



PANalytical
get insight



Texture

Software for quantitative X-ray texture analysis

Texture, a software module for PANalytical's X-ray diffraction systems, permits the analysis, calculation and visualization of preferred crystallite orientations in all kind of polycrystalline materials – metals, minerals, polymers, ceramics, etc.

Its extensive range of graphical display options includes specially developed 3D presentation modes that offer new approaches to the interpretation of pole figures and orientation distribution function (ODF) plots. Texture runs on Windows® XP, Windows® 2000, Windows NT®, Windows 10.



Full range of texture calculations

Unique 3D display modes

Special effects aid data interpretation

Supports PANalytical's XRDML data format

Works with APP via the Command Line Interface

Powerful graphics

Texture calculations

Analyses are based on raw xrdml data gathered with Data Collector. Experimental pole figures used in the ODF calculations can be corrected for defocusing errors, background intensities and absorption in thin samples. The program also includes an intensity correction routine for diffractometer systems equipped with an X-ray lens.

Defocusing data, measured on a texture free specimen, can be corrected for background intensities within Texture.

ODFs are constructed using the WIMV method, for:

- crystal symmetry – cubic, tetragonal, orthorhombic, trigonal, hexagonal, monoclinic
- sample symmetry – triclinic, orthorhombic

The calculated ODF data form the input for recalculation of pole figures and calculation of inverse pole figures. For each sample, all input and calculated data are stored under a single name as an 'ODF Project' file. A log file provides a complete record of the process steps leading to the analytical results.

Texture supports automatic processing with Automatic Processing Program (APP) via the Command Line Interface. After finishing a measurement with Data Collector, you can automatically display texture data in a View window. Optionally, the View window can be printed.

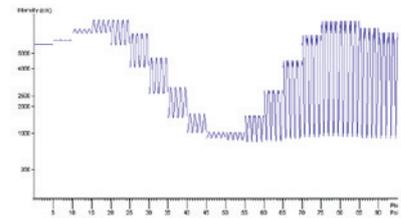
The graphical facility —Views— is a remarkably flexible tool, enabling you to examine data in a highly visual form and to manipulate images at will by means of intuitive mouse control. Graphs of correction measurements and calculations; ODF reconstructions; experimental, corrected, calculated and inverse pole figures can be observed in dedicated View windows. The MDI gives freedom to define the number of objects and the style of presentation to be used in any window.

Pole Figure View gives a choice of four options:

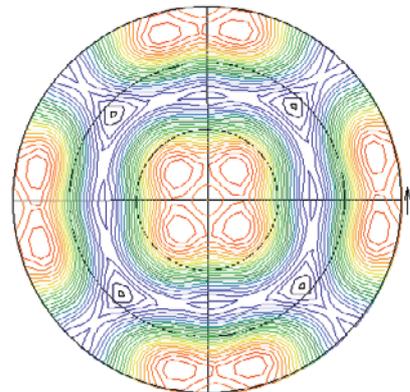
- 1D — x, y graphs plotting intensity against Psi and Phi
- 2D — intensity contour mapping for classical Wulff or Schmidt projections
- '2.5D' — a pseudo-3D presentation, based on a cylindrical projection of the coordinates
- true 3D — unique to Texture, employing a spherical projection to create a realistic image in which intensities are clearly related to the sample tilt angles

In ODF View, plots are displayed using Bunge or Roe coordinates to produce a set of 2D sections. However, another PANalytical innovation, the 'iso-surfaces' approach, allows you to visualise intensity distributions in virtual 3D space. Various intensity levels can be shown within the same 3D figure, in which they are represented with increasing transparency as intensities decrease.

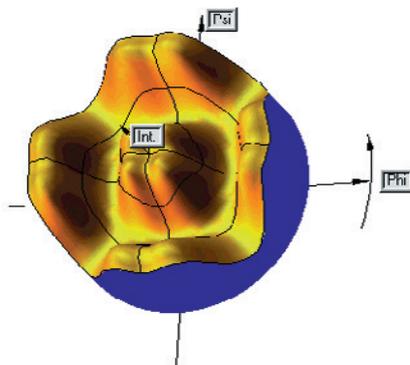
Corrections View is used to display background and defocusing corrections as 1D graphs of intensity against Psi. All data can also be presented in tabular form.



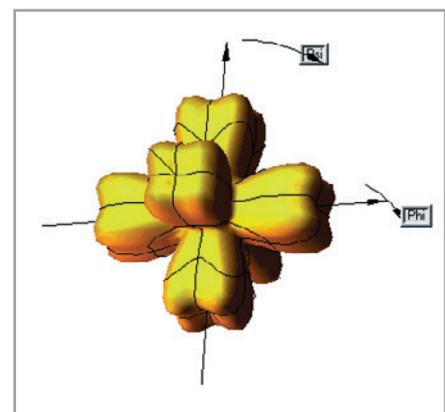
1D



2D



2.5D



3D

Enhanced display

The series of displays shown left illustrates the graphical flexibility available in Pole Figure View. All present the same (411) pole figure for a cubic material with a simulated texture. In the 1D representation, the figure is plotted as a set of Phi-scans, measured at various Psi inclination angles. This option is particularly useful for the inspection and comparison of pole figures before and after correction for background and defocusing effects.

The 2D contour map shows the pole figure in the Schmidt (equal area) projection. The colors for the isocontour lines can optionally be selected from a set of color palettes.

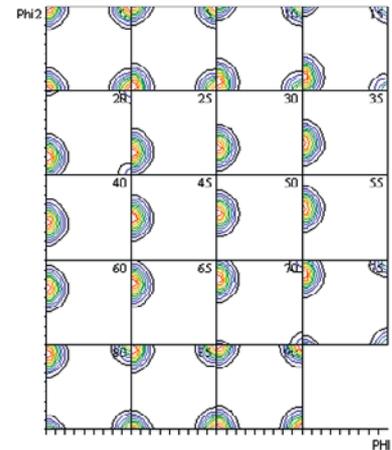
The so-called 2.5D graphic is a cylindrical projection. The intensity at a position with Phi and Psi coordinates in the base-plane of the pole figure is represented by its height in the perpendicular direction. A clear resemblance can be observed between this and the 2D pole figure. Here, the figure is simulated as a shiny gold surface illuminated with a mixture of blue and white light.

The 3D, or spherical, representation shows the pole figure intensities at the 'true' Phi and Psi orientation angles. This provides a clear view of the distribution of the diffracting crystallites over the orientation space. As with the 2.5D version, various simulated 'Materials' and 'Lights' effects can be chosen.

Displaying the ODF

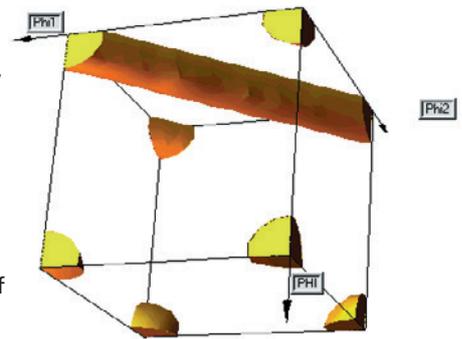
2D display

The conventional 2D display (right) shows an ODF calculated from a set of five simulated pole figures – (110), (211), (310), (321) and (411) – for a material with a cubic crystal structure and an orthorhombic sample symmetry. This is presented in the Bunge notation of the Euler angles, as a set of Phi1 sections from 0° to 90°, with a step size of 5°.



3D representation

In the 3D representation seen below, all three Euler angles are shown in orthonormal space. This 'iso-surface' approach, specially developed by PANalytical, gives a complete view of the ODF. ODFs calculated using the WIMV method can also be presented in a tabular form, in which the intensities are given as a function of the three Euler angles. From these data, pole figures can then be recalculated for various (hkl) orientations. Inverse pole figures can also be calculated for any sample orientation.



Interactive

Texture enables you to select the intensity scales and colour spectra used for graphs, and offers broad scope for the addition of texts and angle labels. Images can be zoomed to permit closer examination of areas of interest. In addition, the 2.5D and 3D graphics may be tilted and rotated, either in automatic increments or by mouse movements. For ease of comparison, you can synchronously manipulate all of the graphical objects in a View window. 'Materials' and 'Lights' functions

simulate different types of surface and illumination for pole figures and ODFs. The images can be made to appear as reflective metallic solids or chalk-like white forms, for example, thus emphasising different topographical features. Graphical views may be stored, printed or saved to the clipboard for insertion into word-processed reports, spreadsheets and presentations. To display background and defocusing corrections as 1D graphs of intensity against Psi. All data can also be presented in tabular form.

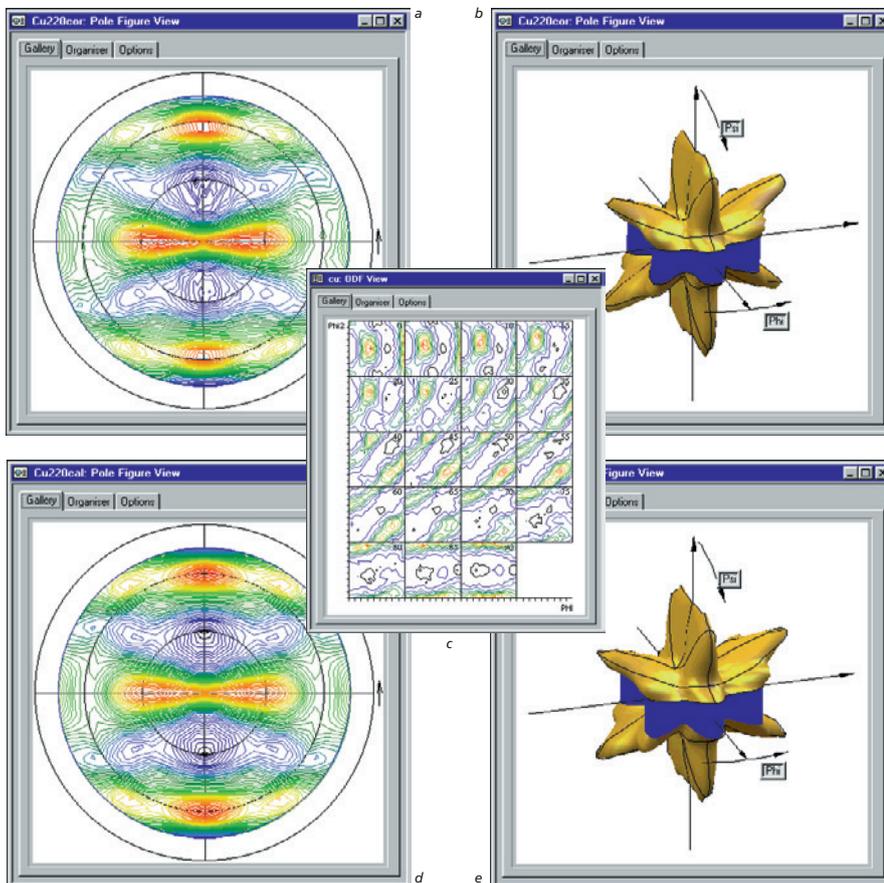
Example: rolled copper

Four pole figures — (111), (200), (220) and (311) — of a rolled copper sample were measured using an X'Pert PRO MPD system equipped with an ATC-3 texture cradle. These were corrected for background intensities and defocusing effects. The defocusing curves, including the applied background corrections, were measured on a texture-free copper powder sample.

As an example, the (220) corrected pole figure is shown in 2D (a) and 3D (b) representation. The pole figures were measured at Psi tilt angles up to 75°. In (a), the outer circle indicates the Phi circle at Psi = 90°. In (b), the blue band indicates the non-measured areas above Psi = 75°. The ODF derived from the corrected pole figures was calculated with an orthorhombic sample symmetry and a cubic crystal symmetry.

A 2D representation of the result, shown in the Bunge notation, is seen in (c). Phi1 is chosen as the fixed axis; the Phi1 step size is five degrees.

The calculated (220) pole figure, shown in 2D (d) and 3D (e), reveals a close resemblance with the corrected pole figure shown in (a) and (b) above. This confirms the consistent quality of the initial measurements.



Global and near



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