Principle of RISE Microscopy

Samples are automatically transferred from one measuring position to the other within the vacuum chamber of the combined Raman-SEM instrument, streamlining the workflow and drastically improving ease of use.

Applications

Titanium dioxide

Two modifications of Titanium dioxide anatase and rutile were mixed and imaged with an SEM. (B) In the Raman spectrum, anatase (blue) can be easily distinguished from rutile (red).

RISE image derived from Raman spectra and SEM data.

Raman imaging parameters: 22,500 spectra, 37 ms integration time per spectrum.

Twisted bilayer graphene

(C) Monolayer graphene (here on SiO₂) is often folded and twisted. These structural properties cannot be differentiated by SEM or EDX, however, they can be correlated with fine structural features by RISE microscopy. Raman imaging parameters: 22,500 spectra, 37 ms integration time per spectrum.

Raman imaging parameters: 22,500 spectra, 50 ms integration time per spectrum.

Twisted bilayer graphene

RISE Microscopy

RISE Imaging and Scanning Electron Microscopy
RISE Microscopy
Molecular and Ultrastructural Imaging

Correlative Raman imaging and scanning electron microscopy for comprehensive sample analysis.
A new dimension in imaging; see both the form and substance of your samples at the highest resolution.

RISE microscopy will benefit ...
- researchers looking for a deeper understanding of their samples through quick and straightforward measurements controlled with an intuitive user interface.
- investigators in materials science, nanotechnology, forensics, geosciences, life sciences, pharmaceutical research and many other fields of application.

RISE microscopy is well suited to ...
- investigations in materials science, nanotechnology, forensics, geosciences, life sciences, pharmaceutical research and many other fields of application.

The Raman Principle
- A Raman spectrum describes the energy shift of the excitation light (laser) as a result of inelastic scattering by the molecular bonds in a sample.
- Each molecule and chemical compound produces a particular Raman spectrum when excited and can be easily identified by this unique "fingerprint".
- Raman spectroscopy is a well-established and nondestructive method for analyzing the molecular composition of a sample.

Additional sample information from Raman spectra:
- Peak intensity: Quantity of a specific compound
- Peak shift: Identification of phases and crystal states
- Peak width: Degree of crystallinity
- Polarization state: Crystal symmetry and orientation

Applications

Brain tissue
- A Raman image of a brain tissue sample. In the color-coded Raman image the white brain matter is shown in green and the gray matter in blue. The corresponding Raman spectra reveal the different spectral characteristics of the white and gray brain matter.
- Raman raw parameters: 22,500 spectra, 80 ms integration time per spectrum.
- The color-coded Raman image, showing the gold substrate (red), LT GaAs sample (green) and GaAs substrate (blue).
- Comparison between RISE microscopy and energy-dispersive X-ray spectroscopy (EDX): The color-coded Raman image showing the gold substrate (red), LT GaAs sample (green), and GaAs substrate (blue).

RISE Microscopy
- RISE systems combine all features of a stand-alone SEM and a WITec research-grade confocal Raman imaging microscope within one instrument to provide:
  - Complete Raman-spectral acquisition at every image pixel with diffraction-limited resolution (1-200 nm).
  - Unprecedented performance in speed, sensitivity and resolution.
  - Outstanding depth resolution ideally suited to 3D image generation and depth profiles.
  - Ultra-thorough spectroscopic capability for the highest sensitivity.
  - Nondestructive imaging. No staining or other specialized sample preparation is required.

RISE Microscopy parameters:
- 90,000 spectra, 50 ms integration time per spectrum.
- 22,500 spectra, 80 ms integration time per spectrum.
- Raman imaging parameters: 22,500 spectra, 80 ms integration time per spectrum.

Comparison between RISE microscopy and energy-dispersive X-ray spectroscopy (EDX):
- The color-coded Raman image showing the gold substrate (red), LT GaAs sample (green) and GaAs substrate (blue) is correlated with the optical image of the sample. The color-coded optical image is a Raman spectrum, as it is an integration of many sample spectra.