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# Diffraction Experiments under Extreme Conditions on Single Crystals with Hot Neutrons on HEiDi

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Single crystal diffraction (scd) with neutrons is one of the most versatile tools for detailed structure analysis on various hot topics related to physics, chemistry and mineralogy. The scd HEiDi at the Heinz Maier-Leibnitz Zentrum (MLZ) offers high flux, high resolution and large q range, low absorption and high sensitivity for light elements.
At very high temperatures studies on Nd2NiO4+δ and Pr2NiO4+δ brownmillerites concerning their oxygen diffusion pathways reveal anharmonic diplacements of the apical oxygens pointing towards the interstitial vacancy sites which create a quasicontinuous shallow energy diffusion pathway between apical and interstitial oxygen sites [M. Ceretti et al., J. Mater. Chem. A 3, 21140-21148, 2015]. Recent studies use a special mirror furnace developped at MLZ which allows not only temperatures > 1300 K but also atmospheres with various oxygen contents and different pressures around the sample to study their influence to the evolution of the occupation of the interstitial sites.
Last but not least a BMBF (German ministry for education and research) funded project was launched in 2016 in order to allow studys on tiny samples < 1 mm³ and to develop new pressure cells for HEiDi which can be combined with its existing low temperature equipment in order to study structural properties down to temperatures below 10 K, e.g. MgFe4Si3 compounds and their magnetic features [A. Grzechnik et al.,J. Appl. Cryst. 51, 351-356, 2018].

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