

## **Physical Methods in Inorganic Chemistry**

*Infrared and Raman (micro)spectroscopy* – Dr Freek Ariese (LaserLaB VU)

Vibrational spectroscopy is a powerful tool for characterizing molecules and materials. Vibrational frequencies depend on the masses of the atoms involved, the bond strength and interactions with nearby groups. Most students will be familiar with infrared absorption techniques, but I will review some of the basics and discuss modern developments such as the use of quantum cascade lasers for fast mapping and options to increase the spatial resolution of IR imaging techniques.

The Raman effect is based on inelastic scattering and also probes ground state vibrations (similar to IR) but the selection rules are different. It is a much weaker effect than IR absorption, but under certain conditions it has distinct advantages. Methods to increase the sensitivity and/or selectivity of the Raman technique, such as surface-enhanced Raman, resonance Raman and stimulated Raman spectroscopies will be presented. Applications will be shown from a broad range of fields, including material science, space exploration, waste recycling, photovoltaics and cultural heritage.