



Contribution ID: 1

Type: **Poster**

In-situ neutron diffraction and electron microscopy to study deformation mechanisms in Ni-based superalloys

Tuesday, 5 December 2023 14:00 (3 hours)

The polycrystalline Ni-based superalloy VDM Alloy® 780 is a further development of the Alloy 718 which is limited in the service temperature of gas turbines to around 650°C. The most important differences between these two alloys are essentially the replacement of Fe by Co and a higher Al-content in combination with a lower Ti-content in VDM Alloy® 780. Tensile loading and unloading experiments were carried out with a newly developed testing machine at the Stress-Spec instrument of MLZ to investigate the deformation behavior at 25 and 500°C. Furthermore, a detailed microstructural investigation was performed by electron microscopy before and after testing to correlate the macroscopic mechanical properties with micromechanical deformation behavior in various oriented grains. The deformation mechanism in the differently oriented grains is primarily dislocation motion and shearing of the Gamma Prime precipitates at both investigated temperatures.

[1] F. Kümmel, A. Kirchmayer, C. Solis, M. Hofmann, S. Neumeier, R. Gilles, *Metals* 2021, 11, 719.

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Session Classification: Poster Session

Track Classification: Material Science