

Complete densification model of TiAl powder for Spark Plasma Sintering

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TiAl alloys are used in aerospace industry thanks to their low density and good mechanical properties. These alloys can be produced by metal casting and powder metallurgy. This second technic is particularly interesting as it ensures good chemical and microstructural homogeneity. Thus, densification of TiAl powder by spark plasma sintering (SPS) is a very promising process for industrial applications. Moreover, the possibilities offered by SPS, especially when coupled with Sinter Based Additive Manufacturing techniques to produce complex shaped parts, made it industrially attractive. Yet, simulation is necessary to ensure the reliability of the process.

A robust and efficient numerical model for the sintering of a TiAl alloy in two numerical steps is created. The first step is dedicated to the thermal-electric simulation of the system and provides the temperature distribution in the tools and the powder by simulating the Joule effect. The second step models the densification of the TiAl powder into a fully dense material by creep (temperature dependent viscoplasticity) using the thermal results obtained in the previous step. The densification model takes into account the creep law of the densified material determined experimentally and a mechanical homogenized model of creep in a porous medium. The model is implemented via the Abaqus® software in a full thermal-mechanical-compaction process. A comparison with the experimental results shows the good adequacy of the simulation.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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