

Development of a new testing machine (load and pressure) for high-temperature alloys

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A great effort has been focused on the development of a new alloy that can operate over 700 °C and can be processed by normal industrial wrought techniques, mainly for aircraft engines and gas turbine applications. VDM Alloy 780, a Ni-based superalloy (NiCoTiAlNbCrMoNiFe), is a promising candidate for this high-temperature application that require e.g. good mechanical properties. This superalloy is based on the γ γ' -system and the austenitic matrix (γ -phase) is strengthened by intermetallic precipitates of Ni₃Al (γ' , fcc L1₂ structure) and Ni₃Nb (γ'' , bct DO₂₂ structure).

For studying the forming process of the alloy a certain sample environment is required. To perform experiments at high temperatures and under load/pressure a new testing machine is developed. In this work we present an overview of the testing machine with its application. In addition first structural studies on VDM 780 superalloy were performed by XRD and ND. Three samples with the same composition but one with standard heat treatment and two with different additional heat treatments were investigated. The mutual project of TU München, TU Braunschweig and VDM Metals is founded by BMBF (FKZ 05K16W02).

Summary

A new Ni-based superalloy called VDM 780 based on the γ γ' -system is under optimization. For this purpose it is necessary to study the microstructure under various conditions as high temperature or deformation. Therefore several experiments like X-ray diffraction (XRD) and neutron diffraction (ND) were performed. Furthermore a testing machine (high temperature, load/pressure) is developed.

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