

Crystallographic texture analysis from synchrotron and neutron diffraction data

Many rocks, metals, alloys, ceramic materials, etc. are polycrystals consisting of grains of one or several crystalline phases. Preferred orientation of crystal lattices of grains - or crystallographic texture - is formed and changed by plastic deformation, sedimentation, crystallization, recrystallization, structural phase transitions. The texture induces anisotropy of physical and mechanical properties of the material. To study crystallographic preferred orientations in bulk samples, synchrotron and neutron diffraction methods are applied. The aim of this project is to familiarize students with these texture research methods and sophisticated data analysis routines.

Tasks of the project:

- 1) study texture analysis basics;
- 2) familiarize with MAUD software;
- 3) process synchrotron and neutron diffraction data of real samples to obtain textures

Preliminary schedule by topics/tasks

The duration of this project is planned to be 6 weeks.

Required skills

Basic knowledge of:

- 1) crystallography;
- 2) diffraction methods;
- 3) Rietveld method

Acquired skills and experience

- 1) knowledge of crystallographic texture analysis basics and orientation distribution function reconstruction methods;
- 2) knowledge of specialized software for crystallographic texture analysis;
- 3) experience with diffraction data processing for extraction of crystallographic preferred orientations

Recommended literature

- 1) Kocks U.F., Tome C.N., Wenk H.-R. Texture and anisotropy. Cambridge University Press, 1998.
- 2) Engler O., Randle V. Introduction to texture analysis. CRC Press, 2010.

- 3) Wenk H.-R., Lutterotti L., Vogel S.C. (2010). "Rietveld texture analysis from TOF neutron diffraction data," *Powder Diffraction* 25, 283-296.
- 4) Lutterotti L., Vasin R., Wenk H.-R. (2014). "Rietveld texture analysis from synchrotron diffraction images. I. Calibration and basic analysis," *Powder Diffraction* 29, 76-84.
- 5) Wenk H.-R., Lutterotti L., Kaercher L., Kanitpanyacharoen W., Miyagi L., Vasin R.N. (2014). "Rietveld texture analysis from synchrotron diffraction images. II. Complex multiphase materials and diamond anvil cell experiments," *Powder Diffraction* 29, 220-232.