

Very high cycle fatigue behaviour of additively manufactured TiAl 48-2-2 at 700°C

Alexander Schmiedel^a, Sebastian M. Rudolph, Anja Weidner, Horst Biermann

Institute of Materials Engineering, TU Bergakademie Freiberg, Germany

^a*alexander.schmiedel@iwt.tu-freiberg.de*

The fatigue lives of TiAl 48-2-2 manufactured by selective electron beam melting were investigated in the range of very high cycle fatigue (VHCF) up to 10⁹ cycles under fully reversed loading ($R = -1$) at 973 K. A conventionally wrought material condition of TiAl 48-2-2 was investigated as well for comparison. Hot isostatic pressing followed by a heat treatment to achieve a more fatigue-resistant microstructure, was performed for both material states. The additive manufactured (AM) material showed increased tensile strength, hardness and ductility compared to the wrought material, which finally led to higher fatigue strength of the AM material in the VHCF range. These results are discussed in terms of the microstructure and fractographic analyses. Both crystallographic-oriented crack initiation as well as crack initiation due to internal defects were observed in both material conditions. Finally, the improved fatigue strength of the AM material is related to the duplex microstructure with comparatively small grains and a low amount of manufacturing defects.