



## **Molecular Science - Spectrometry**

### *Infra-red Spectrometry*

Infrared spectroscopy is a technique that you'll become more familiar with if you attend the SXR205 Residential School. You can think of an infrared spectrometer as a box containing a variable infrared radiation source, a detector, and in between a compartment into which we insert the sample. You can display the infra-red spectrum on a monitor or print it out.

You can use the technique to analyse solid or liquid samples which are mounted between two polished sodium chloride plates. And the plates are kept dry in an oven until they're needed. Sodium chloride doesn't absorb infrared radiation, and so it doesn't affect the spectrum.

When analysing solid samples, you will use the Nujol mull technique where the solid is ground to a fine paste with paraffin oil. A few milligrams of sample is ground up dry in a small mortar and two drops of Nujol added. When the paste is mixed, you can scrape it out of the mortar with a spatula or similar implement. Smear a little of the sample mixture onto one of the plates and then position the other plate on top. The two plates are then placed in a holder and exposed to the infrared radiation in the sample compartment.

The instrument scans through the range of infrared frequencies in less than a minute and displays these on the monitor screen. Of course the Nujol that we used to make the mull has its own infrared spectrum which may overlap with the spectrum of the sample compound, so in order to get round this difficulty, solids are often sampled using a potassium bromide, or KBr, disc.

We need less than a milligram of sample in a hundred milligrams of potassium bromide. These are well mixed and carefully ground to a very fine powder. The mixture is loaded into the body of a stainless steel dye and tamped down with the plunger.

The dye's assembled by first inserting a polished steel disc, followed by the plunger. It's then taken to a press and subjected to a high pressure for a few minutes. When the dye is dismantled, the sample is left as a slightly opaque disc. This disc is then mounted in a special holder which supports it in the sample beam of the infrared spectrometer.