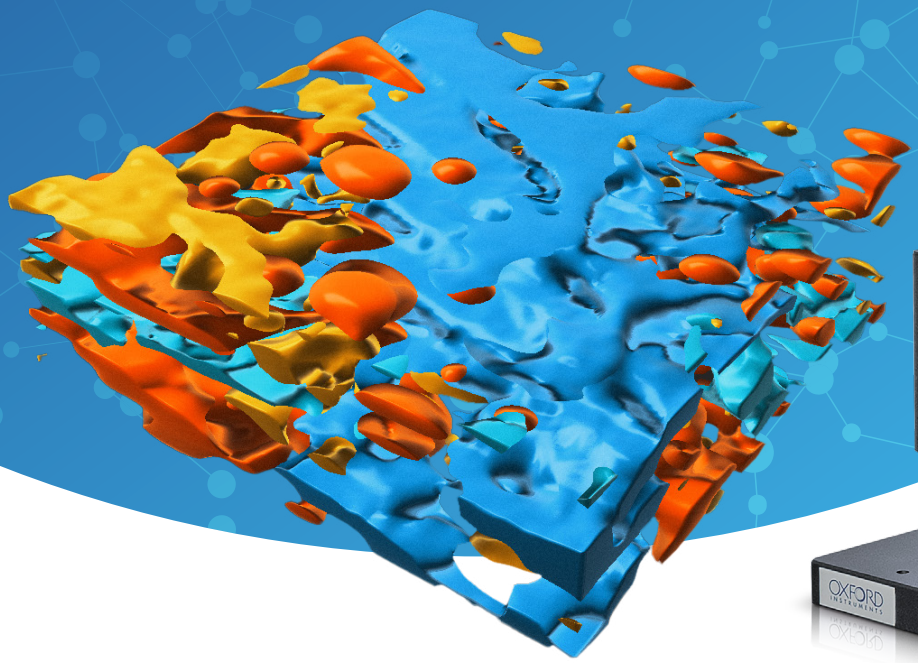
OXFORD INSTRUMENTS

witec360

Confocal Raman microscope

Take your research in any direction

- High performance, research grade Raman imaging system
- Correlative Raman analysis with PL, AFM, SHG, TCSPC, profilometry & SEM
- Modular, customisable & future-ready setup
- Broadband spectral range from UV excitation to NIR with class leading resolution
- Extensive automation options and intuitive multi-user access



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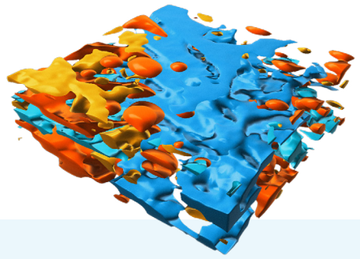
Introducing witec360

The next-generation Raman microscopy platform

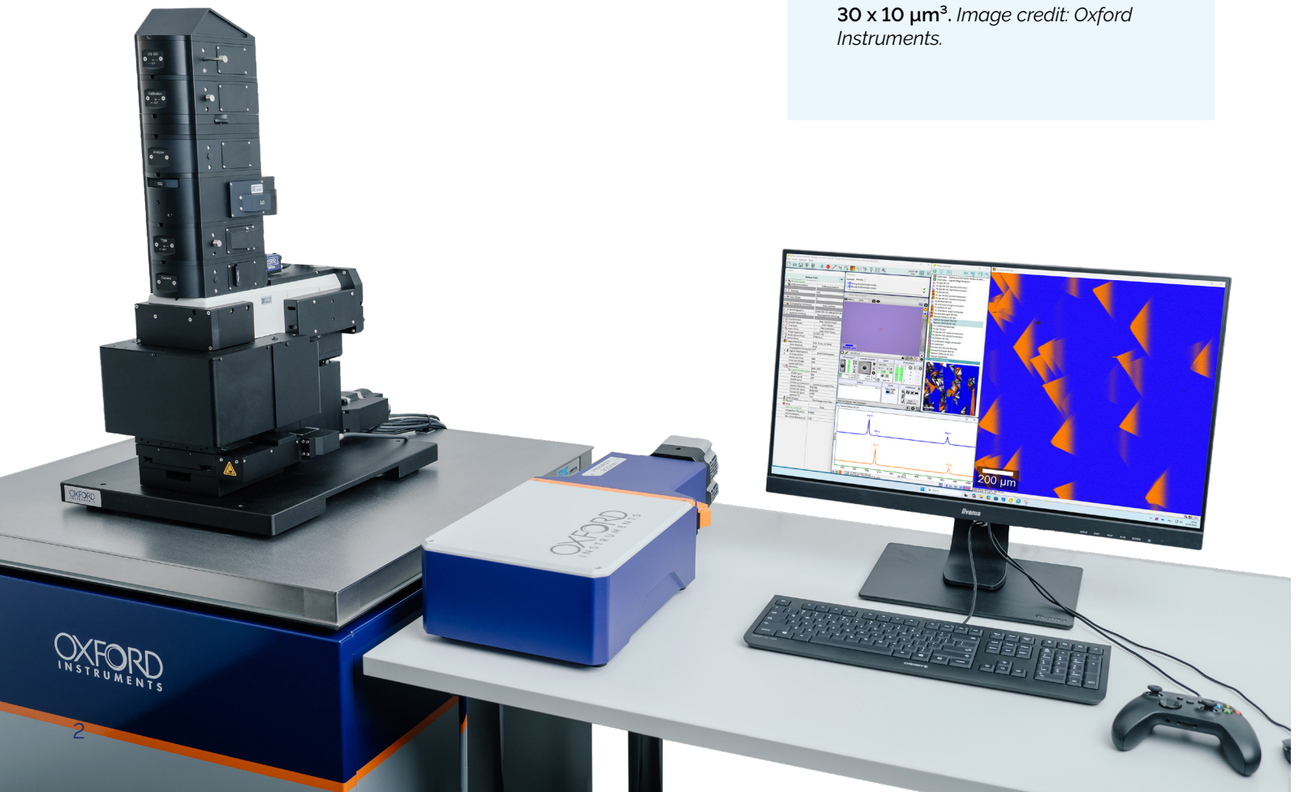
Consolidating decades of expertise in Raman microscope engineering, witec360 sets a new benchmark in throughput and true broadband capability, while preserving unparalleled spatial and spectral resolution, speed and sensitivity.
The witec360 platform enables fast onboarding, supports breakthrough academic research, and boosts industrial efficiency while its modular, user-friendly design ensures scalability and accessibility for all experience levels and future needs.

Confocal Raman imaging microscopy with witec360 provides non-destructive, label-free, and molecularly specific structural and chemical insights in 2D and 3D volume samples at diffraction-limited resolution.

Combining Raman imaging with multi-modal, correlative techniques allows researchers to correlate chemical, structural and morphological data, leading to a deeper understanding of sample properties.



3D Raman image visualising different phases in a cosmetic emulsion with dimensions: 30 x 30 x 10 µm³. *Image credit: Oxford Instruments.*



Raman imaging solutions for leaders in science and industry

From academia to industry, from early-stage research to at-line process analysis, our technology empowers all professionals in research, product development and material analysis to accelerate their discoveries.

Scientific research & PI | Industrial research & QC | Core facilities

Benefit	Feature	Ideal for ...
Achieve cutting-edge results	Class-leading resolution, speed, sensitivity	Scientific research & PI, Core facilities
Broad application field	Lens-based broadband capability without compromise	Scientific research & PI, Industrial research & QC, Core facilities
Dedicated applications	Tailored setups, standard configurations	Industrial research & QC
Plan with confidence	Scalable upgrades, predictable long-term funding	Scientific research & PI, Core facilities
Gain competitive edge	Unique correlative measurement modes	Scientific research & PI, Core facilities
Drive innovation	Continuous innovation, special customer solutions	Scientific research & PI, Core facilities
Adapt flexibly	Modular hardware, correlative methods	Scientific research & PI, Core facilities
Maximise uptime	Up to six gratings with no turret replacement required	Industrial research & QC, Core facilities
Simplify multi-user workflows	Automated workflows and calibration, user management	Industrial research & QC, Core facilities
Onboard easily	Intuitive software and hardware interfaces	Scientific research & PI, Industrial research & QC, Core facilities
Future-proof your investment	Flexible footprint, upgrade paths always open	Scientific research & PI, Industrial research & QC, Core facilities
Facilitate repetitive tasks	Customised automation in hardware and software	Industrial research & QC, Core facilities
Work practically	Sample scanning stages, environmental enclosures	Scientific research & PI, Core facilities

Hexalight – trusted core, next level innovation

Hexalight is the groundbreaking spectrometer at the heart of witec360. Its proprietary lens-based design ensures outstanding spectral precision, sensitivity, and throughput while offering the full broadband capability without compromise. Hexalight enables diverse applications within a single integrated system, simplifying access to funding and future research opportunities.

Modular design: configured for today, flexible for tomorrow

1 LASERS

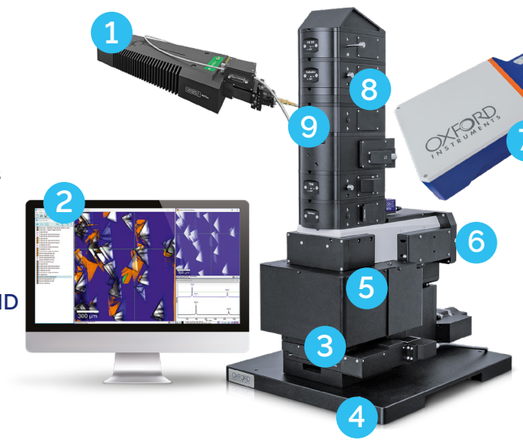
Supports a wide range of lasers, with up to 6 lasers in motorised exchange (more in manual configuration) and up to 4 TruePower lasers with intensity control.

2 SOFTWARE

Integrated software solutions for microscope control, automation and data analysis.

3 SAMPLE POSITIONING AND HANDLING

Manual or motorised stages for precise scanning in x, y, and z. Diverse sample holders. Compatible with devices for controlling temperature and gas phases.



4 COMPACT FOOTPRINT

Flexible positioning of all components. Glove box integration possible.

5 OBJECTIVE TURRET

Up to 6 objectives mounted simultaneously from multiple suppliers, with software-controlled options for enhanced sample safety.

6 HIGH-END WIDEFIELD MICROSCOPE

With class-leading Köhler illumination and multiple imaging modes.

7 HEXALIGHT SPECTROMETER

NEW

High-throughput, lens-based spectrometer with true broadband capability (350 to 1100 nm) up to 6 gratings, and focal lengths 300 mm and 600 mm.

8 MODULAR INPUT AND OUTPUT COUPLERS

Enable individual combinations of imaging modes and techniques.

9 FLEXIBLE ILLUMINATION AND DETECTION

Top or bottom illumination. Transmission and reflection mode.

The witec360's modular design lets you create the ideal microscope for your application and easily upgrade it as your requirements evolve. Choose from a large toolbox of optimized mechanical and optical components, including lasers, objectives, stages, sample holders, gratings, and filters tailored to your budget and analysis goals. Gain the most comprehensive insights with correlative imaging by combining techniques such as Raman and photoluminescence (PL) imaging, bright-/dark-field microscopy, second harmonic generation (SHG) imaging, atomic force microscopy (AFM), profilometry, and more – all in one system. The witec360 also supports automation and remote control, making operation easier and workflows more efficient.

Hexalight: tailored for every use case

Hexalight builds on the modular architecture of the witec360. Whether precision is the key for detecting subtle Raman shifts and advanced research or flexibility for diverse, multi-user environments, Hexalight's broad spectral coverage and high resolution provide the ideal foundation for both specialised and varied applications without compromise.

Scalable architecture:

Up to six different gratings installed without the need for any manual interaction to facilitate the ideal setup for your experiments and easy upgrades within the same core system for long-term savings.

Broadband capability:

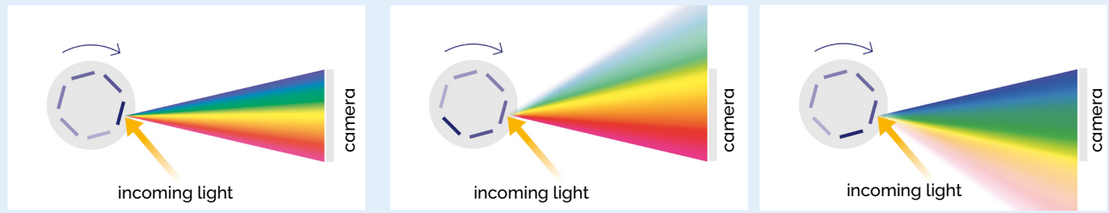
Combining broadband detection capability (350-1100 nm) with the throughput and line-shape preservation of a lens based spectrometer. Flexible experimental setup with seamless switching between high-resolution and broadband acquisition of Raman and photoluminescence spectra, all in one device.

Streamlined operation:

No manual grating exchange for maximum cleanliness and optimum alignment.

Why configuration flexibility matters

Selecting the right diffraction grating with an optimal blaze angle is key to achieving high-quality results. Grating dispersion determines the spectral resolution and detectable wavelength range, while blazed gratings enhance efficiency at target wavelengths. Hexalight employs up to six customised gratings to maximise throughput, resolution, and broad wavelength coverage (350–1100 nm), enabling precise spectral shift detection, comprehensive sample analysis, and effective photoluminescence applications.



Left shows full spectrum detection. Middle shows the detection from a grating with a blazing angle optimised for the orange-red region of the spectrum whereas the image on the right shows one with an optimised blazing angle in the blue range. Using the optimal blazing angle for the task at hand, the maximum detection efficiency of the spectrometer can be achieved.

Applications with fixed spectral configuration: Monolight

If your application requires only one fixed spectral configuration, the Monolight spectrometer is the perfect, budget-friendly alternative for you. Monolight features a single fixed grating while offering the key advantages of Hexalight's optimised optical design, providing high throughput and spectral quality for standardised measurements. Monolight is the standard spectrometer in our alphaCART mobile Raman system. Furthermore, Monolight features the possibility to use ultraviolet (266 nm and 320 nm) and Infrared (1064 nm) excitation wavelengths.

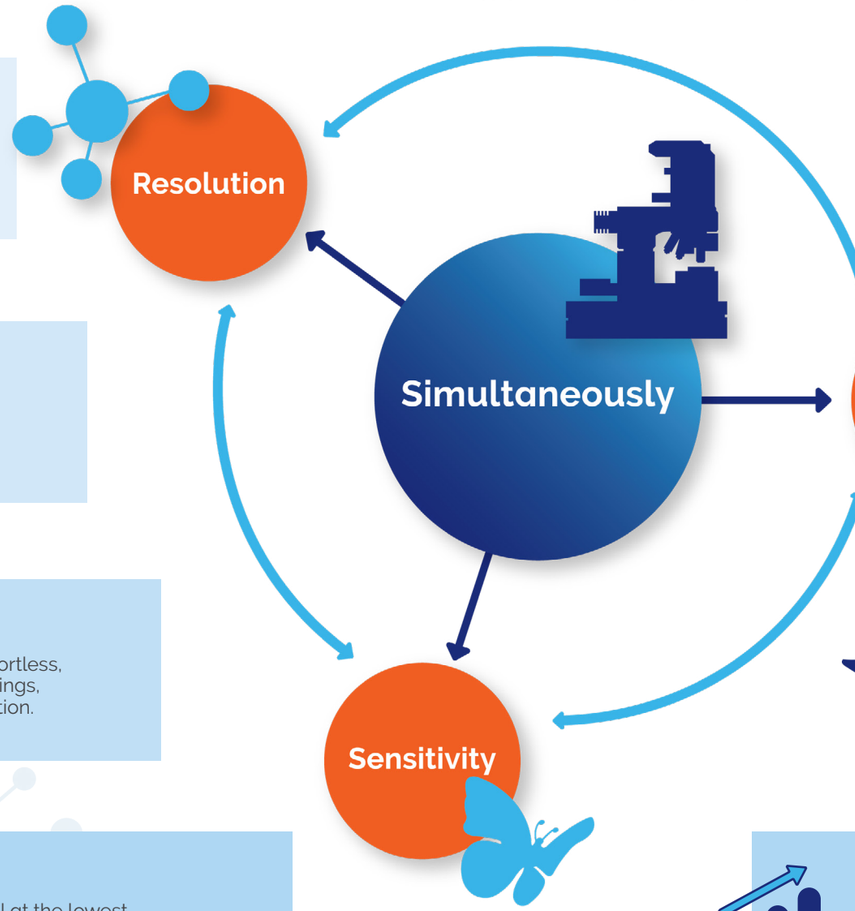
Optimised beam path. Uncompromised performance

In technical decisions every detail matters. That's why the witec360 beam path is precisely engineered. Its optical components work in harmony to deliver reliable, reproducible and high-resolution results. Hexalight is the only lens-based spectrometer with uncompromised broadband capability.

Speed, sensitivity, resolution - simultaneously

Experience exceptional performance in uncovering subtle spectral and spatial features - faster than ever.

- **Speed** - acquisition times < 1 ms per single spectrum (detector dependent).
- **Sensitivity** - maximised signal-to-noise ratio.
- **Resolution** - diffraction-limited, typically <300 nm laterally and <950 nm axially (532 nm: 100x 0.9 NA).



MAXIMISED PHOTON YIELD

Achieve the strongest signal intensity and ideal spectral shape along the entire wavelength range through proprietary Olaf-Hollricher-Design (OHD) lenses and dielectric mirrors.

TRUSTABLE, REPRODUCIBLE RESULTS

Acquire consistently reliable results within seconds, thanks to the innovative harmonic drive that ensures ultra-precise grating positioning.

SEAMLESS SWITCHING

Save time and ensure measurement integrity with effortless, reproducible and automated switching between gratings, without the need for recalibration or manual intervention.

MORE SIGNAL, REDUCED POWER

Detect even the weakest Raman signal at the lowest concentration with minimal excitation power - ideal for sensitive and precious samples.

MINIMAL BACKGROUND

Achieve the best contrast, depth selectivity and spatial resolution with true confocality guaranteed through fibre coupling.

HIGH-SPEED RAMAN IMAGING

Accelerate workflows and minimise times between experiments.

CONSISTENT SIGNAL QUALITY

Achieve full spectral coverage and uncompromised signal intensity by avoiding Al-/Ag- mirrors in the detection beam path.

Materials application focus

Revealing details of material properties

The witec360 empowers material scientists from fundamental research to product development to achieve publication-ready results and accelerate processes. It enables the seamless transitions from full-range spectral measurements to specific wavenumber studies, and accommodates a wide range of laser wavelengths – all within a single system. Its flexibility supports the analysis of atomic bonding, extrinsic sample conditions and material identification, and makes the system ideal for analysing complex photoluminescence or unexpected sample responses. For the most comprehensive analyses, complementary techniques, such as scanning electron, atomic force or second harmonic generation microscopy can be combined with Raman imaging in a single device.

Stress, strain and crystallinity analysis for when sensitivity matters

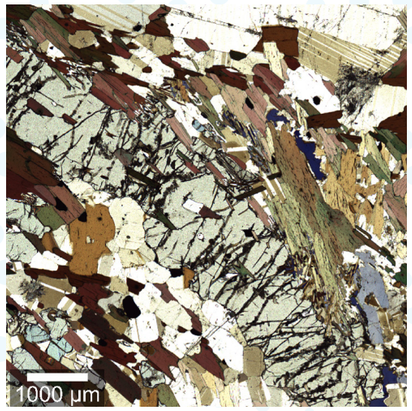
Minimal stress or strain impact material performance and reliability. The witec360 detects subtle Raman peak shifts, enabling peak fitting studies and high-resolution mapping of stress fields and crystal quality.

- Nanoindentation stress pattern
- Material failure analysis
- Thermal coating performance and structural integrity
- Material transformation, e.g. crystallisation or polymerisation

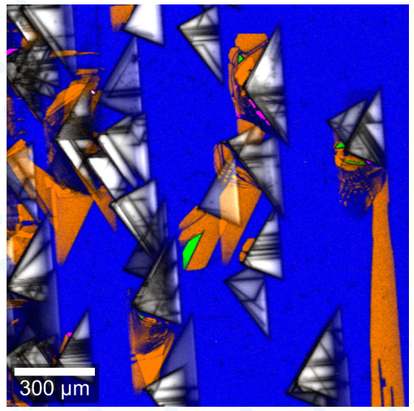
Correlative Raman and photoluminescence imaging for enhancing interpretive power

The witec360 enables high-resolution Raman and PL imaging of the same sample area within one device, providing the flexible experimental setup needed in various fields.

- Structural & optoelectronic characterisation (e.g. GaN, perovskites, MoS_2, nanowires)
- Defect, doping and PL analysis in advanced materials
- PL of precious metals and rare earth elements



White-light polarisation microscopy image of biotite crystals in a thin section of black mica. The image was recorded in transmission with polariser and analyser in parallel orientation. *Image credit: Oxford Instruments.*

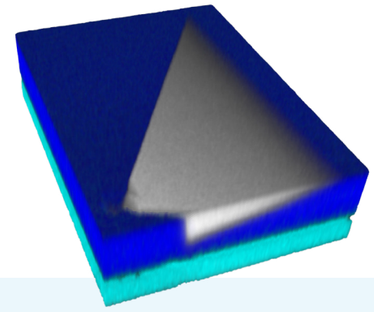


PL image of defects with different bandgap properties in a 4H-SiC wafer, showing spectral characteristics of 4H-SiC (blue), 4H-SiC with stacking faults (orange, green) and 3C-SiC (grey). *Image credit: Oxford Instruments.*

3D depth profiling for deep insights

Superior depth resolution and confocality reveal subsurface structures without damaging the sample.

- Defect and inclusion detection
- Multilayer analysis of semiconductors, polymers & coatings
- Semiconductor metrology
- Chemical altering & profiling



3D Raman representation of a defect (grey) in an epitaxially overgrown (blue) SiC wafer (cyan). Dimensions: 180 x 245 x 7 µm³. *Image credit: Oxford Instruments.*

In situ materials analysis for understanding real-world behaviours

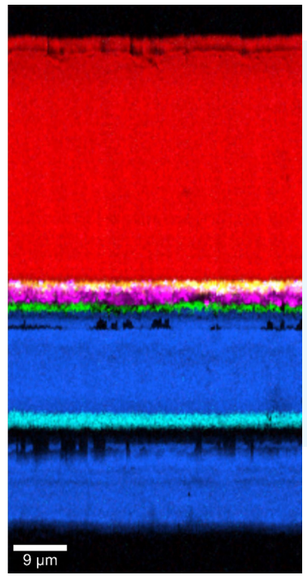
The witec360 enables *in situ* analysis of material behaviour under mechanical stress and thermal load.

- Characterising stress-induced phase transitions in ceramics
- Studying thermal degradation of polymers via polarisation-resolved analysis
- Monitoring catalytic reactions and cooling processes
- Analysing polymorphism, polytypes, and allotropes

Low-frequency Raman for unlocking hidden vibrations

Precise layer identification in 2D materials is key to developing advanced new materials. Low-frequency Raman imaging enables clear visualisation of vibrational modes near the Rayleigh line, also under cryogenic conditions.

- Single- to multi-layer differentiation through low-frequency Raman modes (down to 10 cm^{-1})
- Ultra-low-temperature correlative Raman imaging with cryoRaman



Raman image of a layered plastic packaging foil, consisting of the polymers polypropylene (red), polyethylene (blue), ethylene-vinyl acetate (cyan) and polyurethane (green), and titanium dioxide (pink) among other pigments (yellow, violet, brown, orange). *Image credit: Oxford Instruments.*

Application focus

Delivering detailed molecular insights in life sciences

Confocal Raman microscopy is essential in life science research, offering label-free, non-destructive 2D and 3D chemical imaging. The witec360 with Hexalight adapts to diverse biological samples and reveals chemical, structural, and functional insights with minimal preparation. Its multimodal approach enhances understanding of diseases, drug response, and cancer biomarkers, while gentle laser excitation preserves samples for further analysis.

High-resolution insights for advanced cellular and molecular biology

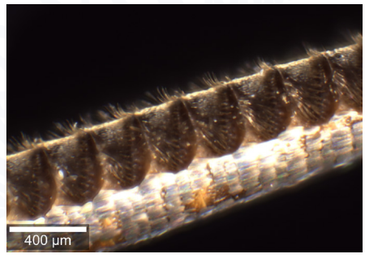
Gain deeper insights into cellular processes: by revealing the spatial distribution of biological components in single cells or tissues, both *in vitro* and *in vivo*:

- Label-free 3D imaging of cellular and subcellular structures, such as organelles, lipids, proteins, and nucleic acids
- Studies of cellular process like metabolism, drug uptake, lipid organisation
- Microenvironment analysis for cell-cell interaction studies
- Distinction between malignant and healthy cellular structures

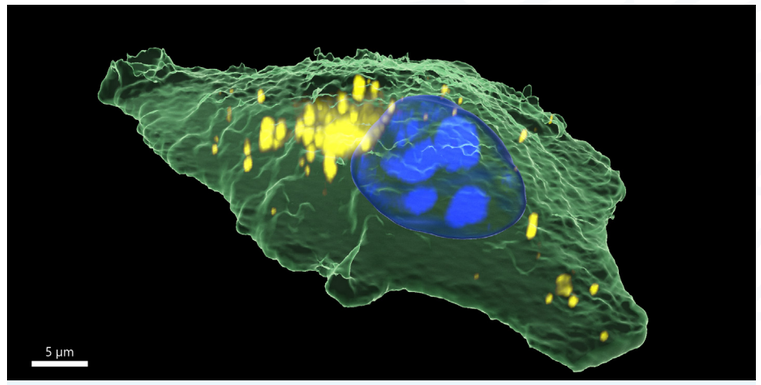
Correlative techniques for understanding interdependencies

The witec360 platform offers various correlative techniques to gain deeper insights, accelerating research in life sciences:

- Raman + fluorescence: seamless combination of chemical composition analysis and fluorescent markers.
- Raman + AFM: Analysis of cell morphology and mechanics, linking stiffness and adhesion to structural and chemical changes in healthy and cancerous cells
- SEM-EDS for additional structural and elemental information



Dark-field image of a butterfly's antenna, recorded at 20x magnification. *Image credit: Oxford Instruments.*



3D Raman image of a human epithelial cancer cell showing cytoplasm (green), nucleus (blue), and lipids (yellow). Dimensions: 40 x 47 x 9 µm³. Image rendered in Imaris. Sample courtesy of Dr. Irina Estrela-Lopis and Tom Venus, Institute of Medical Physics and Biophysics, Leipzig University, Germany. *Image credit: Oxford Instruments.*

Label-free and sensitive analysis in neuroscience and cancer research

Non-destructive 2D and 3D Raman imaging supports the research of neurological diseases by analysing cells, or pathological tissue while preserving clinical samples:

- Early detection of neurodegenerative markers
- Drug delivery and metabolism tracking
- Subcellular insights into mitochondrial activity and protein aggregation

Accelerating pharmaceutical research and development with confidence

Pharma innovators operate in a dynamic and competitive environment, requiring patented therapies, personalised medicine, and solutions against antibiotic resistance. The witec360 supports early development decisions and time-to-market phases with fast, reliable results.

Core facilities benefit from adaptable hardware, easy onboarding, and streamlined upgrade paths. Whether analysing tablets, powders, liquids, cells, or tissues, cross-functional teams gain broad sampling capabilities with easy-to-use hardware and fast training.

Polymorphism and structural information in dosage forms

With witec360 studies on polymorphism can accelerate the determination of solubility, stability, and bioavailability - key factors for dosage form effectiveness and manufacturability.

- Raman-based polymorph differentiation
- Polymorph distribution mapping via large area scans
- Crystallinity and crystal orientation analysis

Active pharmaceutical ingredient content uniformity

Whether capsules, coated/uncoated tablets, or dispersible films or stents, researchers benefit from the witec360 for API distribution and topographic analysis.

- Imaging tablets with rough or curved surfaces
- API mapping in gels, solid dosage forms, and emulsions
- Homogeneity analysis

Understanding mechanisms

The witec360 supports faster and more informed formulation strategies by revealing critical chemical and structural insights.

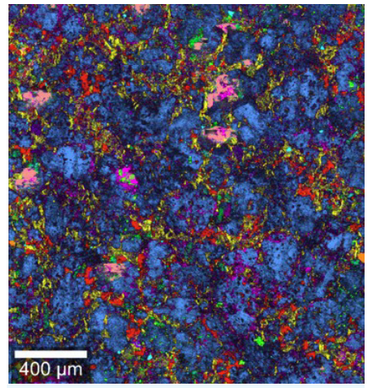
- Physiological/chemical mechanism of drug uptake and intake
- High-resolution 3D coating analysis, revealing layer thickness, uniformity, and chemical composition

Unique combination of:

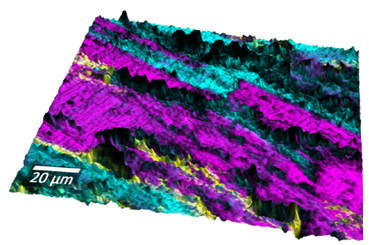
- Automated particle detection with ParticleScout™
- Raman-based identification via TrueMatch
- Ultra-sharp, large-area microscopy image using Focus Stacking & Image Stitching

Ideal for applications in:

- Pharmaceutics & cosmetics
- Food control & technology
- Environmental research (e.g., microplastics)



Raman image showing the spatial distribution of various APIs and excipients on the surface of a pharmaceutical tablet. *Image credit: Oxford Instruments.*



Topographic Raman image of a gallstone showing the distribution of two cholesterol derivatives (pink, cyan) and fluorescence (yellow) on the stone's rough surface. *Image credit: Oxford Instruments.*

Correlative Raman imaging

The modular design of the witec360 enables the combination of various imaging techniques in one instrument without compromising the analytical power or imaging quality. Complementary information from the same sample position can thus be correlated, maximising the insights obtained. The witec360 comes with an integrated software that controls different measurement modes and enables quick overlay of images acquired from the same sample position by different techniques. It is designed to flexibly adapt to your experimental requirements, and can be upgraded with further imaging capabilities.

Second Harmonic Generation (SHG)

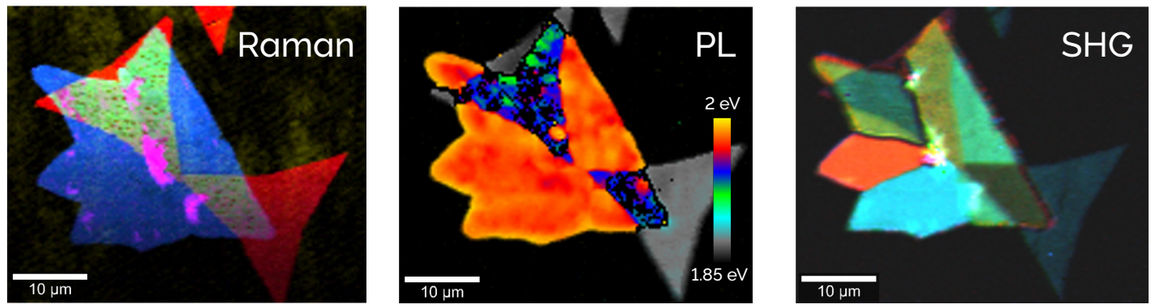
Combining Raman imaging with SHG provides comprehensive insight into crystal properties in materials sciences and biomedical research. SHG is highly sensitive to variations in crystal orientation, crystal symmetry, layer thickness and stacking order. In the witec360, it can be combined with Raman imaging and polarisation-resolved measurements, and carried out under extreme conditions such as low temperatures and high magnetic fields. Learn more.

Raman and photoluminescence

The broadband capability of our Hexalight spectrometer allows for simultaneous recording of Raman and PL signals, reducing the required time and effort. PL adds details about optoelectronic properties such as the bandgap, and about molecular environment parameters such as pH, to the chemical information obtained by Raman imaging. The obtainable insights are particularly valuable for materials science, semiconductor investigations and pharmaceutical research.

Scanning Near-Field Optical Microscopy (SNOM)

The witec360 is available as a scanning near-field optical microscope (SNOM) for optical imaging beyond the diffraction limit (down to ~60 nm) for high-resolution imaging of, for example, cells, proteins or light emitting devices and waveguides. Raman imaging and SNOM capabilities can be seamlessly integrated. As switching between imaging modes only requires a turn of the objective turret, chemical and nanoscale structural information from the same sample position can be correlated easily and precisely. Learn more.



Correlative Raman, PL and SHG analysis of a 2D material heterostructure. The Raman image reveals MoS_2 (blue) and WS_2 (red) crystals with overlapping areas (green, pink), PL visualises the peak emission wavelengths reflecting the band-gap properties of the materials, and SHG recorded at three different polarisation angles (red, green, blue) shows grain boundaries and grain orientations. *Image credit: Oxford Instruments.*

Raman and Atomic Force Microscopy (AFM)

The witec360 with the Atomic Force Microscopy (AFM) extension relates Raman chemical information with surface properties such as topography, adhesion and stiffness, at the nanometre scale.

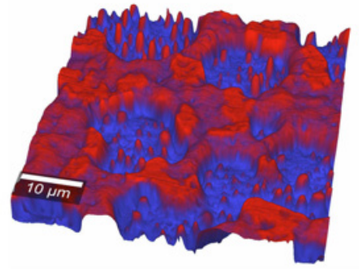
This provides easy and precise recording and correlation of Raman and AFM images from the same sample position, seamlessly integrated in the same core system and software. Learn more.

TrueSurface: Topographic Raman imaging

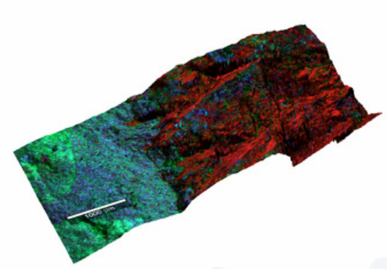
The patented TrueSurface™ Microscopy option enables confocal Raman imaging guided by surface topography. An advanced optical profilometer integrated within the Raman microscope provides one-pass simultaneous recording of chemical and topographic data, and keeps the surface in focus. This is essential for generating sharp images of rough or curved samples, such as rocks, tablets or micro-structured materials, but also for long and large-area measurements. Learn more.

Raman Imaging and Scanning Electron (RISE) microscopy

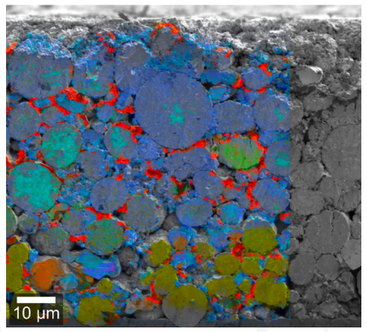
RISE microscopy combines Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDS) and Raman imaging in one instrument within a common vacuum chamber. These systems enable the correlation of ultra-structural surface properties with chemical information to provide more thorough sample characterisation. RISE is available for SEMs from many manufacturers. Learn more.



Overlay of Raman and AFM topography images of a polymer blend, revealing the spatial distribution of two different polymers on the surface structure. *Image credit: Oxford Instruments.*



Topographic Raman image of an unpolished geological sample, revealing the distribution of carbon (green) and calcite in two different crystal orientations (red, blue) on the rough surface. *Image credit: Oxford Instruments.*



Overlay of Raman and secondary electron (SE) images of a polished lithium-ion battery cathode at 50% SOC, revealing LNO and NMC particle morphology and charge state heterogeneities. Sample courtesy of IMFAA Aalen, Germany. *Image credit: Oxford Instruments.*

Configure your microscope

Components, accessories & software

SAMPLE POSITIONING AND HANDLING

For precise sample positioning, manual, stepper motor-driven and piezo-actuated stages with several different travel ranges are available. A wide selection of holders allows you to handle your individual sample easily for safe and reproducible fixation.

ENCLOSURES AND ENVIRONMENTAL CONTROL

The enclosure and the vibration-damping support frame isolate witec360 microscopes from environmental interference to ensure stability for high-resolution imaging.
The platform is compatible with devices for controlling environmental conditions, such as temperature, pressure, gas phase, or mechanical force.

LASER SOURCES, SAFETY AND POWER CONTROL

Choose your ideal combination of limitless laser wavelengths, with up to six lines with motorised automated switching. Combine up to four lines with TruePower for power control down to 0.1 mW or even much lower levels (0.1 µW) in extended configurations. Laser safety class 1 or 1 M configuration options.

CAMERAS

Choose the ideal detector for your application from a variety of ultra-sensitive cameras to ensure efficient detection of extremely weak Raman signals.

OBJECTIVES

A wide range of objectives for various microscopy techniques are available to meet your experimental requirements including magnifications, working distances, and immersion capabilities.

POLARISATION MODULE

Our freely rotatable polariser and analyser modules enable measurements at any desired polarisation configuration without sample rotation. Polarisation resolved Raman, PL or SHG measurements characterise molecular orientation, chirality and optical anisotropy.

LIGHT MICROSCOPY OPTIONS

The witec360 includes Köhler-illumination for research-grade images in, for example, bright-field, dark-field, or differential interference contrast (DIC) modes. Configurations for fluorescence microscopy are also available. Illumination options for polarisation dependent reflection or transmission modes are also available.

RAMAN FILTER SETS

Optimised filter sets enable efficient detection of faint Raman signals, even close to the Rayleigh line. The RayLine and RayShield options make low-frequency Stokes and anti-Stokes Raman signals accessible (down to 10 cm^{-1}).

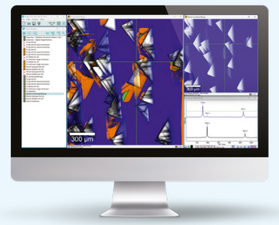
AUTOMATION OPTIONS

All parts of the witec360 can be automated for maximising ease-of-use, streamlining workflows, and enhancing reproducibility. With options ranging from basic automation to fully remote-controlled systems, there's a solution tailored to your needs and resources.

**Work closely with our team to discuss and develop a system perfectly fitted to your needs.
For more information contact us or please visit: raman.oxinst.com/witec360**

Data acquisition and evaluation

One integrated software suite manages the entire experiment, from initial settings and data acquisition through post-processing and image generation, for every supported technique and measurement mode. The software offers basic and advanced data analysis features. For expediting recurring workflows, standard microscope settings and automated experimental sequences can be saved. Multi-user facilities have the option to define access rights for individual user accounts. Measurement settings and data processing parameters are automatically documented, making the results traceable and reproducible.



TrueMatch™

TrueMatch is a powerful software for managing Raman spectral databases, and identifying the compounds in a sample. Existing Raman reference databases can be accessed, or individual spectral libraries can be built.

ParticleScout™

ParticleScout is a tool for easy and comprehensive particle analysis. Automated routines find particles over even large sample areas, acquire their Raman spectra, and sort them by chemical and physical attributes. Seamless integration with TrueMatch database management software enables reliable particle identification. The reports generated provide a detailed and quantitative sample overview.

Programming interface

The programming interface offers you the possibility to implement user-defined measurement procedures through several supported programming languages such as LabVIEW®, Python®, and C#.

Order today

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Lise-Meitner-Str. 6
D-89081 Ulm, Germany
Tel: +49 731 140 700
Email: info.witec@oxinst.com

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