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Study polymers with the inVia™ confocal Raman microscope

Chemical sciences

The Renishaw inVia confocal Raman microscope is ideal for the 2D and 3D chemical analysis of polymers.

Synthetic polymers display a broad range of properties and are extensively used in modern products. The study of polymers in terms of identification, spatial distribution and concentration is important as we search for novel materials, improve effectiveness of existing materials, and reduce the costs of products.

The inVia microscope provides chemical specificity and sensitivity, in a non-destructive manner, with no sample manipulation and preparation required.

Polymer identification:
- Simple identification of polymers using Renishaw's Polymeric materials database.
- Reveal changes in polymer chemistry, including material composition, crystallinity and density.
- Characterise the molecular structure including longitudinal acoustic modes (LAM).

Polymer mixtures:
- Identify and determine constituents in polymer mixtures using Empty Modelling™ component analysis[1].
- Determine concentration estimates of constituents in multi-component mixtures.
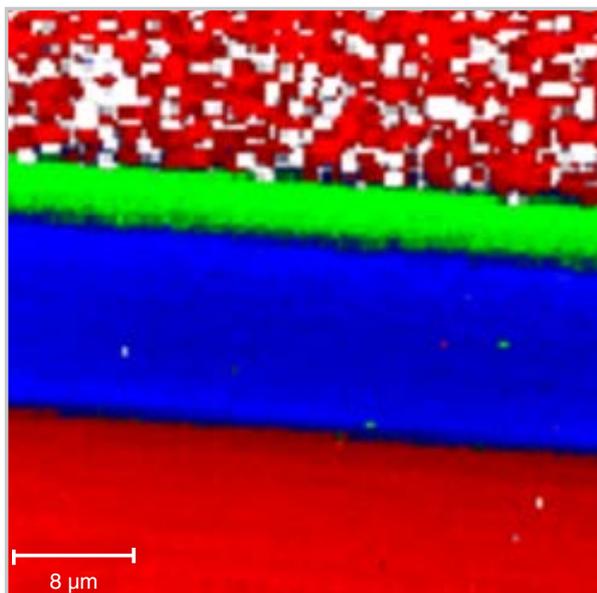

2D image of a cross section of a multilayered film, revealing the different layers of the polymer sample; polyethylene (PE) (red), titanium oxide (TiO_2) (white), silicone, used as an adhesive (green), polyethylene terephthalate (blue).
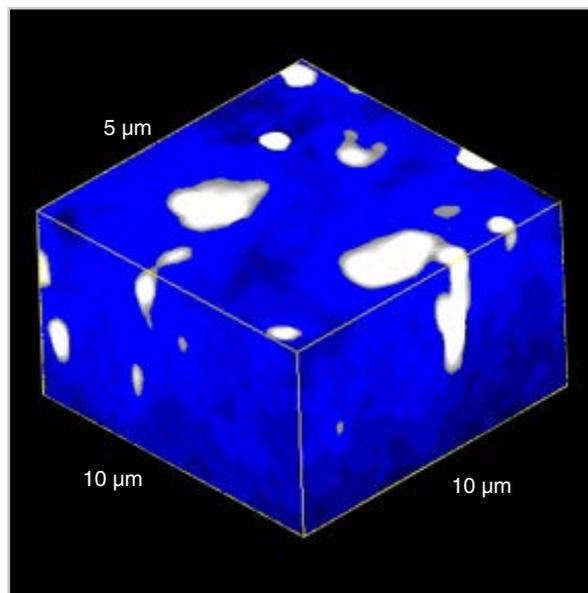
Volume image of a film revealing the 3D distribution and composition of the polypropylene (PP) (blue) and TiO_2 (white).

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Polymer laminates and cross sections:

- Determine the composition and thickness of polymer laminates.
- Transparent samples can be studied without the need for sample preparation, by performing depth profiling.
- Non-transparent samples, containing foils, dyes or adhesives, can be analysed by mechanically cross-sectioning.
- Layer dimensions can be determined with micrometre accuracy.
- Investigate the chemistry of layer interfaces.
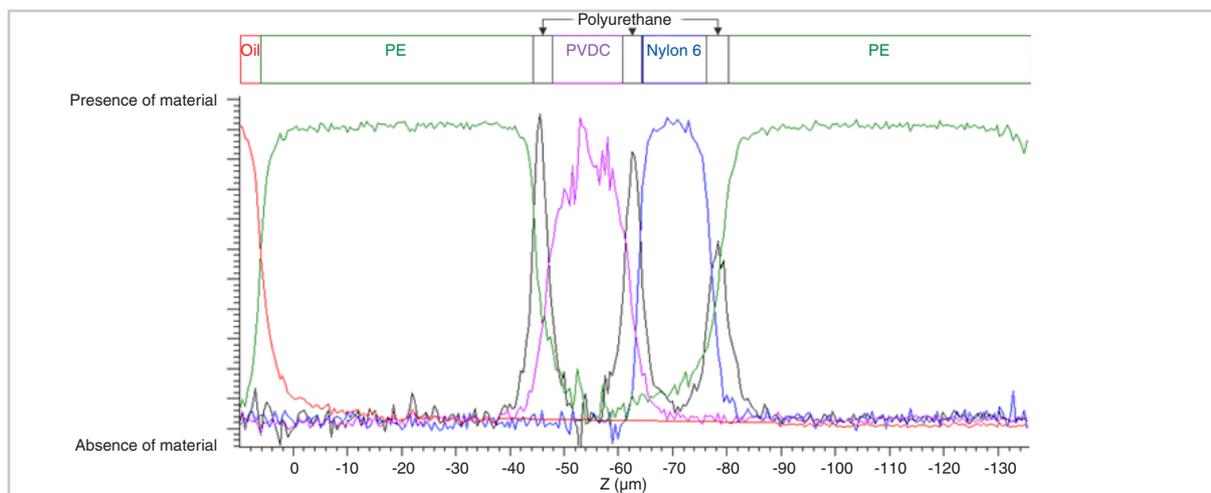
Depth profile of polymer laminate consisting of multiple layers: polyethylene (PE) (green), polyurethane (black), PVDC (pink), and Nylon 6 (blue), collected using an oil immersion objective. Z (in micrometres) refers to the depth penetrated in the sample (refractive index matched).

Renishaw inVia: ideal for studying polymers

With its highly accurate and motorised MS20 microscope stage, measurements can be made in all 3 dimensions; from chemical images over a surface, to depth profiles or volume images.

- Research grade confocal Raman microscope.
- Identification of samples using the Renishaw polymeric materials database.
- Study polymer phase changes using LiveTrack automatic focus-tracking.
- Sub-micrometre resolution using StreamHR™ confocal mapping.
- Configurable for different microscope objectives, including high NA and refractive index matching options.
- 2D image and 3D volume options.
- Empty modelling for mixture analysis.
- Eclipse filters for low Raman wavenumber measurements.

The Renishaw inVia Qontor confocal Raman microscope

References

(1) I. I. Patel *et al*, Analyst, 2011, 136, 4950 – 4959

A range of related Renishaw literature is available. Please ask your local Renishaw representative for more information.

Renishaw. The Raman innovators

Renishaw manufactures a wide range of high performance optical spectroscopy products, including confocal Raman microscopes with high speed chemical imaging technology, dedicated Raman analysers, interfaces for scanning electron and atomic force microscopes, solid state lasers for spectroscopy and state-of-the-art cooled CCD detectors.

Offering the highest levels of performance, sensitivity and reliability across a diverse range of fields and applications, the instruments are designed to meet your needs, so you can tackle even the most challenging analytical problems with confidence.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Please visit www.renishaw.com/chemicals for more information.