MS40-P07 | Diffraction Experiments under Extreme Conditions on Single Crystals with Hot Neutrons on HEiDi

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Single crystal diffraction is one of the most versatile tools for detailed structure analysis. Due to their specific pecularities neutrons are a very useful probe for structural studies on various hot topics related to physics, chemistry and mineralogy. The single crystaldiffractometer HEiDi at the research neutron source 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 $Nd_2NiO_{4+\delta}$ and $Pr_2NiO_{4+\delta}$ 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 [1]. A special mirror furnace which allows not only temperatures > 1300 K but also atmospheres with various oxygen contents and different pressures around the sample allows to study their influence to the evolution of the occupation of the interstitial sites.

A BMBF (German ministry for education and research) funded project was launched in 2016 in order to allow studys on tiny samples < 1 mm^3 and to develop new high pressure cells for HEiDi which can be combined with its existing low temperature equipment for studies on structural properties down to temperatures below 10 K, e.g. $MgFe_4Si_3$ compounds and their magnetic features [2].

[1] M. Ceretti et al.; J. Mater. Chem. A 3, 21140-21148 (2015).
[2] A. Grzechnik et al.; J. Appl. Cryst. 51, 351-356 (2018).