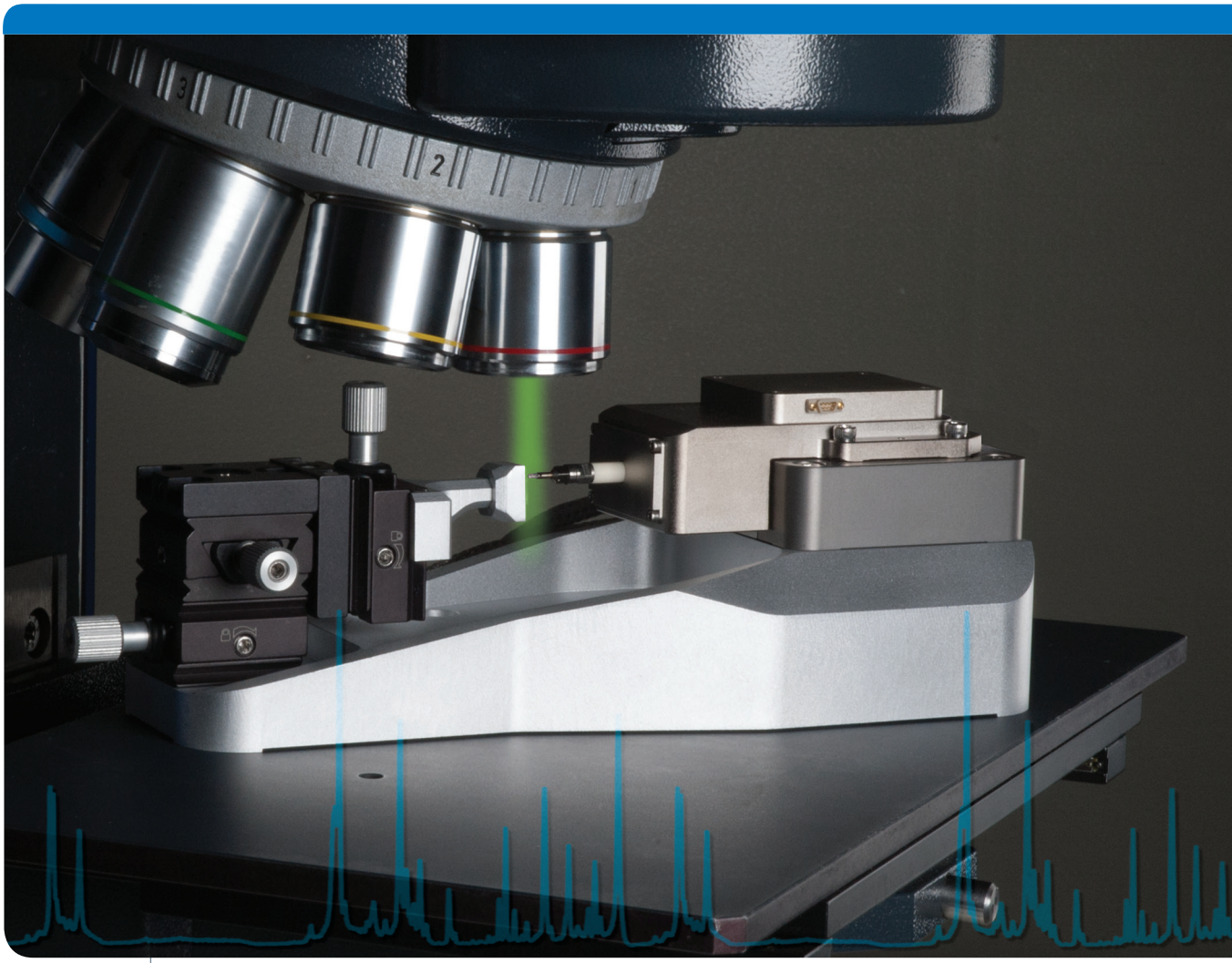


Hysitron IntraSpect 90

- Nanoindentation System for Raman Microscopes

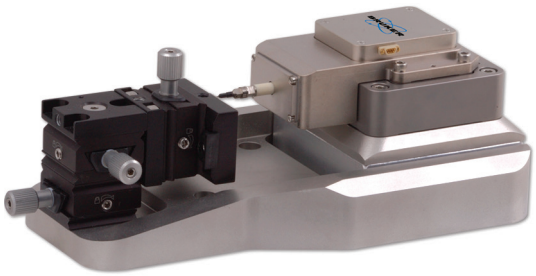
Innovation with Integrity

Nanomechanical Testing

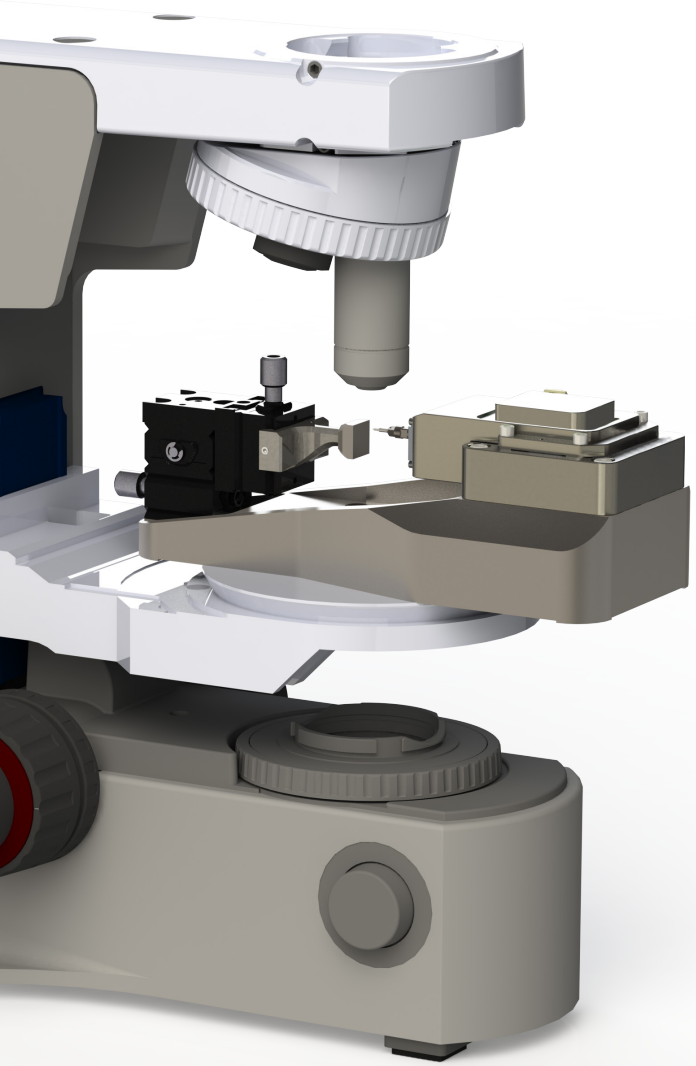
Hysitron IntraSpect 90

Indentation System Optimized for Raman Microscopes

Bruker's Hysitron® IntraSpect™ 90 is an in-situ indentation system specifically designed to correlate physiochemical changes during deformation. This system integrates with existing microscopes to enable simultaneous Raman characterization during small-scale indentation, tension, compression, or bend testing.

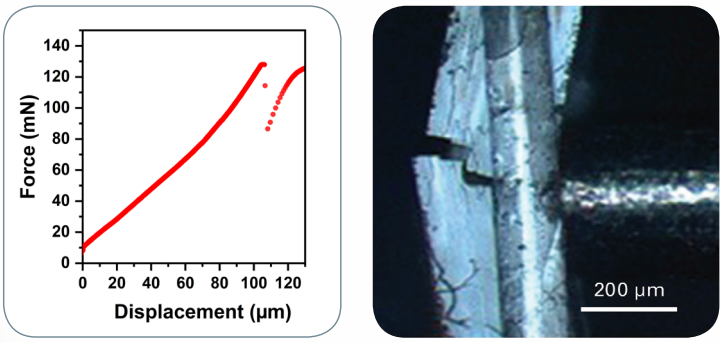


Hysitron IntraSpect 90



Transform Your Raman Microscope into a Mechanical Testing Platform

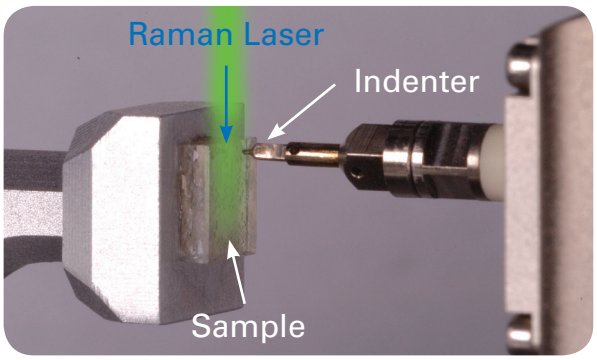
Thanks to a compact design, the IntraSpect 90 easily mounts on the stage of an existing optical or Raman microscope. An extended sample mount provides clearance for the objective lens to easily access the deformation zone; and locking sample stages provide sample positioning while minimizing sample shift during testing. Bruker's unique transducer design provides up to 500 mN of force and 150 µm of displacement with unsurpassed noise floors for truly quantitative nanoscale-to-microscale mechanical testing under simultaneous Raman observation. The mechanical data can also be synchronized to the real-time optical imaging in the TriboScan™ analysis software to give a more complete understanding of the evolution of deformation.



Synchronized mechanical and imaging data during a bending test on a crystalline sample. Mechanical phenomena, such as fracture, can be easily captured and analyzed with both pieces of information.

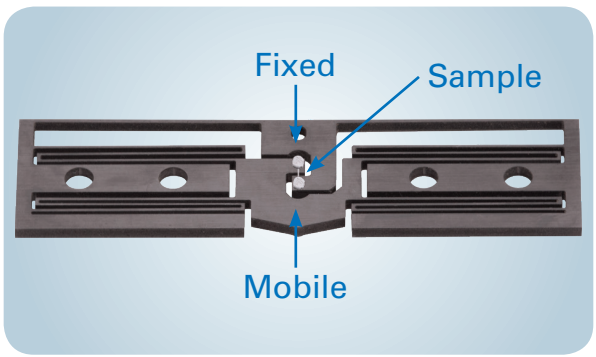
Hysitron IntraSpect 90 Testing Modes

Indentation Testing



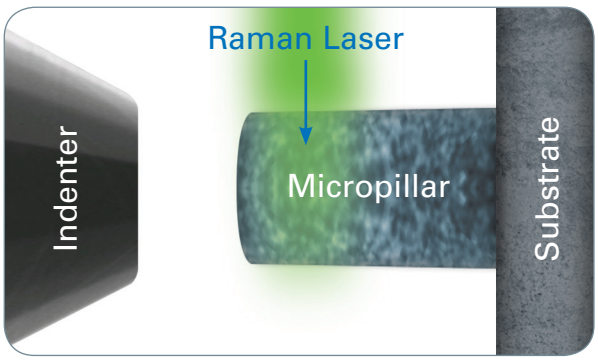
Using the 3-axis sample positioning stages, the sample is positioned appropriately beneath a pyramidal-shaped diamond probe such that the Raman laser source can be focused directly on the contact zone at an angle of 90°. This allows for the direct observation of pressure-induced phase transformations, amorphization, and molecular re-arrangements occurring beneath the contact point during traditional nanoindentation testing.

Tensile Testing



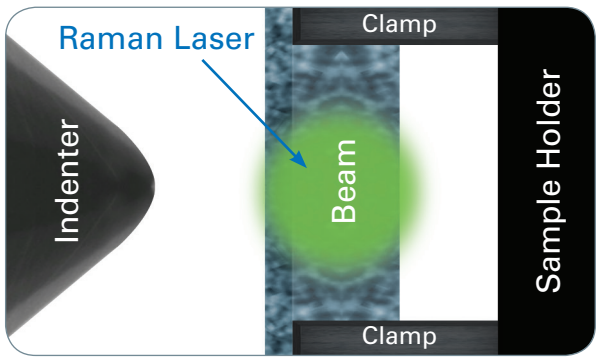
A micro Push-to-Pull (PTP) device provides means for applying uniaxial tension forces to small-scale fibers, films, and 2D materials in combination with Raman spectroscopy. Stress and strain values can be easily obtained from the raw force and displacement output of the system and correlated to structural changes within the material.

Compression Testing



Stress is applied to microscale pillars, particles, and other small-scale structures using a flat-ended diamond probe. The microstructural origins of deformation behavior and strength are dynamically observed to inform the next generation of advanced engineered materials.

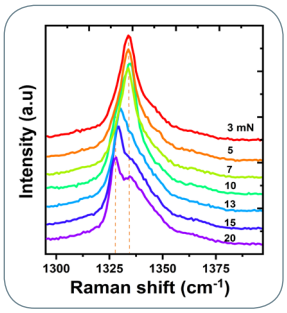
Bend Testing



Elastic and fracture properties of micro-cantilevered and clamped beam specimens can be measured with bend testing. Simultaneous optical imaging enables direct observation of fracture initiation and subsequent propagation through a sample.

Hysitron IntraSpect 90 Case Studies

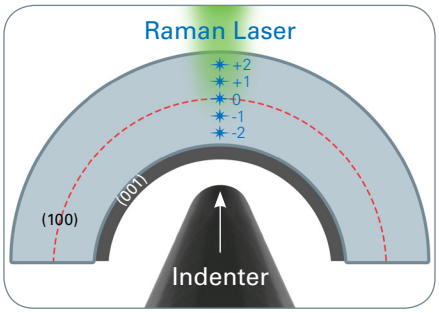
Indentation of an Anti-Inflammatory Pharmaceutical Crystal

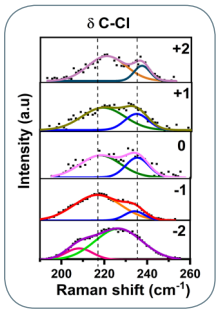


Indentation measurements on the (011) and (0$\bar{1}$1) faces of a Piroxicam crystal showed varying hardness values. In-situ Raman spectra recorded during indentation detected a variation in inter/intramolecular bond interactions, which provided a more comprehensive understanding of the molecular origins for this mechanical anisotropy.

JOM, Volume 69, Issue 1, pp. 57-63.

Three-Point Bending of Engineered Organic Crystals

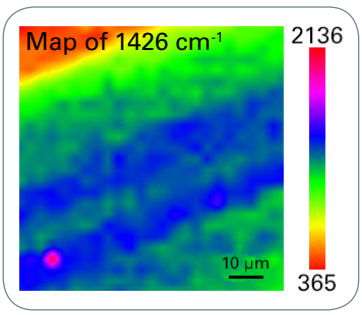


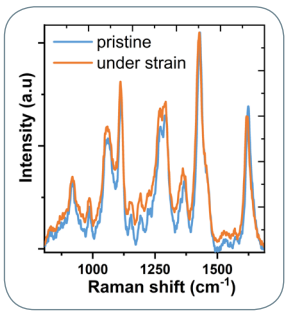


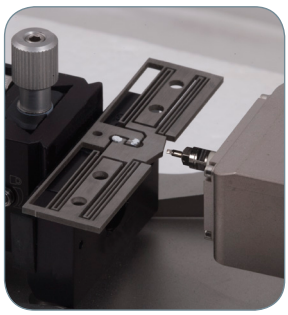
In-situ Raman spectra was recorded at different locations of two types of organic crystals while applying a bending stress. The internal perturbations of the crystal structure were identified using the Raman spectra, which suggested competing strengthening and weakening intermolecular interactions within the inner and outer regions of the bent crystal.

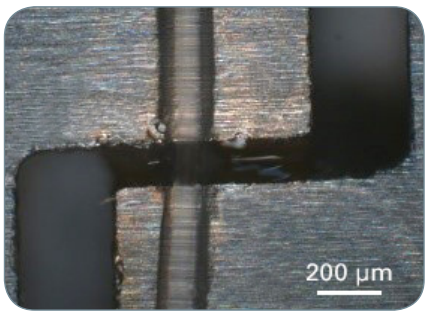
Chem. Commun., 2017, 53, pp. 13035-38.

Microscale Tensile Testing of a Polymeric Microfiber









A polymeric microfiber was mounted on the PTP sample mount and strained in tension. Raman point spectra and maps were collected within the strained region to help detect the nature of molecular rearrangement as a function of stress.

IntraSpect 90 Features

- High-rigidity loading frame easily mounts on the stage of an existing optical or Raman microscope
- Test in either load or displacement-controlled mode
- Unique PTP sample mount allows uniaxial tensile testing of fibers, wires, and other sample geometries with synchronized Raman mapping
- User-changeable probes facilitate a wide range of testing modes, including indentation, compression, tensile, and bending

IntraSpect 90 Specifications

Maximum Force	500 mN
Force Noise Floor	<5 µN
Maximum Displacement	150 µm
Displacement Noise Floor	<5 nm
Sample Positioning Range (XYZ)	≥9.5 mm

*Listed noise floor specifications are valid for microscope platforms with suitable vibration isolation.

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