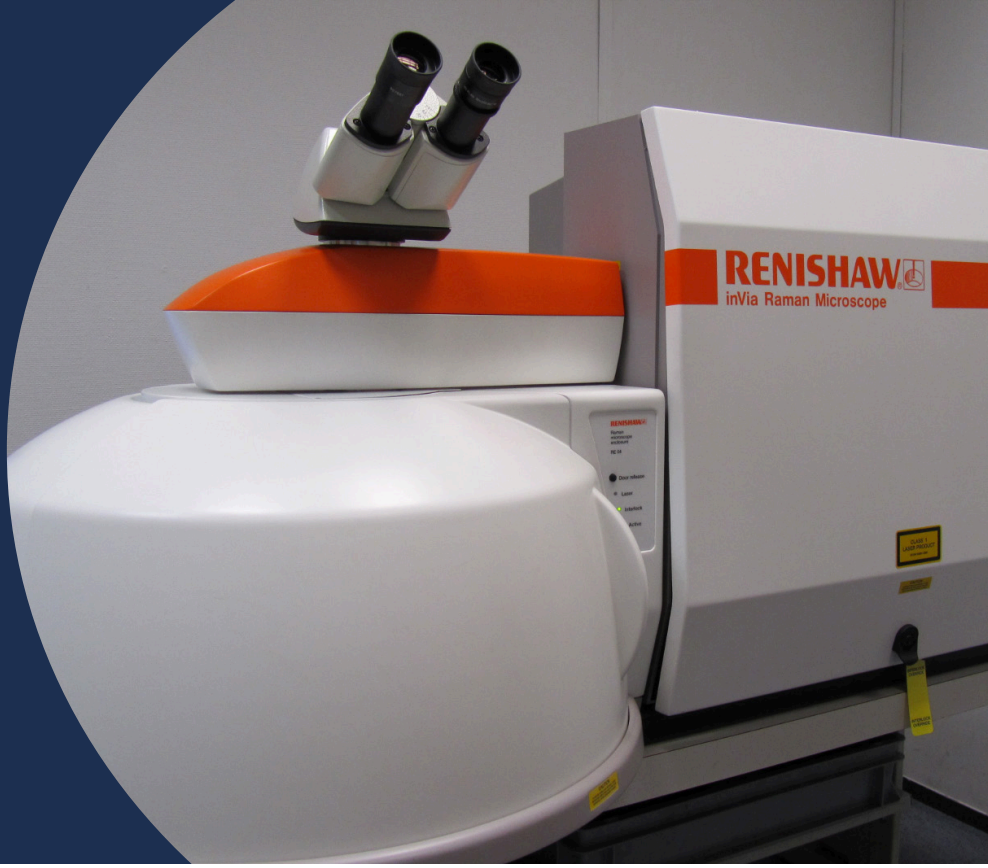
MANCHESTER 1824
The University of Manchester

RAMAN SUITE



Raman spectroscopy is a technique to identify vibrational, rotational and other low-frequency modes in a system. It relies on the laser interaction with medium resulting in modulation of the exciting monochromatic light by low-frequency modes from the excited system.

After the interaction the scattered laser beam consists of two parts: elastic radiation (Rayleigh) and inelastic scattering. Rayleigh scattering is filtered out by the edge pass filter, while the rest of the collected light is dispersed onto a detector. Raman scattering is typically very weak, and as a result the main difficulty of Raman spectroscopy is separating the weak inelastically scattered light from the intense Rayleigh scattered laser light. inVia's design uses several techniques to rich high sensitivity enables to look at weak Raman signals:

- The spectrometer uses a narrow entrance slit (between 10 µm and 65 µm).
- The optimised Rayleigh filter mount is positioned away from the entrance slit.
- An internal cover isolates inVia's spectrometer from the rest of the instrument.
- It has a light-absorbing interior.

A robust design and precision automated assemblies enable inVia to complete common tasks—such as switching laser wavelength, changing diffraction grating, and acquiring a Raman image—rapidly, simply, reliably, and without the need for manual intervention.

Raman spectroscopy is quick, easy and non-destructive optical methods for chemical and structural characterization, which is suitable for investigation of the samples in solid or liquid states.

Analysis of the Raman spectra provide combines information about composition, quality, thickness, doping effect, stress, temperature, orientation and crystallinity of the materials, as well as the grain size of the thin graphene film and number of layers in 2D structures.

Samples do not need special treatment if their dimensions low then 5x5x5 cm3, and can accurately and repeatably position on to a motorised encoded sample stage, which combines a high precision 100 nm step size with fast movement and great ergonomics. Sample loading is easy. You can manually move the stage to load your sample and position it under the microscope objective lens by dragging the stage to the required position. The motorisation is suspended automatically to remove resistance and restarted when the stage is released. You can fine tune the position by using the trackball or software.

Leica is high quality microscope and the standard option for inVia, which is equipped with low to high magnification objective lenses — VIS: 5, 20, 50 and 100x, UV: 15 and 40x.

The inVia is fitted with 4 lasers:
- The Renishaw RL633 Helium Neon 633nm 20mW laser;
- The Renishaw HPNIR 785 semiconductor laser sources at 785 nm 300mW;
- The Modul-LaserTM Stellar-REN argon laser 457, 488, 514 nm 150mW;
- The KIMMON IK Series He-Cd Laser 325 nm 12W.

The shutter and internal mirrors are used to direct the laser beam to the interlocked filter cabinet and then onto the microscope.

Range of Rayleigh filters for each of the available wavelengths.

Gratings: 1200 and 2400gr/mm with the spectral resolution corresponds to 2 and 1 cm-1.

The spectrum is recorded using an electrically Peltier cooled CCD detector (-70°C).

Power filter sets are: 5*10-8; 10-7; 5*10-7; 10-6; 5*10-6; 10-5; 5*10-5; 10-4; 0.05; 0.1; 0.5; 1; 5; 10; 50 and 100%.

Wide area and high resolution mapping is possible: laser spot size is about 1um.

Applicable for particular the PL measurements (limited by Raman filter).