

# 1 year X-Ray Analysis Course Profile

## Objectives

To gain practical and analytical skills required to use:

- 1) XRF (X-ray Fluorescence)
- 2) Powder XRD (X-ray Diffraction)
- 3) Single Crystal XRD

At the end of the course the client will have gained the skills needed to be able to run an analytical service from initial sample collection to final interpretation and reporting.

## Modules

### XRF

XRF analysis and XRF analytical techniques training will be provided within the Manchester Analytical Geochemistry Unit.

- (i) A 1-week intensive training course on XRF operations will be provided by our XRF supplier.
- (ii) 10 x 3 hour lectures/practicals on analytical techniques in general, including XRF. Delivered over 10 weeks as part of a 3rd year undergraduate module.
- (iii) A 100-hour project involving the preparation and analysis by XRF of 50 - 100 samples, access to instrument and provision of advice and detailed feedback. We would ask the client to produce a short report on the aims of the work, methods, results, quality control measures utilised and an assessment of data quality as part of the training.

### Powder/Single Crystal XRD

XRD training will be provided within the School of Chemistry X-Ray Diffraction Section.

- (i) 4 lectures and 4 workshops on X-ray diffraction theory, single crystal and powder diffraction will be provided. This course is also available in CD format.
- (ii) Powder X-Ray diffraction training will be provided on a Bruker D8 and Pan Analytical X-Pert system. A comprehensive number of experiments will be performed that will train the client the skills required in sample preparation, collection and then interpretation and reporting. The use of mineralogical data bases for sample identification will be explained.
- (iii) Single Crystal Diffraction training will employ diffractometers from Oxford Diffraction, Bruker and Nonius and will encompass the use of crystallographic databases, crystallisation, single crystal XRD measurements, computational methods employed for the solution and refinement of crystal structures up to producing an Acta C format report

based on a CIF.

- (iv) All the time remaining after the XRF module will be employed in both powder XRD and Single Crystal XRD. The suitability of the training and analysis will be tailored to the specific needs of the client. Although, the ultimate aim is to train the client to a level where they will be able to perform most analytical collection involving X-Ray methods.
- (v) A number of completed reports for powder XRD and finished structures for Single Crystal diffraction will be produced over the period of the course.
- (vi) The extensive “hands on” element of this course will allow the client, when appropriate, to participate in general equipment maintenance and trouble-shooting. It will also foster an understanding of the alignment and optimization of equipment required for specific experiments.
- (vii) Due to the nature of X-Ray analysis a significant proportion of the work will be computer based.