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Focusing High-Resolution Three Axis Neutron Diffractometer for Microstructure Investigations of Polycrystalline Materials

Tuesday, 21 March 2023 16:00 (2 hours)

Presented three-axis neutron diffractometer setting documents the feasibility of using it in special cases high-resolution powder diffraction studies, namely, for thermomechanical (elastic and/or) plastic deformation studies of bulk polycrystalline samples when the whole powder diffraction spectrum is not required. Contrary to the conventional double-axis setting the suggested alternative providing a much higher resolution, consists of an unconventional three axis set-up employing a bent perfect crystal monochromator and analyzer with a polycrystalline sample in between. The analysis of the profile of the beam diffracted by a sample is carried out by rocking the BPC-analyser and the neutron signal is registered by a point detector. Then, the so-called analyzer rocking curve providing a sample diffraction profile can reflect the lattice or structural changes. Moreover, much larger widths (up to 10 mm) of the irradiated gauge volumes can be investigated when just slightly affecting the resolution of the experimental setting. Finally, a feasibility of the proposal of the three-axis alternative employing PSD for strain/stress studies which could substantially decrease a long measurement time when using the step-by-step rocking curve scanning will be documented.

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