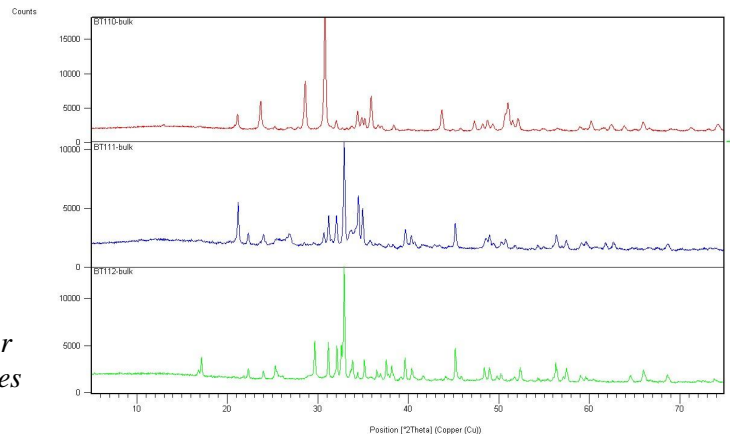


## Introduction

X-ray diffraction is used to investigate the structural characteristics of a given material. Bragg's Law is used in X-ray diffraction to explain the interference pattern of X-rays scattered by crystals. XRD is a quantitative and qualitative technique which is used for the 'fingerprint' characterisation of crystalline materials and their crystal structures. The diffraction pattern contains a range of peaks of different relative intensities at specific angles of diffraction which is unique to a specific crystal structure. Crystal phases can be identified from these diffraction patterns.



Figure 1. Phase analysis on powder even on very small sample quantities



## Philips X'Pert PRO MPD

- Inorganic phase analysis on powder even on very small sample quantities. Analysis of polymorphs.
- In situ phase transformations. Crystallisation phenomena as a function of temperature can be studied at temperatures up to 1200oC
- Measuring of the thickness of poly-crystalline thin layers and interpretation of the roughness at the layer interface
- Crystallographic measurements, thin-film thickness measurement
- Determination of crystal parameters by diffraction of X-rays
- Texture Analysis – to determine the preferred orientation of the crystallites in polycrystalline aggregates
- Residual stress – based on the measurement of lattice strain distributions. Stress is calculated from strain distribution.



## Analysis

- Qualitative phase analysis.
- Automatic semi-quantitative phase analysis using RIR values.
- Crystallinity determination.
- Cluster analysis automatically sorts closely related scans of an experiment into clusters.
- Systematic error correction with polynomial functions for precise lattice parameter determination.
- Processing of multiple scans (add, subtract, merge, extend, edit).
- Crystallite size or micro strain calculations by the Scherrer method.



Figure 2 Thin film, glancing angle... modules for different applications.

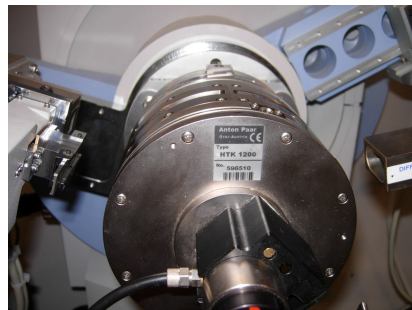


Figure 3. HTK 1200 for in situ High Temperature XRD.

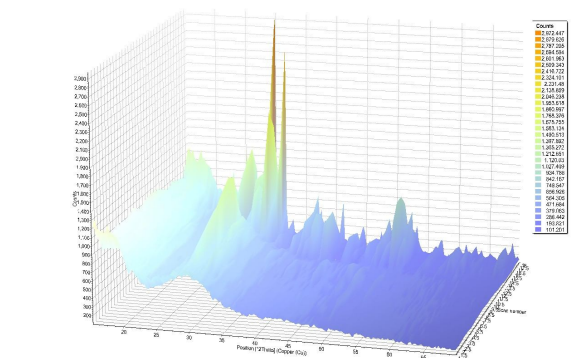
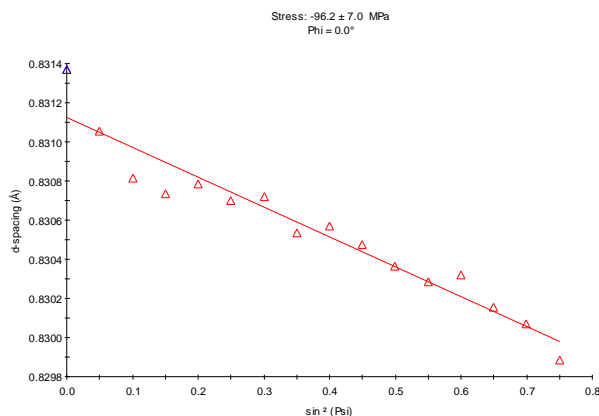


Figure 3 Crystallisation of a glass from ambient temperature to  $1000^\circ\text{C}$



Figure 4. A wide range of sample sizes and shapes.

Figure 5. Residual Stress is calculated from strain distribution

