Quantitative Texture Analysis (QTA) [1] has been developed for several decades at many neutron centres worldwide. Time measurement can be reduce at few hours when intense beam got available like on D20 at the steady-state source of ILL [2]. We show here that this time can still be reduced by increasing the solid-angle range spanned by the detector, as recently became available at the D19 beamline of ILL.

Results from the D20 instrument.

We choose two Belemnite sp. calcitic rostra from the Cretaceous and Jurassic to calibrate the instruments for the combined analysis.

Results from the D19 instrument.

The D19 instrument is equipped with a 120° curved position sensitive detector that encompasses 30° along the tilt angle (cf. Fig Below), reducing the (χ, φ) texture scans nearly by a factor of 5. The χ rings (72 sample positions using a 5° resolution grid) are measured completely, but only 4 detector positions are needed to span the 90° in φ, resulting in only 288 measured points (vs 1368 on regular instruments) for the same resolution grid. Furthermore the grid resolution is a priori only limited by data binning.

Data reduction

The Debye-Scherrer cones are corrected first for flatfield and solid-angle using a standard scatterer (V). The rings curvature are then developed, then binned to a desired resolution grid (5°). 2D – diagrams are obtained, equivalent to those of one dimensional CPS detectors. Simple angular relationships are obtained between coordinates of the D19 and other one dimensional detectors. Transformations from diffractometer space to pole figure space [3] are obtained using classical relations for CPS detectors. D-spacings obtained from the two instruments are in good agreement.

Results from the D19 instrument.

For this acquisition only 5 scans (vs 19 for D20) in φ, become necessary thanks to the χ-scan of the detector. This reduces the acquisition time to less than 1h. Very similar pole figures are obtained using the D19 instrument, though the maximum distribution density is lower than on D20. This is attributed to a relatively worse fit (as denoted by the largest reliability factors) very probably due to artifacts introduced during data reduction, which still need improvements.

Reliability factors for the D19 and ODF refinement:

\[ R_{wp} = 5.4764\% \]
\[ R_{exp} = 5.9349\% \]

References