Rietveld-texture analysis of SRM 1976a: a possible standard for texture measurements?

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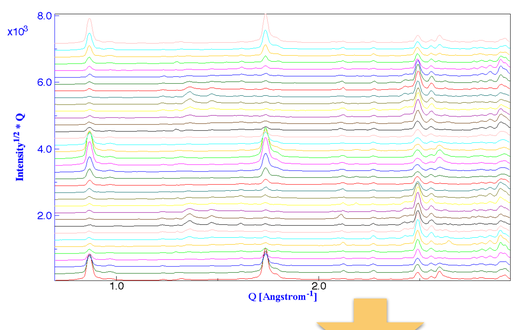
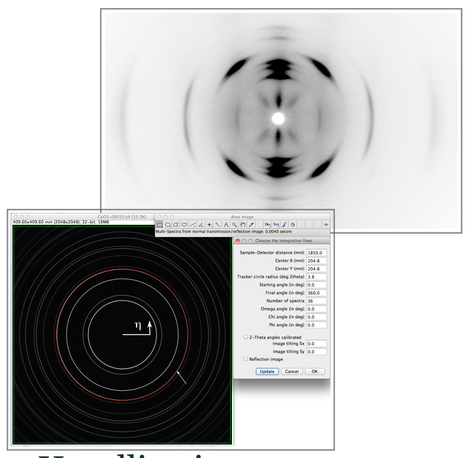
Rietveld Texture Analysis

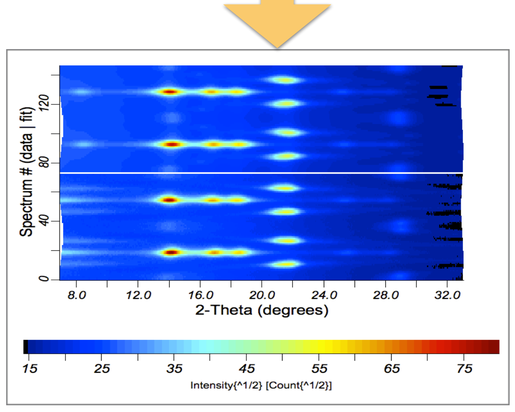
From diffraction patterns (collected at different sample orientations χ, ϕ)



From diffraction images



Unrolling images



Rietveld Texture fit

Pro: can be used with multiphase, low symmetry, complex samples

Cons: ?

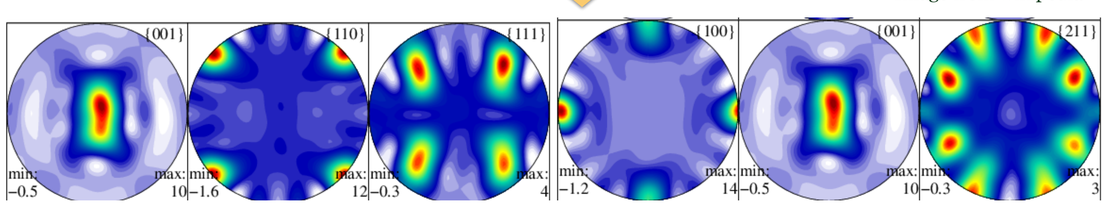
Traditional Texture Analysis

From several complete or partial measured pole figures

Background subtraction and intensity integration

Pole figures normalisation

Image from wikipedia



Pole figures inversion:

- Harmonic
- WIMV
- MTEX

Pro: ?

Cons: Only for 1 phase, high symmetry (requires well separated peaks)

Final ODF (Orientation Distribution Fiunction)

Why a texture standard?

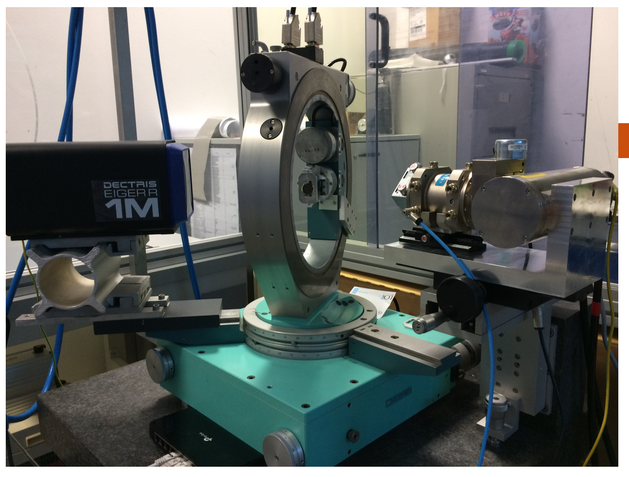
- Instrument, procedures & analysis assessment
- To measure the instrumental "texture broadening"

Available standards:

- H.-R. Wenk limestone cube (used for texture round robins, 1 sample) [1]
- Labosoft texture reference materials (not a standard, each sample sold with texture measurement) [2]

Why NIST 1976a[3]/b/c/d?

- Already certified standard, distributed in quantities
- Reproducible intensities ☛ reproducible texture/ODF
- Sharp ODF ☛ good to measure "texture broadening"

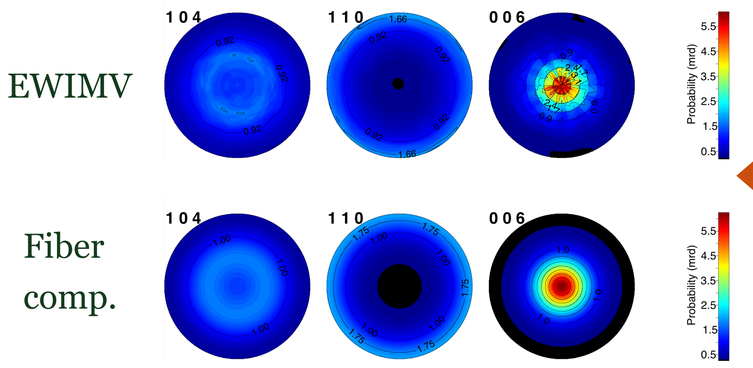


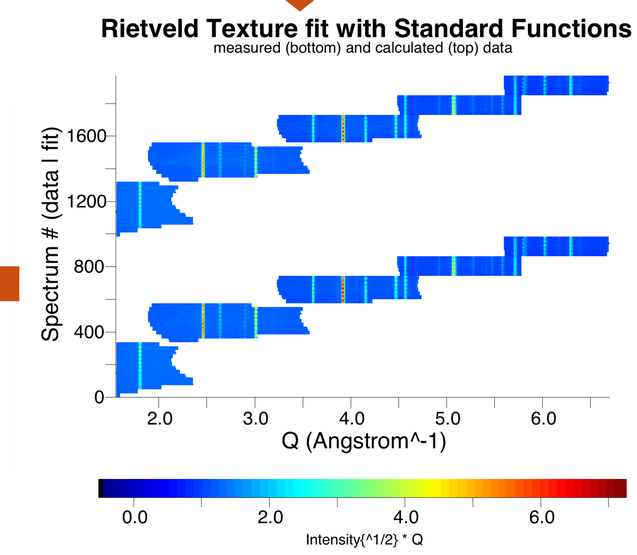
Measurement: for different χ, ϕ collection of 5 images at different 2θ, ω (covering 120° in 2θ). Total: 120 images (1 minute per image)

Rietveld Texture Analysis (MAUD):

1) using EWIMV, 2) switching to 1 fiber component in standard functions

Recalculated pole figure from ODF

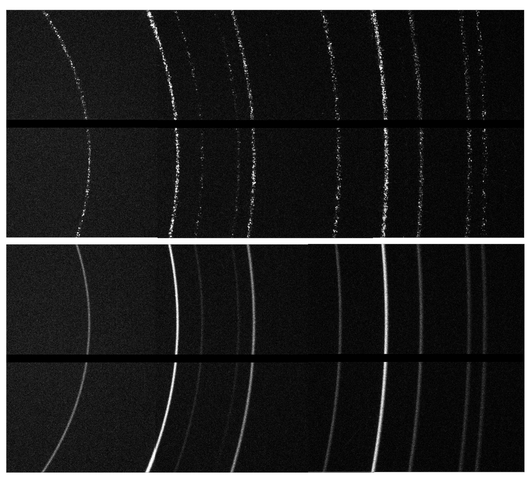




Problem: graininess, may requires oscillation with X-ray high resolution instruments

NIST 1976a static measurement (images at different 2θ merged)

NIST 1976a oscillating (image reflected horizontally)

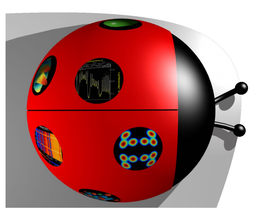


References

[1] Wenk H. -R., J. Appl. Crystallogr. 1991, 24, 920.

[2] Labosoft, Texture reference samples, http://www.labotex.com/texture_standards.html.

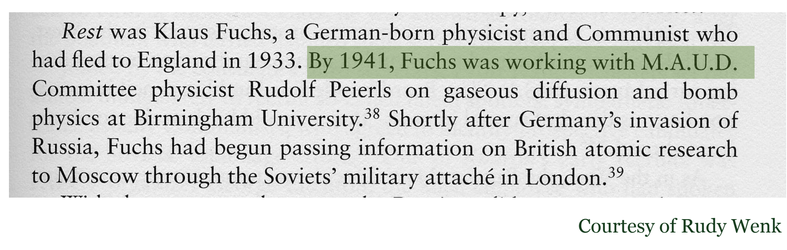
[3] SRM 1976a, 2008, NIST Standard Reference Materials Program, Gaithersburg, MD, USA.



Made with MAUD

Free download at: http://maud.radiographema.com

- L. Lutterotti, Total pattern fitting for the combined size-strain-stress-texture determination in thin film diffraction, Nuclear Inst. and Methods in Physics Research, B, 268, 334-340, 2010.
- L. Lutterotti, M. Bortolotti, G. Ischia, I. Lonardelli and H.-R. Wenk, Rietveld texture analysis from diffraction images, Z. Kristallogr., Suppl. 26, 125-130, 2007.
- L. Lutterotti, S. Matthies, H.-R. Wenk, A.J. Schultz and J. Richardson, Combined texture and structure analysis of deformed limestone from neutron diffraction spectra, J. Appl. Phys., 81[2], 594-600, 1997.



Rest was Klaus Fuchs, a German-born physicist and Communist who had fled to England in 1933. By 1941, Fuchs was working with M.A.U.D. Committee physicist Rudolf Peierls on gaseous diffusion and bomb physics at Birmingham University.[38] Shortly after Germany's invasion of Russia, Fuchs had begun passing information on British atomic research to Moscow through the Soviets' military attaché in London.[39]

Courtesy of Rudy Wenk