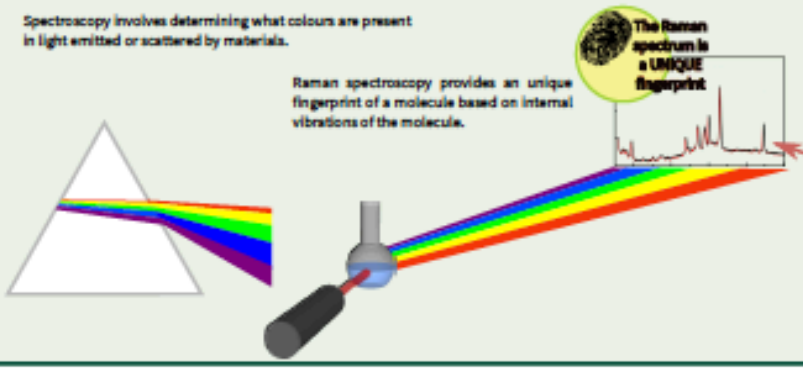
RAMAN SPECTROSCOPY

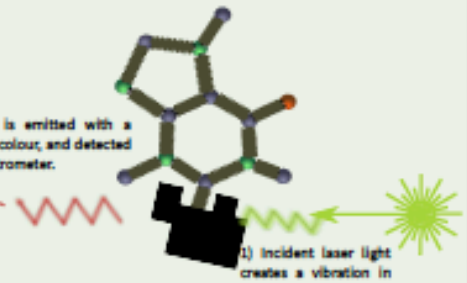
http://www.victoria.ac.nz/raman

Spectroscopy

Spectroscopy involves determining what colours are present in light emitted or scattered by materials.

Raman spectroscopy provides an unique fingerprint of a molecule based on internal vibrations of the molecule.

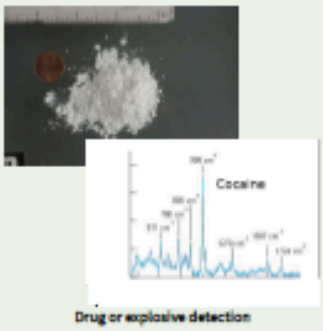




Applications

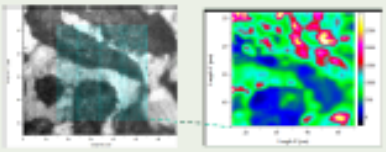
We can use Raman spectroscopy for:

- Analytical chemistry
- Pharmaceuticals and Forensics
- Art and archeology
- Study of materials

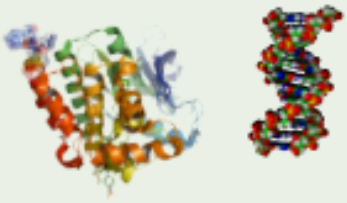


Drug or explosive detection

Investigation of inks and dyes in an old manuscript



Micrometer-resolution Raman map



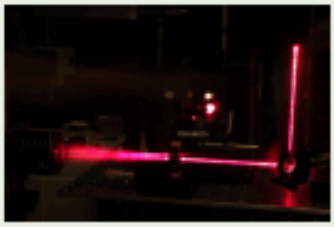
Study and detection of proteins, DNA, etc.

Advantages:

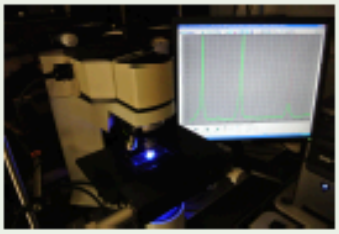
- High chemical specificity
- Non-invasive/non-destructive
- Ideal for aqueous solutions
- Excitation laser can be tuned for specific applications
- Spatial resolution of ~1µm
- Possibility of Raman imaging

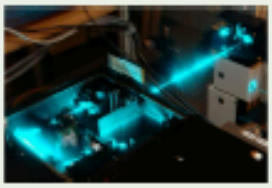
Our facilities

We have two state-of-the-art microscopes and Raman spectrometers.



Our systems are equipped with a selection of different lasers, able to be used as required for different samples.



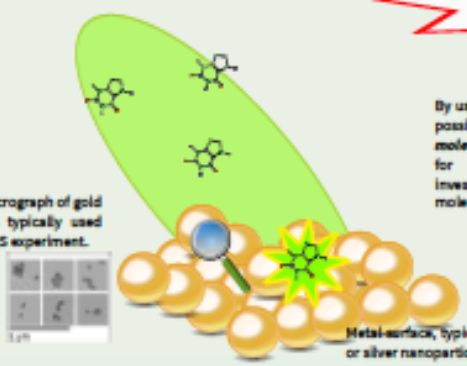


We also have cryostats and heating stages, allowing measurements from -263°C to 627°C (10K to 900K).

Surface-enhanced Raman spectroscopy

By using metallic surfaces, it is possible to get signals that are 10 billion (10^{10}) times larger, using a technique called "Surface-enhanced Raman spectroscopy" (SERS).

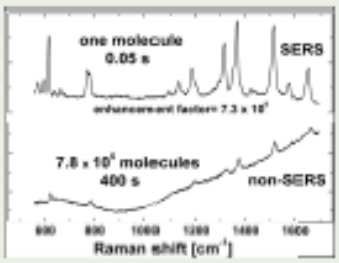
Single molecule detection possible !!!



SEM micrograph of gold colloids typically used in a SERS experiment.

Metal-surface, typically gold or silver nanoparticles.

By using a metal to enhance the signal, it is possible to observe the signal from a ***single molecule***. This incredible sensitivity is useful for detecting minute quantities, or investigating fundamental properties of the molecules themselves.



Even when the signal only comes from a single molecule, the large enhancement means it may be obtained quickly, and with much clearer peaks than the non-SERS signal from many molecules.