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Quenching and Deformation Dilatometer for In-Situ Materials' Characterization by Neutron Diffraction (STRESS-SPEC) and Small Angle Neutron Scattering (SANS-1) at MLZ

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

A Quenching and Deformation Dilatometer (TA instruments DIL805A/D/T) operates at the MLZ for performing in-situ neutron diffraction (phase, texture, stress/strain) at STRESS-SPEC and small-angle neutron scattering (nanostructure) at SANS-1. Imaging applications are under preparation at ANTARES. With this setup, the evolution of the sample length during heating or quenching can be accurately monitored while scattering data are being acquired. Thanks to induction heating and gas cooling very high rates are accessible. Forces up to 20 and 8 kN can be applied in compression and tension, respectively. Besides, special sample holders for powders will soon extend the range of applications.
The combination of the neutron scattering and dilatometry measurements yields a unique view on the microstructural evolution under thermomechanical treatment. In this work, we will show the parameters of the dilatometer and its possibilities to be used for in-situ scattering characterization. Besides we will present some results of different materials like TiAl alloy to investigate the mechanisms of hot compression and further to optimize the mechanical properties, and Cu-Ce_{0.8}Gd_{0.2}O_{2-δ} (CGO) composites to tune thermo-mechanical compatible electrodes for solid oxide fuel cells (electrolyzers).

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