Contribution ID: **10** Type: **Plenary talk (only invited speakers)**

In situ Neutron Diffraction of martensitic Ni-Ti Shape Memory Alloys

Ni-Ti shape memory alloys (SMAs) are used for medical and engineering applications with increasing commercial success. Despite their technological importance, the elastic behaviour of the monoclinic B19'martensite phase remains elusive, because martensite single crystals are not available for mechanical testing. DFT calculations have provided elastic constants for 0 K involving a monoclinic angle of γ≈107° [1] instead of γ≈98.5°, as we observe experimentally. In recent experimental work 5 out of 13 independent elastic constants were calculated [2].
In the present work we performed in situ neutron diffraction on a B19' Ni-Ti sample (Mf≈44℃) applying tensile load. A special load frame was used where the sample and load axis can be rotated in an Eulerian cradle. This technique allows to separate the effects of elastic and inelastic (detwinning) deformation processes.
Evaluation of previous neutron experiments indicated complex behavior with changes from constant-strain to constant-stress microstructures during loading to 4% pseudoplastic strain. In our recent experiment diffractograms were recorded in the elastic regime at ~0.2, ~0.4 and ~0.6% strain allowing to isolate the orientation dependent elastic strain of the B19'structure from textural changes (caused by variant reorientation). Applying micromechanical models we can then calculate the single crystal elastic-constant-tensor of Ni-Ti B19'.

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Track Classification: Structure