

# Raman and Infrared Facility

## What is Raman and infrared spectroscopy?

Fourier Transform Infrared (FTIR) and Raman spectroscopy are the main analytical techniques used to study the vibrations of molecules.

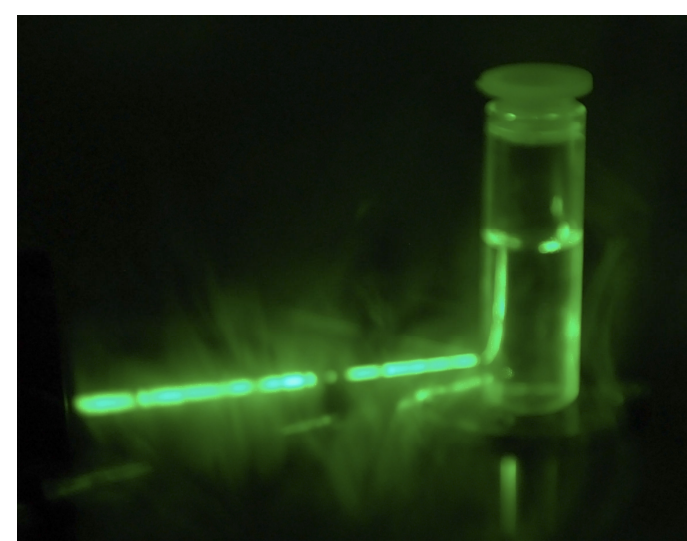
The energy of vibrations are measured with infrared spectroscopy after **absorption** of infrared light from a **polychromatic source**, while Raman spectroscopy measures the energy of **scattered** light after irradiation with a strong **monochromatic light** (laser). Raman and infrared spectra can be described as a fingerprint of the material and used for identification purposes

### Instruments

#### Raman spectrometer



- ◆ Microscope
- ◆ Mapping
- ◆ Macro sample chamber
- ◆ No sample preparation
- ◆ Blue, green and red laser lines
- ◆ Minimum sample size  $1 \mu\text{m}^2$



#### FTIR Spectrometer



- ◆ Mid and Far infrared available ( $50\text{-}7500\text{cm}^{-1}$ )
- ◆ Transmission mode
- ◆ ATR diamond cell
- ◆ Hyperion microscope attachment
- ◆ ATR attachment for microscope
- ◆ High resolution
- ◆ Mapping available

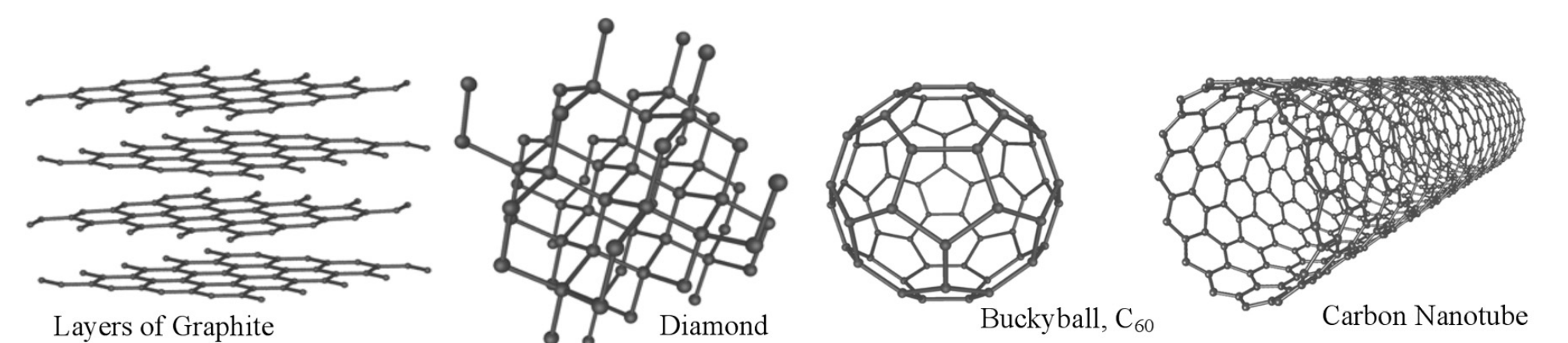
## A selection of current projects

A large variety of research subjects are investigated using the Raman and FTIR instruments in the facility. Many of the projects are conducted in large national and international multidisciplinary research groups.

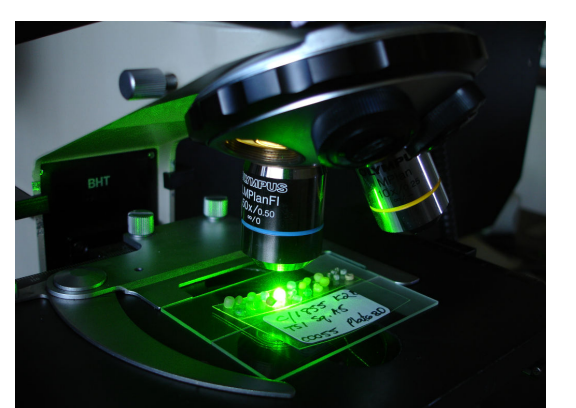
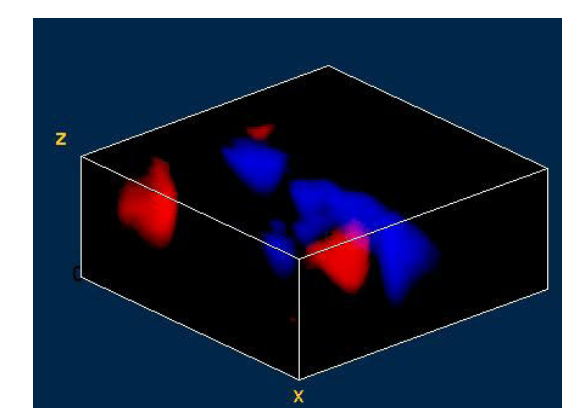
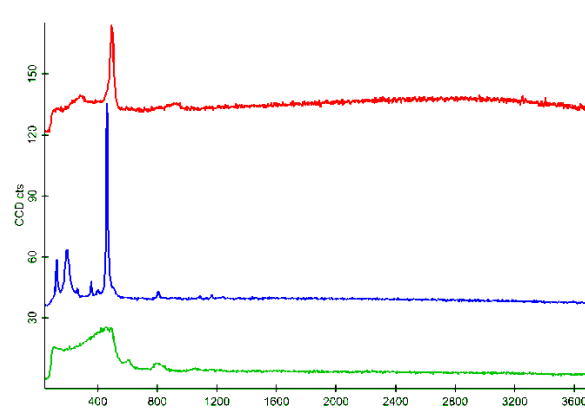
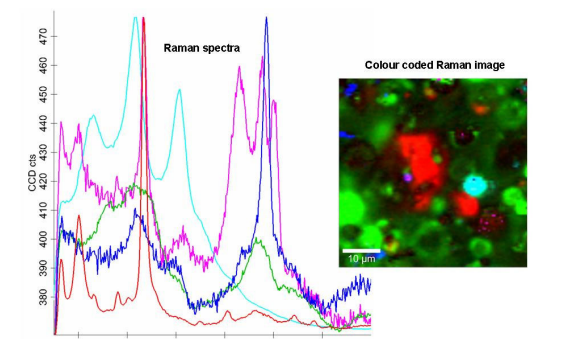
- ◆ Optical characterization of nuclear materials before and after irradiation with ions, neutrons etc. (Physics)
- ◆ Distinguishing between fake and authentic gemstones (Physics and Geology)



- ◆ Characterizing carbonaceous materials through their Raman spectra (Physics and Carbon group)



- ◆ Determining the effect of anti-cancer extracts on single blood cells through their Raman spectra (Physics and Biochemistry).
- ◆ Characterization of the surface of coal fly ash modified by Sodium Lauryl Sulphate (Chemistry)
- ◆ An investigation of fulgerites formed by lightning at Witsand in the Kalahari desert, illustrating the distribution of stress in quartz particles. (Physics)



- ◆ Re-dating Magora hill, an archaeological site in Limpopo Province, by identifying the pigment colouring a glass bead as nano-(Zn,Cd)S<sub>x</sub>Se<sub>x-1</sub> mixed crystals. (Physics and Archaeology, Unisa)



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