

ADVANCED GUINIER-TYPE POWDER INSTRUMENTATION

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X-ray powder diffraction may be considered the main 'workhorse' in almost any field regarding solid state and materials sciences. Advances with instrumentation in recent years provided for major improvements with established methods but also induced the development of new and more specialized applications. The application of shorter wavelength (higher energy) X-rays while looking for higher resolution in the diffraction experiment is a principal contradiction calling for combinations of 'smart' solutions.

The Huber G670 Guinier system is very versatile and reliable, but at the same time simple and flexible for modifications towards more dedicated experiments. The imaging plate based detector system is well suited for any kind of typical lab-based X-ray sources ranging from Cr-K α (5.4116 keV) up to Ag-K α (22.1054 keV). However, much higher energies or synchrotron radiation may be used without any problems.

We have started to evaluate improvements and dedicated applications of the instrument on a broad basis. Concerning conditioning of the primary X-ray beam several options will be presented including 1-D and 2-D multilayer optics along with Johansson-type crystal monochromators. Such devices become very demanding in many respects when high-energy X-rays are targeted. Spot shaped beams are not commonly used with Guinier-type setups, however, a small but brilliant spot provides an excellent basis for studying small samples in general, but in particular with diamond-anvil cells or for typical samples in the fields of art and cultural heritage. Any setup may be easily adapted to a broad range of X-ray sources.

Unit improvements in resolution but also concerning signal-to-noise ratio will be discussed with respect to the camera setup and the detector. Diffraction data of well defined samples will be presented for any particular setup evaluated.

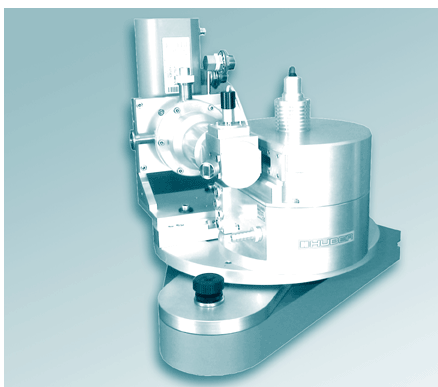


Fig. 1: The Huber G670 Guinier system used for the experiments.

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