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A newly developed 100 KN testing machine optimized for in-situ microstructural characterization of high-temperature alloys

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An innovative 100KN testing machine for, tensile, compression, and fatigue testing of industrially relevant high-temperature alloys has been developed and optimized for in-situ microstructural characterization of high-temperature alloys under mechanical and thermal loading. Moreover, this machine can be used as a new sample environment for in-situ experiments at FRM II, e.g., at the instruments Stress-Spec, Spodi, and SANS-1. Neutron Diffraction (ND) is performed to determine the lattice constants (misfit), phase fractions, and strain while Small-Angle Neutron Scattering (SANS) is applied to identify the size and the volume fraction of nano-sized γ' precipitates. Deformation and heating, to simulate the application conditions, is performed in situ to determine the behavior of the alloy. It is possible to investigate the alloys at temperatures up to 1200 °C and with a maximum deformation of approximately 50%. A laser heating and an active cooling device are two developments for the testing machine in future.

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