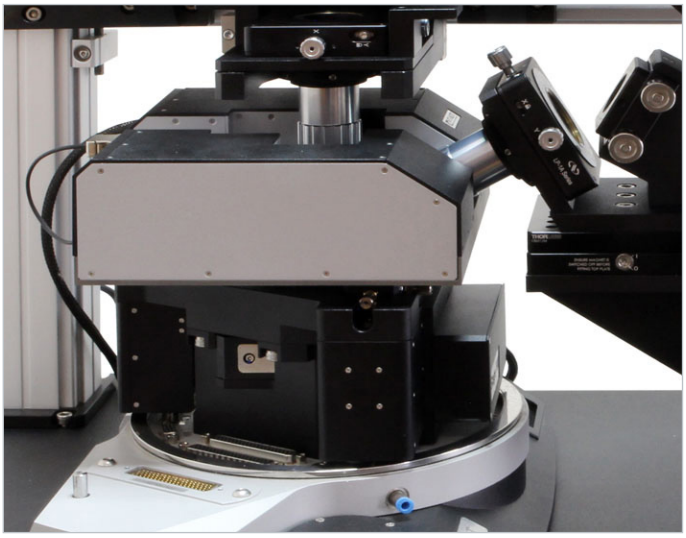
NTEGRA Spectra II – automated AFM-Raman, SNOM and TERS system

NTEGRA Spectra II:

- High-performance versatile AFM
- Optical access from top, side and bottom optimized for TERS and SNOM
- Flexible optical design providing any combination of excitation/collection configurations
- Automated AFM laser, probe and photodiode alignment

Since 1998 NT-MDT has been successfully integrating AFM with optical microscopy and spectroscopy techniques. More than 30 basic and advanced AFM modes including HybriD Mode™ are supported providing extensive information about the sample surface physical properties.





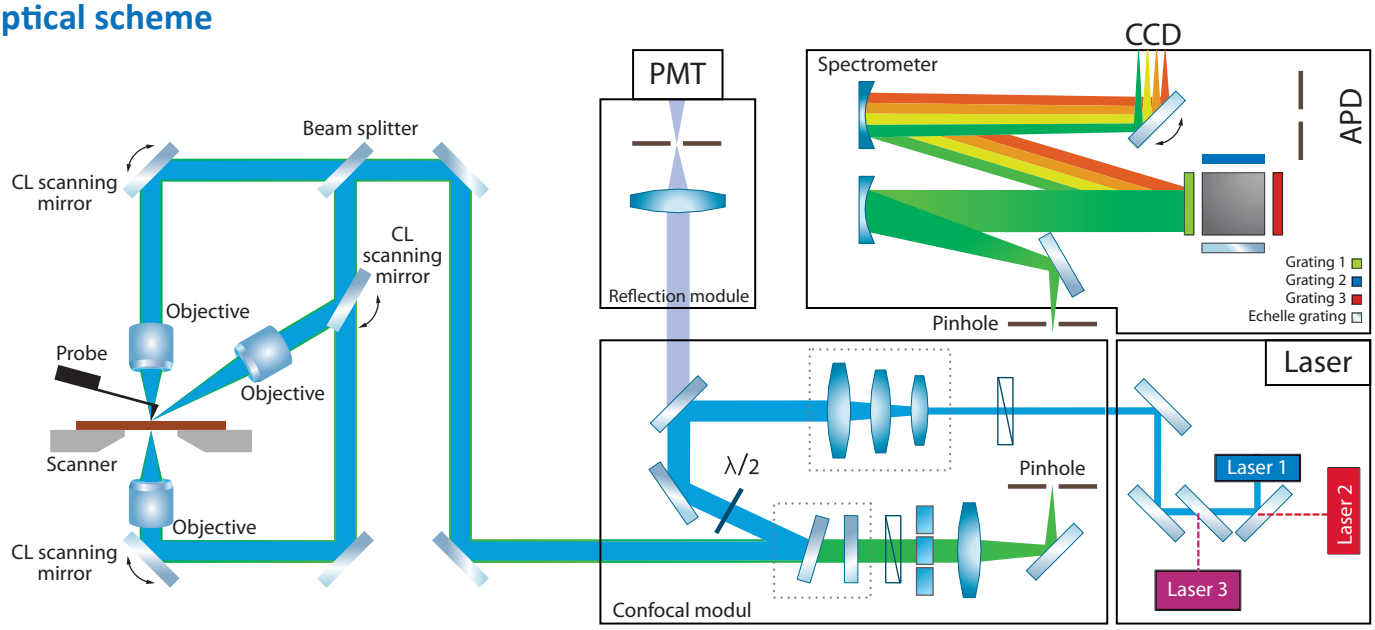
Integration of AFM with confocal Raman/fluorescence microscopy provide the widest range of additional information about the sample.

Simultaneously measured AFM and Raman maps of exactly the same sample area provide complementary information about sample physical properties (AFM) and chemical composition (Raman).

Owing to Tip Enhanced Raman Scattering (TERS) NTEGRA Spectra II allows carrying out spectroscopy/microscopy with nanometer scale resolution.

Scanning near-field optical microscopy (SNOM) is another approach to obtain optical and spectroscopy images of optically active samples with resolution limited by probe aperture size (~100 nm).

Optical scheme



Specifications

Confocal microscopy

Confocal Raman/fluorescence/Rayleigh imaging runs simultaneously with AFM

Diffraction limited spatial resolution: <200 nm in XY, <500 nm in Z (with immersion objective)

True confocality; motorized confocal pinhole for optimal signal and confocality

Continuously variable ND filter with the range 1 - 0.001 for precise change of laser power

Motorized variable beam expander/collimator: adjusts diameter and collimation of the laser beam individually for each laser and each objective used

Fully automated switching between different lasers - with a few mouse clicks

Full 3D (XYZ) confocal imaging with powerful image analysis

AFM/STM integration with spectroscopy

High-performance low noise AFM: Z noise<0.1 nm (RMS in 10-1000 Hz bandwidth)

Easy-to-do exchange of registration system operational wavelength (670, 830, 1064 and 1300 nm). No interference between AFM laser and Raman spectroscopy

Automated AFM laser, probe and photodiode positioning and alignment

Objective-independent AFM registration system

XYZ closed-loop sample scanner 100x100x10 µm

Focus track feature: sample always stays in focus due to sample Z-feedback. High quality confocal images of very rough or inclined samples can be obtained

Exchangeable probe holders (AFM, STM, Tuning fork). All standard SPM imaging modes are supported (including KPFM, SRI, PFM, SCM) and combined with confocal Raman microscopy

HybriD Mode™ allowing direct and fast force detection for quantitative and high-resolution mapping of local sample properties

Spectroscopy

Extremely high efficiency 520 mm length spectrometer with 4 motorized gratings

Visible, UV and IR spectral ranges available

Echelle grating with ultrahigh dispersion; spectral resolution: 0.007nm (< 0.1 cm^{-1})

Up to 3 different detectors can be installed:
- TE cooled (down to -100 °C) CCD/EMCCD cameras
- APD in photon counting mode or FLIM detector
- PMT for fast confocal laser (Rayleigh) imaging

Flexible motorized polarization optics in excitation and detection channels, crosspolarized Raman measurements

Low wavenumber/THz Raman spectroscopy: <10 cm^{-1} with Bragg volume filters

Hyperspectral imaging (recording complete Raman spectrum in every point of 1D, 2D or 3D confocal scan) with further software analysis

Light delivery system

Optical access for top, bottom and side illumination at 30 degrees

Highest possible resolution optics is used simultaneously with AFM: up to 1.45 NA for Inverted, up to 0.7 NA for Upright, up to 0.7 NA for Side configurations

Exchangeable objectives with kinematic mounts: precision <2 µm

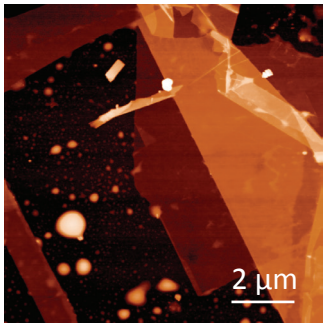
Dual scan: scan by sample AND scan by laser spot (for Hot Spot mapping in TERS)

Closed-loop scanning mirrors for precise laser spot positioning to the tip (important for SNOM, TERS): Upright, Inverted and Side configurations: 50×50 µm with 100× objective

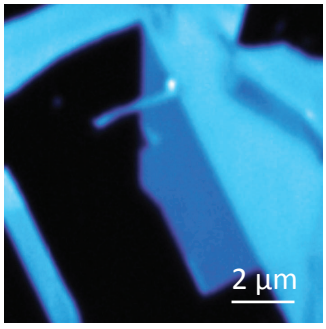
All SNOM signals are detected: laser intensity, fluorescence intensity, spectroscopy. All SNOM modes are supported: Transmission, Collection, Reflection, Scattering (s-SNOM)

All existing TERS geometries are available: illumination/collection from bottom, from top or from side

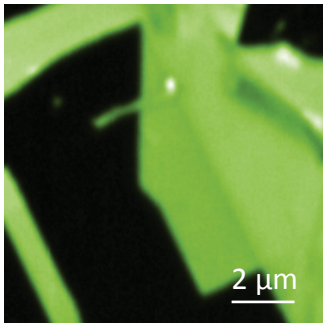
Graphene flake on Si/SiO_2



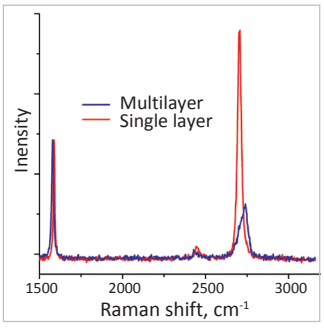
Topography



G band intensity



2D band intensity



Raman spectra