

Innova-IRIS AFM-Raman System

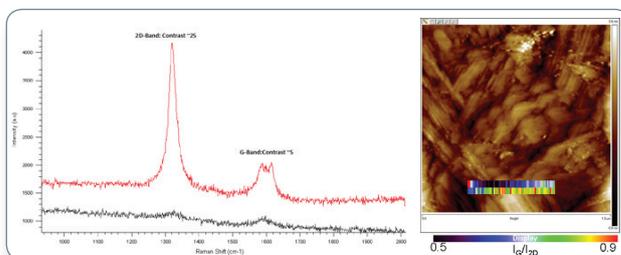
● The Most Complete TERS Solution

Innova-IRIS combines industry-leading atomic force microscope (AFM) performance and Bruker-exclusive TERS probes to deliver the world's only complete, guaranteed tip-enhanced Raman spectroscopy (TERS) solution. It merges seamlessly with the Renishaw inVia micro-Raman system while fully preserving the capabilities of each separate component. The result is a productive and completely integrated platform for correlated micro- and nanoscale property mapping that extends the boundaries of AFM applications to nanospectroscopy and nanochemical analyses.

Integrated TERS System for Nanoscale Chemical Analysis:

- Only complete solution with guaranteed TERS performance
- Enabled by Bruker's Exclusive High Performance TERS probes
- Easiest-to-use AFM for nanospectroscopy in nanostructured materials
- Colocalized AFM and Raman microscopy with image overlay
- Complete AFM capabilities and high-performance operation

Tip enhanced Raman spectroscopy (TERS) image of CVD graphene, illustrating variation in G and 2D band intensity over a 10 nm length scale. Image courtesy of Renishaw.



Atomic Force Microscopy

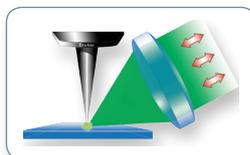
High Performance Reliable TERS Probes

Reliable high performance probes are the central and non-trivial part of any tip-enhanced Raman spectroscopy (TERS) solution. Bruker-exclusive high contrast TERS probes uniquely enable measurements on a wide range of samples. Bruker's reliable TERS-AFM Tuning Fork probes exhibit zero spectral interference (no feedback laser), delivering superior sensitivity with high confidence. The Innova IRIS platform provides today's ultimate solution for productive TERS research utilizing Bruker's exclusive TERS Probes.



Anatomy of a TERS-Enabled AFM-Raman System

To combine atomic force microscopy and Raman spectroscopy techniques successfully for use on any sample or to explore the full capabilities of TERS, an AFM platform must fulfill a set of fundamental requirements. First, full optical access to the tip-sample junction is needed to maximize the light capture while fully accounting for tip-shadowing and polarization effects. The publication record proves that these critical requirements are best addressed in an off-axis reflection geometry that accesses the tip-sample junction from the front-side of the probe. Second, the optical "hot-spot" alignment must be retained during scanning, which requires a stationary tip system. Combination of a Bruker Innova® sample-scanning AFM with a Renishaw inVia Micro-Raman System is designed from the ground up to fulfill these requirements, and create a truly Integrated Raman Imaging System (IRIS™).

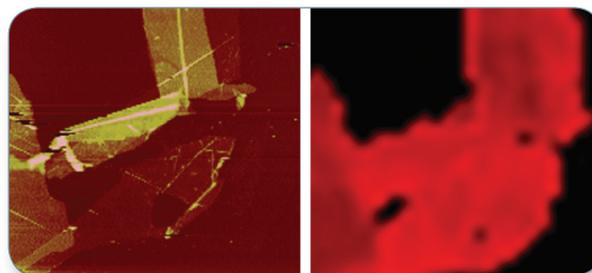
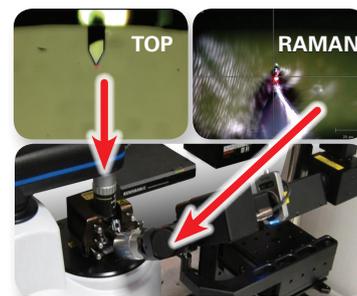


Schematic view of optical configuration for TERS on opaque samples. Only Bruker's Innova-IRIS allows for an ideal optical path free of obstructions.

An Optimized AFM-Raman Solution

As a sample-scanning system with exceptional open optical access to the tip-sample junction and a modular, expandable software platform, the Innova AFM platform simplifies the unique requirements of optics alignment to the AFM tip. The rigid Innova-IRIS head and stage design, along with its ultra-low closed-loop noise, likewise provide the force and position control required to fulfill the stringent performance requirements of TERS. Tip integrity and positioning are preserved over

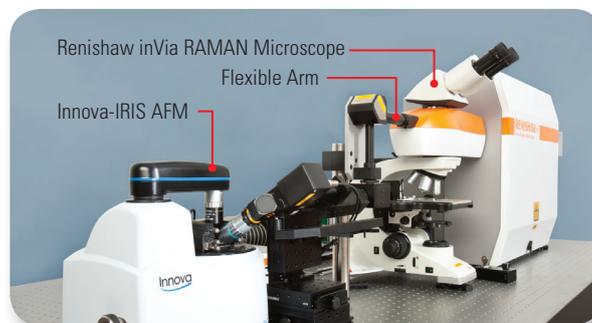
the long signal integration times needed for more sensitive Raman and TERS imaging. The Innova-IRIS integration software module also enables extensive real-time handshaking communication, coordinating the actions of the Innova AFM and inVia Raman system components and transferring data for correlated analysis.



Correlated AFM topography (left) and Raman chemical map (right) of individual graphene flakes using Innova-IRIS and inVia system.

Ultimate Versatility

The Innova-IRIS integration with the Renishaw inVia fully preserves the uncompromised performance, power and flexibility of both the AFM and Raman microscopes. Each utilizes its own full-featured, real-time control and data analysis package. The result is a single integrated system that enables the correlation of complementary nanoscale topographic, thermal, electrical, and mechanical information. Ultimately, Innova-IRIS frees researchers to focus on what is most important in their work—scientific discovery.



View of fully integrated Innova-IRIS and inVia system.

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