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New at ICORS 2010

True Surface Microscopy

Topographic Confocal Raman Imaging
Topographic Large Area Surface Imaging
Topographic Spectroscopic Imaging

Confocal Raman Imaging opened the door for many applications in Raman spectroscopy and imaging that were previously unavailable for measurement with conventional (non-confocal) Raman methods. However, high confocality always results in a high focus sensitivity and this can make measurements difficult with rough or inclined samples. Especially when performing scans on a larger scale (i.e. >1x1mm^2), this often necessitated careful alignment and sample preparation.

The Topographic Confocal Raman Imaging option of the alpha500 microscope series adds optical profilometer functionality to the highly sensitive alpha500R Confocal Raman microscope. Using this profilometer function, topographic scans of 50x50mm^2 or even more can be acquired. This is much larger than the typical scan ranges in AFM measurements (typically <100x100µm^2). In addition to the recording of the topography and Confocal Raman Images, the alpha500 series allows the collection of a Confocal Raman image, precisely tracing the true 3D surface topography. Surfaces with a roughness of > ca. 0.5-3µm that had previously been only intermittently in focus (depending on the NA of the system) can now be recorded with the surface in constant focus. Heavily inclined surfaces with additional roughness can also be measured as shown in the example. Using topographic Confocal Raman Imaging, these can now be imaged without further preparation and without having to compromise on confocality of the system. The sensor for profilometry can be configured with a variety of ranges and sensitivities (i.e. 3mm Z range with ca. 120nm Z resolution or 300µm Z range with ca. 12nm Z resolution) and interfaces directly with the WITec Control software.

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Topographic Confocal Raman Imaging - Application Examples

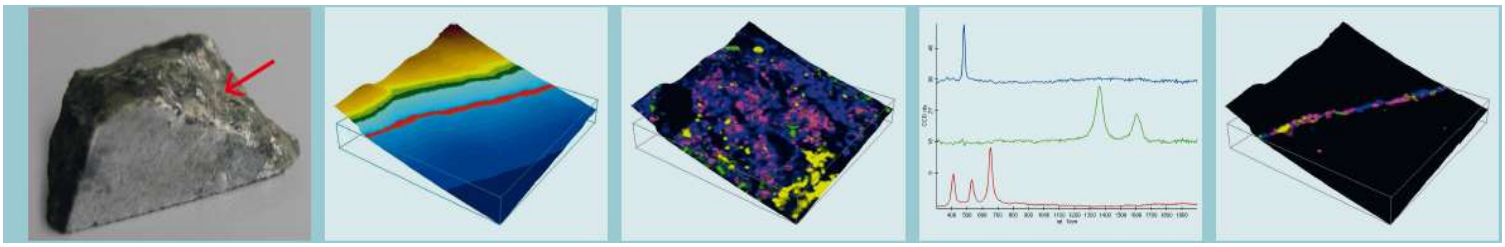

Fig. 1: InPhotograph of the sample Josefsdal Chert 99SA07 (sample courtsey Frances Westall, CNRS Orleans, France). The area indicated by the red arrow was scanned while the sample was positioned as showed on the image.

Fig. 2: The height profile as measured by the incorporated optical profilometer. The area scanned was 2x2mm. The orange band marks the contour line scanned by the flat Confocal Raman scan.

Fig. 3: The height profile with the combined image of the topography traced confocal Raman measurement overlaid. The colors in the image correspond to the colors of the spectra shown in Fig 4. Mixed areas are displayed as mixed colors (i.e. violet). The yellow color indicates a high level of Fluorescence where no Raman could be detected.

Fig. 4: The average spectra deducted from the topography corrected confocal Raman image scan shown in Fig. 3. The colors of the spectra correspond to the colors shown in Fig. 3. Blue shows the quartz phase, green the Kerogen phase and red the Anatase phase. The spectra are normalized to their maximum intensity and offset for clarity.

Fig. 5: The height profile with the combined image of the flat confocal Raman measurement overlaid. The color coding is identical to the one described in Fig 3. It can clearly be seen, that signal can only be detected if it originates from the slim area where the sample was in focus.

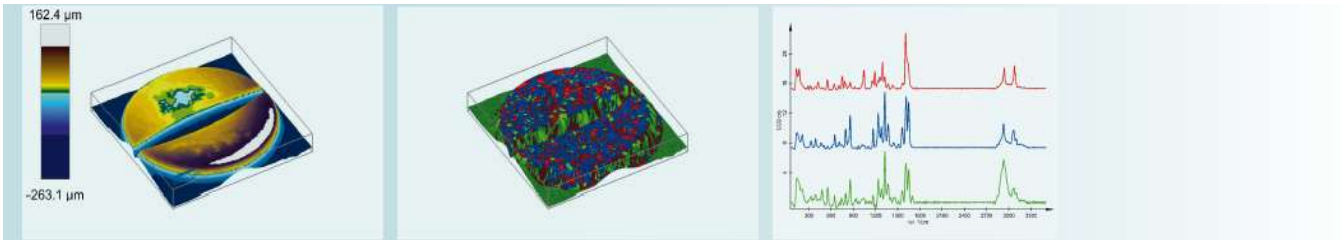

Fig. 6: The height profile of a tablet as measured by the optical profilometer. The area scanned was 12x12mm.

Fig. 7: The height profile with the combined image of the topography traced confocal Raman measurement overlaid. The colors in the image correspond to the colors of the spectra shown in Fig 8. Mixed areas are displayed as mixed colors. It can clearly be seen, that all surfaces of the tablet can be imaged.

Fig. 8: The average spectra deducted from the topography corrected confocal Raman image scan shown in Fig. 7. The colors of the spectra correspond to the colors shown in Fig. 7. The spectra