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POWTEX Neutron Diffractometer at FRM II - New Perspectives for *In-Situ* Rock Deformation Analysis

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In Geoscience quantitative texture analysis here defined as the quantitative analysis of the crystallographic preferred orientation (CPO), is a common tool for the investigation of fabric development in mono- and polyphase rocks, their deformation histories and kinematics. Bulk texture measurements also allow the quantitative characterisation of the anisotropic physical properties of rock materials. A routine tool to measure bulk sample volumes is neutron texture diffraction, as neutrons have large penetration capabilities of several cm in geological sample materials.

The new POWTEX (POWder and TEXture) Diffractometer at the neutron research reactor FRM II in Garching, Germany is designed as a high-intensity diffractometer by groups from the RWTH Aachen, Forschungszentrum Jülich and the University of Göttingen. Complementary to existing neutron diffractometers (SKAT at Dubna, Russia; GEM at ISIS, UK; HIPPO at Los Alamos, USA; D20 at ILL, France; and the local STRESS-SPEC and SPODI at FRM II) the layout of POWTEX is focused on fast time-resolved experiments and the measurement of larger sample series as necessary for the study of large scale geological structures. POWTEX is a dedicated beam line for geoscientific research.

Effective texture measurements without sample tilting and rotation are possible firstly by utilizing a range of neutron wavelengths simultaneously (Time-of-Flight technique) and secondly by the high detector coverage (9.8 sr) and a high flux ($\sim 1 \times 10^7$ n/cm^{2}s) at the sample. Furthermore the instrument and the angular detector resolution is designed also for strong recrystallisation textures as well as for weak textures of polyphase rocks. These instrument characteristics allow *in-situ* time-resolved texture measurements during deformation experiments on rocksalt, ice and other materials as large sample environments will be implemented at POWTEX.

The *in-situ* deformation apparatus is operated by a uniaxial spindle drive with a maximum axial load of 250 kN, which will be redesigned to minimize shadowing effects inside the cylindrical detector. The HT deformatione experiments will be carried out in uniaxial compression or extension and an upgrade to triaxial deformation conditions is envisaged. The load frame can alternatively be used for ice deformation by inserting a cryostat cell for temperatures down to 77 K with a triaxial apparatus allowing also simple shear experiments on ice. Strain rates range between 10^{-8} and 10^{-3} s^{-1} reaching to at least 50 % axial strain. The deformation apparatus is designed for continuous long-term deformation experiments and can be exchanged between *in-situ* and *ex-situ* placements during continuous operation inside and outside the neutron detector.