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MMM Seminar

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Crystal plasticity based analysis of deformation behavior of two- phase TiAl alloys using a FE^2 multiscale modeling approach

Two-phase TiAl alloys with generic microstructure of duplex to lamellar are simulated using a crystal plasticity model. The structural features of a TiAl alloy in micro and meso level are linked by a two level finite element method (FE^2 multiscale approach) to capture the local microstructural influence on the global load-deformation behavior. The microstructure information of the TiAl phases is obtained from microscopy analyses (SEM and TEM) and implemented into the unit cell model at micro level. The information of grains and lamellar colonies are also extracted and implemented in to the meso scale model. The FE^2 multiscale approach allows coupling the micro and meso models via localization and homogenization of deformation and stress fields. The constitutive behavior of the phases is incorporated into the crystal plasticity models. The crystallographic parameters are either taken from the literature or adjusted from the experiment and simulation data fitting. In this presentation a short overview of the modeling approach and the model generation for different TiAl microstructures will be given. Our results showed that the modeling approach has potentials to generate different TiAl microstructures and to predict the deformation behavior of TiAl alloys reliably. Microstructure and property for different TiAl alloys can be correlated and successfully predicted.