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DBO (Dynamic Beam Optimization): the ultimate in powder diffraction

TOPAS quantitative phase analysis of crystalline material is nowadays a straightforward task. A growing demand is seen for the quantification poorly crystalline and amorphous material. For those materials it is important to separate their broad and weak signals from the instrument background especially in the vicinity of the incident primary beam.

Reasons why these materials are difficult to detect in the experiment compared to well crystallized materials are found in the nature of their contribution to the signal to be measured:

- Instrument background towards low diffraction angles is due to contributions from the primary beam and X-rays scattered in air in particular when using linear detectors.
- Fluorescence from the sample and white radiation from high energy X-rays add features to the background that are broad in the low angle region. Those broad signals may be misinterpreted as amorphous.
- Amorphous and nano-crystalline materials show broad and low intensity diffraction signals. This makes it difficult to detect them if present at low concentration.

In summary low intensity broad peaks are difficult to be detected at low diffraction angles which requires a well-defined background that should be as low as possible.

The dynamic beam optimization (DBO) became recently available for BRUKER XRD instruments, this technology permits to collect high quality data easily with rapid measurement time. This opens the door to routine quality-control XRD on poorly crystalline material.