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The new Quenching & Deformation Dilatometer for Materials Science with Neutron Scattering at MLZ

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A Quenching & Deformation Dilatometer (TA instruments DIL 805A/D/T) is now operational at the Heinz Maier-Leibnitz Zentrum (MLZ). It is customized for running neutron scattering measurements during temperature/deformation treatment of the sample, in particular neutron diffraction (phase, texture, stress/strain) at STRESS-SPEC and neutron small-angle scattering (nanostructure) at SANS-1.

The dilatometer offers a simultaneous high-precision measurement of the length changes of bulk samples at all times, also when heating/cooling or deforming the sample, adding an additional measurement quantity that is sensitive to transformations in the sample. The combination of the neutron and dilatometry measurements yields a unique view on the microstructural evolution under thermomechanical treatment.

The sample can be inductively heated and gas cooled according to a user-defined linear or exponential cooling rate. The temperature range is currently from room temperature up to 1500°C. The heating rate can be up to 4000°C/s, while specimens can be deformed with deformation rates between 0.01 and 200 mm/s. Depending on user demand, the temperature range can be extended down to -160°C with an additional furnace configuration.

In addition to the dilatometer, we will present also first in-situ neutron scattering experiments.

Primary author: Dr LI, Xiaohu (German Engineering Materials Science Centre (GEMS) at Heinz Maier-Leibnitz Zentrum (MLZ), Helmholtz-Zentrum Geesthacht)

Co-authors: Dr KOOS, Robert (Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München); Dr GAN, Weimin (German Engineering Materials Science Centre (GEMS) at Heinz Maier-Leibnitz Zentrum (MLZ), Helmholtz-Zentrum Geesthacht); Dr HOFMANN, Michael (Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München); Dr BUSCH, Sebastian (German Engineering Materials Science Centre (GEMS) at Heinz Maier-Leibnitz Zentrum (MLZ), Helmholtz-Zentrum Geesthacht); Mr WILHELM, Andreas (Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München); Dr MOULIN, Jean-François (German Engineering Materials Science Centre (GEMS) at Heinz Maier-Leibnitz Zentrum (MLZ), Helmholtz-Zentrum Geesthacht); Prof. MÜLLER, Martin (Insitute for Materials Physics, Helmholtz-Zentrum Geesthacht)

Presenter: Dr LI, Xiaohu (German Engineering Materials Science Centre (GEMS) at Heinz Maier-Leibnitz Zentrum (MLZ), Helmholtz-Zentrum Geesthacht)

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