

DETECTORS FOR DEMANDING X-RAY DIFFRACTION EXPERIMENTS

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State-of-the-art detectors are indispensable for successful X-ray diffraction experiments. They determine the quality, reliability and throughput of X-ray diffraction and scattering investigations in the laboratory as well as at synchrotron beam lines.

The most important requirement for XRD is real photon counting with lowest possible detector noise to achieve large peak-to-background ratio, high dynamic range, and high maximum count rate capability. Basically, two technologies became accepted: gas-filled proportional counters and silicon based solid state detectors. Both technologies still offer potential enhancement concerning above mentioned properties as well as energy and spatial resolution. Not surprisingly numerous activities are focused on achieving further performance progress to allow more demanding or even new applications.

The different technologies for 0-, 1- and 2-dimensional XRD detectors will be discussed in the view of application specific capabilities on e.g. energy range and resolution, count rate limit, background and dynamic range, size and spatial resolution. The example shown below illustrates optimized discriminator settings for Fe-bearing samples measured with Cu-radiation and a 1D- detector (LynxEye) in only 30 minutes total scan time. The vastly improved peak background ratio due to suppressed fluorescence is apparent.

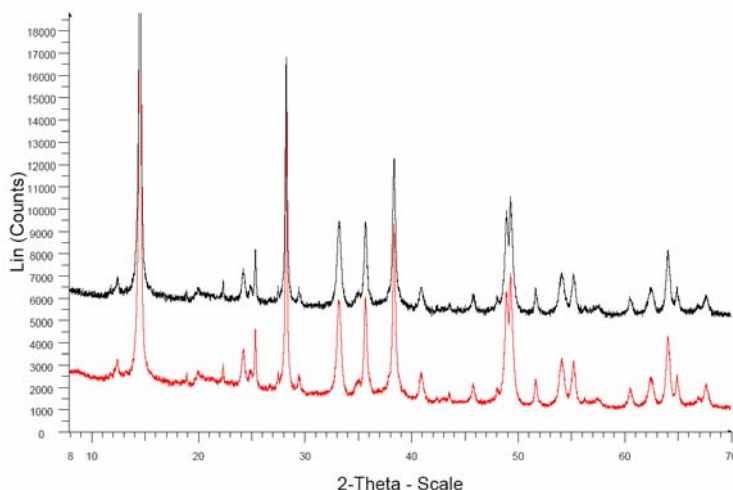


Fig: Fe-bearing bauxite XRD data (LynxEye detector, Cu radiation) with standard (top) and optimized (bottom) discriminator settings to reduce fluorescence. Data are normalized to maximum intensity.