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Model on the Densification of Agglomerates of Nano Powders

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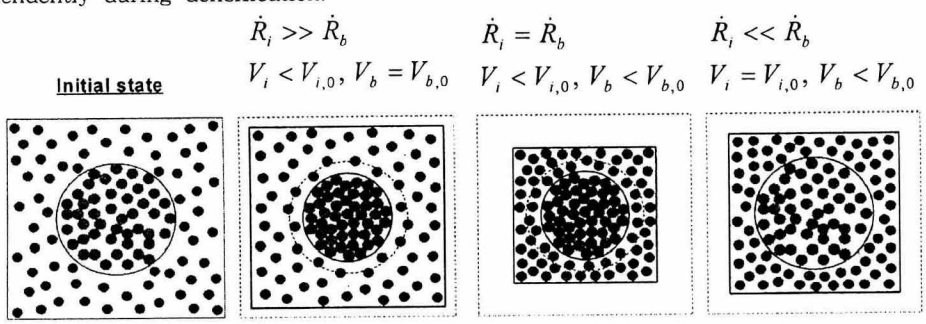
1. Introduction

Successful implementation of the powder forming process requires a detailed understanding of several interacting phenomena, including metal flow, heat transfer, friction and microstructural change. The aim is to better control the process variables, such as temperature, strain rate and pressure, and to optimize the design parameters. This can be achieved by combining experimental studies with numerical modelling approaches. A number of studies were carried out using various constitutive models that take the density change during powder forming into account. Most of them were developed for sintered porous metals, but any of them can describe powder agglomerates, whose behaviour is different from that of uniformly arranged powder, as well. The modification was needed to account for the effect of agglomerate on densification behaviour.

Although a large number of constitutive models for powder densification are available, there are few that can take the agglomeration of powder particles into account. Incorporating powder agglomeration into a constitutive model is of considerable importance, as it provides a possibility of relating the powder densification response to microstructural characteristics of powder particles, especially in case of nano powders. We proposed a new powder agglomerate model in order to describe the unique densification behaviour of nano powders.

2. Agglomerate Model

The following figure shows the proposed model for the configuration of powder agglomerates. The agglomerate is considered as a mixture of dense inner powder compacts (core phase) and surrounding loose powders (boundary phase). The each phase behaves independently during densification.



References

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Abstract

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