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POWTEX –Angular- and Wavelength Dispersive, High-Intensity Neutron TOF Diffractometer

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POWTEX is a TOF neutron powder diffractometer under construction at MLZ. Funded by Germany's Federal Ministry of Education and Research (BMBF), it is built by RWTH Aachen University and FZ Jülich, with contributions for dedicated texture sample environments from the Geo Science Centre of Göttingen University. An instrument overview and the advances made in neutron instrumentation will be presented. Several new concepts were developed including a novel 10B detector and a double-elliptic neutron-guide system sharing focal points at the positions of pulse chopper and sample. The common focal point is an "eye of a needle" in time and space, optimizing time resolution and reducing the source background. The guide features an octagonal cross section with graded super-mirror coating, which results in Gaussian intensity and divergence distributions. The innovative jalousie detector based on solid 10B is a development for POWTEX that achieves high efficiency for a remarkably large coverage of nine steradians with almost no blind spots.

POWTEX aims for short measurement times and gives access to in situ chemical experiments, e.g., phase transitions as a function of T, p, and B₀. For texture analysis, in situ deformation, annealing, simultaneous stress, etc., the large angular coverage drastically reduces the need for sample tilting/rotation. We developed new algorithms for refining angular- and wavelength-dispersive data sets (intensity as function of 2θ and λ).

Primary author: MEINERZHAGEN, Yannick

Co-authors: HOUBEN, Andreas (RWTH Aachen, Institut für Anorganische Chemie); DRONSKOWSKI, Richard (RWTH Aachen University)

Presenter: MEINERZHAGEN, Yannick

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